European Commission

European Competitiveness Report 2012

Reaping the benefits of globalization

Enterprise and Industry

European Competitiveness Report

2012

Commission Staff Working Document
SWD(2012)299 final

accompanying document to the
Communication from the Commission

A stronger European Industry for Growth and Economic Recovery
Industrial Policy Communication Update
COM(2012)582 final

European
Commission

This report was prepared in the Directorate-General for Enterprise and Industry under the overall supervision of Daniel Calleja Crespo, Director-General, and Viola Groebner, then Director of the Directorate for Industrial Policy and Economic Analysis.

The publication partly draws on background studies prepared by a consortium led by WIFO (see page 231 for a full list of the background studies).

The report was put together in Unit A5 'Economic Analysis and Impact Assessment', by a team consisting of Jorge Durán-Laguna (Chapter 1), Mats Marcusson (Chapter 2), João Libório (Chapter 3), Ágnes Magai (Chapter 4), César Roa and Maya Jollès (Chapter 5), Tomas Brännström (Chapter 6), Luigi Cipriani and Miroslav Skriecka (statistical support) and Dominique Lambourg and Patricia Carbajosa Dubourdieu (administrative support). The team was led by João Libório, Project Manager and Konstantin Pashev, Head of Unit.

Comments and suggestions by many colleagues from the DG ENTR as well as from DG ECFIN, DG TRADE, DG DEVCO and JRC are gratefully acknowledged.

Comments and feedback on the report would be gratefully received at:

http://forums.ec.europa.eu/competitiveness

By e-mail to: entr-econ-analysis-and-ia@ec.europa.eu

Or by mail to:

Directorate-General for Enterprise and Industry

Unit A5 - Economic Analysis and Impact Assessment

European Commission

B-1049 Brussels (Belgium)

Dear reader

The 15th edition of the European Competitiveness Report this year addresses some of the pressing policy questions of industrial recovery and sustainable competitiveness, in a time when globalization has changed both the way firms compete and the way they cooperate.

Daniel Calleja Crespo
Director General
DG Enterprise and Industry

Today we are experiencing a difficult test. Recovery from the crisis is taking longer than expected and looks less certain than a year ago. The economic slowdown and shrinking public and private spending confront European enterprises with hard choices. Their successful integration in the global value chain and competitive positioning in international trade and investment flows has gained new importance for restoring and sustaining our growth model.

In this context, understanding the challenges and opportunities of the global value chain is central for a better targeted industrial policy. Increased internationalization of industrial production gave birth to new concepts such as **'domestic content of exports'**, and the related policy objectives to achieve its optimization. The latter is increasingly seen today as an important measure of industrial competitiveness, together with traditional measures based on exports of final products. Today, enterprises' **value chain performance** becomes as important as their **export performance**. For instance, an SME that is well positioned in the export value chain as a subcontractor or supplier of intermediate goods and services to an exporter might be better off and faster growing than an SME who is a direct exporter; but one who adds only a small portion of value to the inputs it buys for export.

The report contributes to this debate with new empirical information on the long-term evolution trends of the global value chain and their consequent implications for industrial policy. Building on the concept of the domestic value of exports, the report also looks at the **energy content of exports;** in order to draw lessons for the role of energy efficiency for competitiveness. It shows that EU countries have been able to export more and at the same time have been leaders in the worldwide reduction of energy used per export unit, thus reducing their exposure to energy price increases.

Equally important in present day competition is the potential of **FDI flows** to generate growth and employment in times of domestic investment slowdown, also in the medium and long term. This report has a special focus on the EU as a FDI destination and source. It adds empirical insights to the debate about the spill-over benefits and perceived risks of foreign ownership of the European

industrial base. The findings are important for the better understanding of and response to the risks of relocation and hollowing out of Europe's industrial base due to investment outflows to high-growth markets.

Last but not least, the 2012 report looks at how globalization has changed the way firms cooperate, and the advantages and limitations of **business networks** (as compared to clusters). It looks at the EU's **neighbourhood policies** as a source of competitive and value chain gains and argues that globalisation starts at our doorsteps and that the low-hanging fruits of globalization have not yet been fully harvested.

I believe you will enjoy the report. But I also hope that it will inspire you to give feedback on its findings and policy implications. The economic and societal challenges faced by us today call for new and better targeted industrial policy at EU level. This cannot be achieved without a broad debate. I would be grateful if you would share your thoughts and ideas with us, at: http://forums.ec.europa.eu/competitiveness

Daniel Calleja

CONTENTS

EXECUTIVE SUMMARY

The 2012 edition of the European Competitiveness Report provides new empirical evidence for understanding the drivers of industrial competitiveness and the opportunities and constraints faced by European enterprises in the post-crisis recession.

The focus of this year report is on maximizing the benefits of globalization. It studies:

- **the development of global value chains and their impact on the value added of exports;**
- **energy efficiency as a determinant of export performance;**
- **the potential of FDI flows;**
- **the role of business networks; and**
- **the potential of European neighbourhood policies for reaping the benefits of globalisation**.

The 2012 report seeks to identify opportunities to make European industries more competitive by maximising the benefits of globalisation

These topics are important because many of the drivers of and the challenges to the recovery of industrial demand and employment are to be found outside Europe. The new industrial markets outside the EU are key to European competitiveness, particularly in the context of the recovery. More importantly, however, they are crucial for European industrial competitiveness in the long term. This is because the emerging industrialised economies are increasingly competing with Europe not only in traditional exports but also in knowledge-intensive industries. Fast-growing new industrial powers outside Europe present European firms with both challenges and opportunities. These have either not been fully studied or their implications for European industrial policies have remained ambiguous.

The single market and, especially, the expansion into markets outside the EU have made EU economies more open and more specialised. Demand from non-EU countries for EU exports is thus a powerful driver of recovery. The actual impact, however, differs from one EU country to another.

The report starts by putting the stalled recovery into the context of Europe's external trade performance. It argues that even though trade plays an important role in the recovery from the crisis, exports alone will not lead the EU out of the current crisis. The opportunity to rely on foreign demand can be very important in the short term when domestic demand is particularly weak but in the long term sustainable growth will be generated through technical progress and productivity growth. It is in that sense that **the modernization of the industrial base** and the **removal of institutional impediments to entrepreneurship** can be seen as crucial for the European enterprises' competitive performance in and outside Europe.

Economies affected by the pre-crisis real estate bubble are undergoing painful adjustment and deleveraging. The

The recession began when accumulated speculative bubbles in the US and certain EU Member States finally burst. These overpriced assets, and the related distortions of allocative efficiency, are typical for long periods of stability such as 1993-2007. In countries affected by the bubble (e.g. Spain and UK), the subsequent crisis is followed by a long period of slow deleveraging that explains the difficult recovery. In these countries the bursting of the bubble and the deleveraging of firms and households is a process of painful adjustment. Countries that did not accumulate internal imbalances in the period 2000-07 (e.g. Germany), the contraction in GDP is almost entirely due **to shrinking intra-EU exports** of goods and services and to **postponed investment** given the uncertain business conditions of the EU. Consequently, the recovery is expected to be faster in countries in the former group as uncertainty fades away. In the future **recovering exports to fast growing economies outside the EU will certainly contribute compensating for weaker domestic and EU demand in both groups of countries.**

The analysis of export specialization trends of EU member states also sheds light on the impact on recovery of the different patterns of export specialization. In the last two

resultant drop in internal demand cannot be fully offset by demand from outside the EU.

decades the **EU member states increased their openness** in terms of share of exports relative to GDP. For EU-15 Member States the Single market explains only part of this increase in the early 1990s. After that the share of exports to the EU remains relatively stable: the export expansion is mainly outside the Single market. This expansion is accompanied **by increased specialization in exports of manufactures or services**. Even if manufacturing and services are increasingly interrelated, traditional manufactures exporters like Germany or France specialize further in this direction. Meanwhile, UK, Denmark, Greece and Ireland display a notable increase in the export of services.

The study also looks at how competitiveness is fostered by the **institutional and regulatory environment**. It is argued that structural and institutional reforms may not offer quick-fix solutions but given the current fiscal constraints they appear plausibly as a key element of a cost-effective policy response for a way out of the crisis. In the longer term growth depends on the ability of an economy to adopt and develop new ideas. In turn, this ability depends crucially on having the right institutional and regulatory environment.

Outsourcing of production is important driver of cost optimisation and new market penetration.

A clue to maximizing the competitive gains from globalization is the understanding of the **value chain positioning and performance of EU industries.** This report studies trends in the internationalisation of production and the related challenges and opportunities for EU industrial policy. Thanks to globalisation and improved cross-border transport and technological progress, outsourcing production is now an important driver of cost optimisation and new market penetration. Different parts of firms' production processes are now located in different parts of the world, chosen according to the comparative advantages of the locations and their sales potential. The internationalisation of industrial value chains has resulted in a sharp **increase in trade in intermediate and semi-finished products**. The related challenges, risks and opportunities for industrial performance have significantly changed the way firms compete. Today, their positioning in the global value chain — i.e. their ***value-chain performance*** — is becoming a more important measure of competitiveness than the traditional emphasis on *export performance* measured through market shares and comparative advantages.

Hence EU industries' positioning and performance in the global value chain, measured through their domestic content of exports becomes as important guide to policy-making as the traditional measures based on export of finished goods.

How can EU industrial policy help European firms achieve the best position in global value chains? This question is especially important for small businesses (SMEs), which – for a number of well-documented reasons – cannot easily find their way to the world markets.

This report tries to inform policy-making by shedding light on how industrial value-chain competition develops, and what influences firms' decisions to outsource. It uses a **new way of measuring vertical specialisation** — the *import content of exports,* derived from the recently-launched World Input-Output Database (WIOD) — to analyse vertical specialisation patterns. According to the findings, the import share of EU 15, Japan and the US is about 10-15 %, while for the EU 12 it is significantly higher, rising to 34% during the boom period and brought down by the crisis to 30%.

The share of the domestic content of EU exports is slightly lower than that of US and Japan, but the difference reflects the higher reliance on foreign inputs of EU-12 exports.

The analysis of the foreign value of EU exports shows that **China's role is growing**. From 1995 to 2007 the share of imports from China in the EU exports expanded from below 1% to about 10% for EU 12 and from 5% to 15% for EU 15. In fact, from the mid-1990s, China's share in EU-15's exports grew faster than EU-12's share. Chinese manufacturers captured even larger shares (about 20%) of US and Japanese exports. During the crisis, only China managed to increase its share of exports from the EU, US and Japan. Imports from China increased in all major economies during the trade slump. The chapter in question shows that China's share in European, US and Japanese exports has grown mainly at the expense of domestic suppliers. The increased use of foreign imports, including those from China, in European exports has made EU firms more competitive on the world markets.

China's share in EU exports is increasing, but less rapidly than its share in US and Japan's exports.

The chapter looks at **four sectors** which form the backbone of the EU's industrial base: chemicals, transport equipment, electrical and optical equipment and machinery. The share of trade in parts and components in each of these sectors offers new insights into the challenges of recovery. During the trade slump, trade in parts and components declined more sharply than trade in finished goods, probably because of some multiplier effect and inventory adjustment higher up the value chain. The three sectors other than chemicals depend largely on the supply of parts and components, which grew fast in the pre-crisis years and was severely interrupted by the trade slump. This could partly explain why recovery in these sectors is so difficult and is taking so long.

Offshoring seems to be mainly cost-driven. Upstream quality gains may provide a viable alternative to cost-driven relocation.

Finally the chapter uses survey data to analyse **determinants of the decision by firms to offshore** as well as their choice of destinations. It finds that, other things being equal, larger companies or those with higher revenue per employee are more likely to offshore their production. Consequently, any industrial policy that helps companies grow would also improve their positioning in the global value chain. The evidence shows that **offshoring might be primarily cost-driven**. First, more sophisticated products seem less likely to be offshored. Second, offshoring firms tend to spend less on R&D than non-offshoring firms, but are more likely to upgrade their products more often. This finding might mean that **in-house R&D and specialisation in knowledge-intensive products** is an alternative to offshoring to lower-cost locations. The report also considers whether relocation may be driven by excessive regulatory costs in the source country, but does not find empirical evidence in support of this hypothesis.

Pro-active industrial policy may consider FDI promotion and support for the optimal positioning of the SMEs in the global value chains, as well as better-targeted instruments to encourage investment in intangibles and in process and marketing innovations

The findings of this chapter are **important for policy-making in three ways**. *First,* they provide useful input for an EU policy that would allow industry to reap the benefits of the global value chain. Pursuing policies that increase openness to trade helps local companies to become part of global value chains and thus become more productive. This is important since more than two thirds of EU imports consist of intermediate products which boost EU industry competitiveness and productivity.

Second, off-shoring could help European industry maximise cost/quality gains with regard to finished goods. This would require a policy mix that increases the EU's share of exports of finished goods from its trading partners, especially the fast-growing new industrial powers.

Third, the chapter's insights are important since the EU aims to maximise the domestic value of its exports. Case studies show that most of the value is created at the beginning and end of the value chain. Industrial policies should therefore look at the knowledge-creating upstream parts of the value chains and at process and marketing innovations in the downstream parts of those chains.

This goes beyond the mere increase of market shares in goods and services. It includes targeted promotion of **foreign direct investment (FDI)**, support for the **optimal positioning of SMEs in the global value chains**, and new instruments to encourage **investment in intangibles and in process and marketing innovations.**

In addition to the domestic content of exports, the reports studies their energy content and presents new empirical evidence on how energy efficiency contributes to export competitiveness.

The report goes deeper into the **structure of the value-added of exports** to examine in particular how **energy efficiency contributes to external competitiveness.**

Energy is an important component of production costs and competitiveness. The prices of energy commodities, particularly oil, have **risen sharply** in the last decade. Some of the causes are **structural** — such as globalisation and the increasing demand from developing countries, limited fossil fuels resources and overall increasing exploration costs — and tend to lead to permanent energy price increases. The recurrent energy price hikes and volatility seen in the past were often due to **cyclical factors.** These included the considerable rigidity of energy demand in the short term, the failure to fully anticipate its fast growth (as evidenced by low levels of exploration investments and lack of spare capacity), or concerns related to geopolitical events.

Rising energy prices and volatility directly affect **businesses', production costs, their**

economic activity, external accounts and competitiveness. The competitive losses are greater for countries or sectors that are less energy-efficient, more specialised in energy intensive products or more energy-dependent. These include countries that depend heavily on imported fossil fuels and where low-carbon (i.e. nuclear and renewable) sources account for only a small share of the energy mix.

Energy efficiency gains are seen in almost all Member States.

Global competition and the cross-border integration of production chains call for improved energy efficiency and offer new business and energy-saving opportunities. As a result, **energy efficiency improvements** can be observed in almost all countries over the period 1995-2009. In Europe, the EU-12 economies improved significantly their initial low levels of energy efficiency and the European Union as a whole consolidated its overall lead in terms of energy efficiency.

In general, over the period 1995-2009, EU countries were able to export more and at the same time **significantly reduce the energy embodied per unit of exports**, in particular the part of energy that is sourced domestically. The EU has a higher share of foreign-sourced energy in its total exports (34% for the EU-15 and 28% for the EU-12 in 2009) relative to Japan (33%) — a country that is also heavily dependent on imported fossil fuels. The figure for the US is much lower (around 18% in 2009). Emerging economies such as Brazil, Russia and especially China are becoming increasingly important sources of the energy embodied in exports of advanced economies.

The EU leads in reducing the domestic energy content of exports, outperforming the USA and Japan.

The **European economies have been leading** the world in reducing the domestic energy content of exports. For the EU-12 this was primarily due to a significant drop in the energy incorporated domestically in manufacturing exports. For the EU-15, the most important contribution came from the drop in the domestic energy content in service exports. This has helped mitigate the adverse effects on competitiveness and terms of trade arising from the increase in the relative price of energy.

An index decomposition analysis shows that, from 1995 to 2009, manufacturing in the European Union moderately increased its gross output while at the same time keeping its energy use fairly constant thanks to continuous technical improvement. Japan, like the EU, is a world leader in energy efficiency in manufacturing but did not improve its technical efficiency over this period. Manufacturing output and technical efficiency both improved in the US, but less than in the EU.

The EU is also leading the internationalisation and cross-border flows of eco-investment and eco-innovations.

Manufacturing output increased and technical efficiency improved in almost all EU-27 Member States, but their individual performances vary significantly. The highest increases in manufacturing output were seen in the EU-12 countries and Ireland, and these were also the countries that tended to achieve the greatest improvements in technical efficiency. There was a shift towards less energy-intensive sectors in the EU-12 Member States, with only a few exceptions.

Eco-innovating firms are, on the whole, more successful than conventional innovators.

Looking at how eco-innovation affects competitiveness, the report finds that EU firms introducing new products with energy-saving features tend to be **more successful innovators**, particularly in the case of manufacturing firms. Controlling for other determinants of innovation success in the market, these eco-innovators sell more new products than conventional innovators, and this may give them an important competitive advantage.

The report provides new empirical confirmation of the effectiveness and efficiency of the EU's sustainable industrial policy and its

Overall, **EU firms are world leaders** in the increasing cross-border 'eco-investments' in clean and more energy-efficient technologies and products and services. For instance, EU firms account for almost two thirds of the FDI by multinational enterprises (MNEs) worldwide in renewable energy in the period 2007-2011. They are also global frontrunners in other eco-technologies (such as engines and turbines) used to provide environmental goods and services. However, **international competition is increasing**, including from MNEs based in the emerging economies. To remain competitive, EU firms need to focus on exploiting the business opportunities offered by global environmental and societal goals and challenges.

importance for the overall competitiveness of European firms.

This year's report attaches primary importance to the potential of **Europe's foreign direct investment (FDI) policy** for fostering industrial competitiveness. It examines the EU's positioning as a source and destination of cross-border capital flows and the implications for the competitiveness of European firms.

FDI inflows bridge investment gaps and lead to spillovers and technology transfer

Outward FDI positions EU firms in the global value chain

The European Union is a **major player in global FDI**, both inward and outward. This reflects both the potential of the Single Market and the ability of EU companies to successfully compete in EU and non-EU markets.

The EU maintains its lead in inward and outward FDI but is losing its attractiveness as an FDI destination

In the most recent years, however, the EU's share of global inward FDI has **declined significantly**. The crisis meant a severe drop in intra-EU flows: European firms were less able and less willing to invest in the EU market. Consequently, FDI from non-EU countries became more important. Companies based in developed countries, mainly the US and Switzerland continued to dominate this picture, but FDI inflows from emerging economies also gained in importance. Analysing the structure of inward FDI in the EU, **relatively strong foreign presence** can be observed in some manufacturing industries, such as the **chemical industry and petroleum refining**.

This is mainly due to a decline intra-EU flows. Inflows from outside the EU are dominated by advanced economies (the US, Switzerland, Norway) but emerging economies are gaining relative weight.

EU firms are the most important direct investors in the world. However, since 2008 European multinationals have curtailed their FDI activities. In outward FDI there has been a **shift from intra-EU to extra-EU flows**. Low growth in the EU as a whole during the economic crisis may lead many European MNEs to seek investment opportunities in fast-growing emerging markets outside the EU. Nevertheless, extra-EU outflows continue to be highly geared towards developed markets, particularly to the US and EFTA countries. EU MNEs seem to be more globally competitive in manufacturing industries (e.g. chemicals, machinery and vehicles) than in service industries. The overall trends in the EU's outward FDI mostly reflect the EU-15 pattern. However, over the last decade, there have been several signs that the EU-12 is gradually catching up. Investments by EU-12 companies is concentrated within the EU and dominated by the service sector.

The report finds that the major drivers of inflows have been the single market, the single currency and cost advantages in the case of west-east flows.

The crisis-induced decrease in inward FDI to the EU raises some important questions. What are the main factors influencing companies' decisions about investing in the European market? How can the European market be made more attractive? A number of factors can be distinguished:

- institutional factors, including the legal and administrative system and international agreements;
- economic factors, such as market size or labour costs and skills;
- business facilitation, such as investment promotion;
- local factors at the level of individual firms

The importance of fiscal incentives is not confirmed empirically; the impact of unit labour costs and tax rates differs between countries.

The empirical analysis shows that the **driving forces behind inward FDI** in the EU are **cost advantages, the euro and EU membership**. The impact of unit labour costs and corporate taxes on bilateral FDI stocks differ from country to country. In particular, the rate of corporate taxes seems to be a key factor in the EU-12 countries, and in the case of greenfield investments in the EU-27. In addition, the analysis shows that rising unit labour costs in some EU-15 countries are a major factor in slowing the growth of inward FDI stocks, and it confirms the importance of having a well educated workforce.

In general, countries seem to benefit from hosting multinational companies. Their presence can bring in finance, technology, skills, management techniques and good practices, and may ensure market access. The empirical analysis shows that **foreign**

Since FDI can help boost the competitiveness of European firms the EU must design policies for attracting FDI and maximising its benefits.

affiliates do a lot to boost productivity in EU manufacturing industries. The anaylsis shows that backward linkages (effects from foreign companies to local suppliers) are more important than horizontal spillovers for productivity growth. The empirical analysis of EU-10 countries suggests that the presence of foreign firms helps to create jobs in the local supply industries. FDI spillovers via backward are greatest for innovative local firms and especially for those that do not export. This would lead to the conclusion that foreign firms act as catalysts encouraging domestic suppliers to introduce technological innovations. The review of the home country effects of outward FDI shows that the effects on productivity in the home country are mostly positive.

The empirical analyses provide a basis for some policy conclusions. It has been shown that the best way to promote internationalisation through outward FDI is not to provide subsidies and targeted support, but to **promote a competitive business environment**, which ensures that resources are reallocated to the best performing firms. It is also crucial to provide conditions which allow small firms and small MNEs to grow. To attract FDI into the EU it is essential to **improve cost competitiveness**, but a well functioning internal market and the single currency remain key factors. When it comes to promoting investment policy-makers in different Member States could usefully learn from one other about their most successful practices.

The analysis of the impact of FDI suggests that industrial policies should contribute to increase spillovers from MNEs on local enterprises, in particular through networks. Also crucial for maximising the benefits of inward FDI are policies that facilitate technology transfer between MNEs and local firms and that help companies in building their capabilities.

Globalisation changes the way firms compete, but also the way they cooperate. It also **shifts the pattern of their cooperation from clusters to networks**. Networks not only help firms reap the benefits of FDI, as described above, but are also a good way for firms to adapt to globalisation.

Globalisation is also changing the way firms cooperate.

This report looks at non-price and non-contractual interactions that are tending to grow among independent companies, such as the formation of clusters and networks. In the case of clusters — firms carrying out similar activities in the same geographical area — the linkages arise automatically from the interplay of market forces. In the case of networks, however, it is up to the firm to establish linkages with other companies without being formally absorbed into their organisational structure.

Clusters and networks offer additional benefits from inter-firm spillovers.

Clusters have long been an object of academic study and an instrument of industrial policy for regional and national authorities. Networks of firms, however, have been a more elusive topic — not very easy to identify and not attracting policy recommendations. But **globalisation and the new organisational structures** that firms are adopting in its wake have increased policy-makers' interest in networks and in their usefulness as a policy tool. The important question is to what extent networks can be used to enhance the performance of cluster-based policies and to support SMEs in the process of internationalisation.

Networks enable EU SMEs to reach critical mass, share information and enlarge their industrial scope

Networks spring from autonomous decisions of companies that decide it is in their best interest to be inside the network rather than outside it. Unlike clusters, **networks do not need to be concentrated** in a specific area. In fact, a group of companies that cooperate in a region may decide to set up closer links with other groups in more distant areas. There may be several reasons for these moves: a lack of critical mass in the original region; sharing information with other companies for the purpose of entering new markets; enlarging the firm's industrial scope. Such needs are felt more acutely by SMEs, for whom the cost of access to suitable information on international markets can be exorbitant.

Faced with globalisation, SMEs have an incentive to identify emerging activities that will give them a **new competitive advantage**. Cooperation within a network may be a sensible strategy for preventing the decay of their traditional specialisation. In Italy, for example, the Romagna Creative District is a network focusing on communication,

art, design, architecture, theatre, music and literature. It aims to connect and share the resources of individuals and companies for the purpose of achieving new creative projects and spreading them across the Romagna Region. In Germany, the Eastern Ruhr Industry Network in another example of efforts to boost competitiveness in regions undergoing industrial change. In this case, the network brings together firms in traditional manufacturing sectors.

Public authorities have an interest in helping firms create networks. In practice, in-kind instruments tend to be more effective.

Public authorities may share with firms an interest in building **more effective and widespread networks**. In this case, alongside financial incentives, regional and national governments have at their disposal 'in-kind' instruments such as providing structures to collaborate. Which instruments to choose depends on the activities policy-makers want to encourage.

Generally speaking, the rationale for public policy intervention rests on externality or information asymmetry or on other market or regulatory failures. There is an argument for promoting clusters in terms of the **positive externalities** that an agglomeration of industries may well foster. The case for supporting networks is less straightforward and crucially depends on the activities that networks are engaged in. For example, accessing new markets and developing new products demand very precise information and close cooperation that could be best achieved through a common network. If there is going to be any kind of public involvement, policy-makers must show that it is more efficient to help the network than its individual members.

EU networks are useful complements to existing regional and national cluster programmes.

The removal of administrative barriers and the access to a common knowledge infrastructure and collaboration platform could boost network activities in new areas that are fundamental to growth. Europe-wide network programmes could be a useful complement to cluster-based programmes.

Finally the report looks at the potential of **neighbourhood policies** to contribute to growth and industrial competitiveness. The opportunities of cross-border investment and trade with our neighbours are in a way the low-hanging fruits that have not yet been used to their full potential.

The importance of each neighbouring country for the competitiveness of the EU and its Member States varies depending on the form of cooperation between the EU and the country in question, how deep and comprehensive the cooperation is, the size and structure of the economy of the neighbouring country, its level of development, trade and investment flows, any bilateral agreements, and migration between the country concerned and the EU. By examining each of these aspects, the chapter endeavours to shed light on the challenges and opportunities for EU competitiveness stemming from its neighbourhood in the context of globalisation, also reflecting the dynamics over time in terms of EU enlargement, the global economic crisis, evolving relations across borders, and internal developments in neighbouring states (such as the Arab Spring).

Several large economies dominate the EU neighbourhood in terms of population and GDP

A **few large economies dominate** the neighbourhood: Russia, Ukraine, Switzerland, Norway, Egypt. Without these countries, the region surrounding the EU would be significantly less important in terms of GDP and have less than half its current population. Oil and gas production plays a central role in a small number of countries – Russia, Algeria, Azerbaijan, Libya, Norway – while most countries are service-based economies, in many cases also with a relatively large agricultural sector.

Most economies suffer from lack of competitiveness…

Most countries in the neighbourhood suffer from a **lack of competitiveness**, in many cases as a result of being relatively closed economies with weak business environments. Many of them also run high external imbalances – usually deficits, apart from the energy exporters listed above which all have persistent trade and current account surpluses.

Asymmetry in partnership

The EU is an important trading partner for all neighbouring countries. From the point of view of the EU though, they play rather a modest role as trading partners, for the reasons explained above. This **asymmetry in the relative importance of trading partners** has an impact in bilateral negotiations as any development affecting trade relations is likely to have much more impact on the non-EU trading partner than on

the EU.

Opportunities of export-led growth largely missed

The type of extensive and successful export-led growth strategy witnessed in recent decades in other parts of the world, with the potential to diversify and upgrade exports and integrate economies into global trade networks, has so far had less success in the countries surrounding the EU. Most of them have not seen their market shares increase on the world market, most likely due to their relatively small shares of manufactured goods in their exports. In addition, several of the neighbouring countries are caught in a situation where rents from natural resources prove detrimental to export diversification and structural upgrading.

EU is the most important investor in the neighbourhood

Outward FDI from the EU to its neighbours exceeds inward FDI from the neighbours. Around a fifth of all outward extra-EU FDI from Member States goes to the surrounding region, with the exception of 2009 and 2010 when the share was much higher. In the opposite direction, more or less a quarter of all inward FDI comes from the surrounding region, a share which however has dropped recently.

The Southern Mediterranean is an important destination for EU investments, in particular **Egypt, Tunisia and Morocco**. While in Egypt most FDI has gone into the petroleum industry, FDI flows into Morocco have been more diversified. Mainly for historical reasons and due to its geographical proximity, the EU is in fact the leading investor in the region.

Inward labour migration is an opportunity rather than a challenge for EU growth and competitiveness

Labour migration to EU Member States is high on the agenda of EU policymakers. Mediterranean neighbouring countries are a major source of EU immigration, the total number of first-generation emigrants from that region ranging from 10 million to 13 million, as for various reasons the EU is the main destination for migrants from the other side of the Mediterranean. Immigrants from the region represent 20 % of the 30 million immigrants in the EU and 6 % of total EU population. The flow of migrants from the region could rise, at least temporarily, against the backdrop of the Arab Spring. Migration is obviously linked to local unemployment, economic hardship and a lack of options. It can represent the only viable alternative to unemployment, and is a natural reaction to social and economic upheaval or internal political conflicts.

Faced with the prospect of **ageing and potentially diminishing populations** exerting serious pressure on their welfare systems and potentially holding back their competitiveness, EU Member States have come to see immigration, not only from the immediate neighbourhood but from further afield as well, as a solution. The Europe 2020 strategy set out to promote a forward looking and comprehensive labour migration policy which would respond in a flexible way to the priorities and needs of labour markets. By matching shortages on EU labour markets with the excess labour supply outside the EU, Member States could sustain their international economic competitiveness, growth and prosperity.

Remittances go hand in hand with labour migration. Both have increased over the last decades, in many cases generating significant welfare gains in the countries to which remittances are sent. Moldova is an extreme case in point as it has the highest share of remittances to GDP (23 %), and remittances contribute to developments on the labour market there. Other countries with high shares of remittances to GDP are Lebanon and Egypt. However, the economic crisis and ensuing austerity packages implemented in many Member States have made it more **difficult for immigrants to find gainful employment in the EU**, and while some of them have returned to their countries of origin, most immigrants have adjusted to the economic crisis by reducing their remittances.

The report is structured as follows. The introductory chapter ***"The External Sector in the Recession"*** sets the scene by studying the role of the external sector in the European industries' recovery and their sustainable competitiveness. Chapter 2 ***"EU Industry in the Global Value Chain"*** studies the internationalisation of production and the trends in the domestic value of European exports. Chapter 3 ***"Energy Content of Exports and Eco-Innovation"*** analyses competitiveness in the context of energy

efficiency of exports. Chapter 4 ***"FDI Flows and EU industrial competitiveness"*** examines the positioning of the EU as a source and destination of cross-border capital flows and the related implications for the competitiveness of European enterprises. Chapter 5 ***"Clusters and Networks"*** studies the changes in the way firms cooperate and the room for policy support. The concluding chapter 6 ***"Competitiveness developments along the external borders of the EU"*** looks at the potential of neighbourhood policies to contribute to growth and competitiveness.

CHAPTER 1. THE EXTERNAL SECTOR IN THE RECESSION

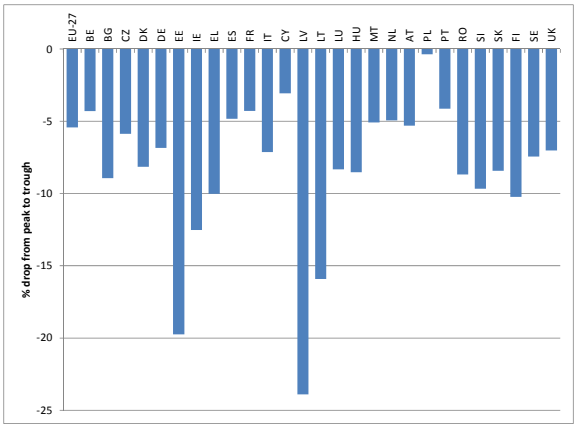
The EU is experiencing a large and long recession, both in depth and scope. The recession was preceded by a long period, from the mid-1990s to 2007, characterized by macroeconomic stability and sustained growth. Indeed, as in previous large recessions combined with a banking crisis, '[t]he crisis was preceded by a long period of rapid credit growth, low risk premiums, abundant availability of liquidity, strong leveraging, soaring asset prices and the development of bubbles in the real estate sector'. [1] Within the EU, some Member States became net lenders by a significant fraction of its GDP while other became large net borrowers. These developments distorted the financial position of many European countries feeding what today is referred to as external imbalances.[2]

This chapter is an overview of the consequences of the crisis with a particular emphasis on the external sector. When examining the performance of exports and imports, it tries to elucidate to what extent what it is observed, the external position of EU members, reflects a true gain or loss of competitiveness or is simply a reflection of the internal imbalances accumulated during the boom years, and in so doing highlights the challenges faced by EU economies.

1.1 THE CONTRACTION OF OUTPUT

The current crisis is unprecedented in that it is deep and it has affected many economies around the world, particularly the US and the EU. Although the causes of the current global economic crisis are complex, the origins can be linked to growing mispriced assets, notably real estate, both in the US and some EU Member States. The recession was triggered by increasing doubts of the sustainability of these prices in the US, undermining the soundness of mortgage-backed assets and ultimately dragging the US financial sector into serious disruption towards the end of 2007. The disruption in the financial sector announced a sharp recession in the US in 2008 which hit global demand. In addition, the internationalisation of financial products linked to US real estate lending meant that the fall in the US real estate market affected financial sectors globally. Trouble in the US pricked the bubble in some EU countries leading to a serious recession on this side of the Atlantic. Between 2008 and 2009 the EU suffered a large contraction of economic activity: more than 5% of GDP with respect to the peak value for the Union as a whole, whereas and in some Member States the drop in GDP was well beyond this figure.

Figure 1.1. The contraction of GDP in 2007-09 across Member States



Source: Eurostat, Annual National Accounts.

The recession is not only deep, it is also prolongued. Table 1.1 illustrates the duration of the recession. Some EU Member States like Greece have been in recession for more than two years in a row. Not all EU Member States have been equally affected. Figure 1.1 and Table 1.1 show how heterogeneous the experience has been across Member States: from Poland, virtually unaffected by the crisis, to the Baltic Republics, with cuts in activity reaching 25% and several consecutive quarters in recession.

[1] See European Commission (2009), Chapter 1 'Root causes of the crisis' and Chapter 2 'The crisis from a historical perspective'. See also European Commission (2010b), 'Surveillance of Intra-Euro-Area Competitiveness and Imbalances'. On the difficulties to deal with these imbalances ex ante, see Wolf (2012).

[2] In 2012 the European Commission initiated a monitoring program called the Macroeconomic Imbalances Procedure (European Commission (2012)). See the Alert Mechanism Report COM(2012) 68 and the in-depth country reviews published as European Economy - Occasional Papers, DG Economic and Financial Affairs, European Commission.

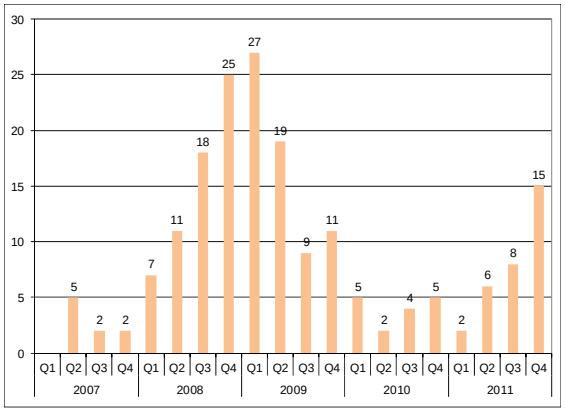
Table 1.1. An overview of the recession: Real GDP in 2007-11; index, 2000=100

	2007				2008				2009				2010				2011			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
27	115.3	115.9	116.6	117.2	117.8	117.5	116.8	114.7	111.8	111.4	111.8	112.1	112.6	113.7	114.3	114.5	115.4			
BE	113.7	113.9	114.6	115	115.9	116.3	115.7	113.3	111.3	111.5	112.8	113.4	113.4	114.6	115.1	115.7	116.8	117.1	117.1	117.1
BG	144.1	146.6	148.5	151.7	154	156.1	158.3	158.9	148.9	148.9	149.4	144.7	146.6	148.7	149.9	150.5	151.2	152	152.3	152.8
CZ	136.8	136.5	138.8	140.9	141.6	143.1	143.3	141	136.4	134.9	135.4	136.6	137.6	139	139.9	140.7	141.4	141.8	141.7	141.5
DK	111.5	110.9	111.8	112.9	111.4	113	111	108.3	105.9	103.9	103.8	104.1	104.4	105.6	106.9	106.3	106.6	107.1	106.9	106.8
DE	109.4	110.1	111	111.3	112.5	112.1	111.6	109.2	104.8	105.2	106	106.8	107.3	109.4	110.3	110.8	112.3	112.6	113.3	113.1
EE	166.1	166.8	168.6	167.3	164.2	165.7	164.1	150.3	142.8	137.1	135.3	137.2	136.8	140.5	142	145.6	149.6	152	153.4	153
IE	141.9	139.6	138.8	143.7	140.3	137.2	137.2	132.5	128.6	127.6	127	125.7	127.3	126.4	127.1	125.8	127.2	128.7	127.3	127
EL	132.5	133.3	134.4	134.5	134.6	135.3	135.7	134.6	133.1	131.7	130.9	131.8	129.3	127.6	125.6	122.1	122.3			
ES	125	126	127	127.8	128.4	128.4	127.4	126	124	122.7	122.3	122.2	122.4	122.7	122.8	123	123.5	123.7	123.7	123.4
FR	112.7	113.3	113.8	114.1	114.5	113.8	113.2	111.5	109.6	109.6	109.7	110.3	110.7	111.4	111.8	112.3	113.3	113.2	113.5	113.6
IT	108.8	109	109.4	108.8	109.3	108.7	107.4	105.5	101.8	101.6	102	101.8	103	103.5	103.9	104.1	104.2	104.5	104.3	103.6
CY	125.8	127.4	128.9	130.7	131.8	132.8	133.3	133.5	132.2	130.2	129.5	129.4	131.1	131.2	132.3	132.7	133	133.1	131.9	131.8
LV	175.2	178.9	180.5	181.6	180.3	180.1	169	166	150.1	148.4	138.2	139.8	141.4	141.5	142.7	144.3	145.9	148.8	151.1	152.8
LT	166.5	170.8	174.8	177.7	178.1	178.5	176.6	175.6	151.8	150.9	151.4	150.1	150.8	151.7	153.3	156.8	159.2	161.6	163.5	164.8
LU	131	133.5	134.2	135.4	136.5	136.9	135.2	129.5	128.2	125.5	128.3	127.6	129.1	131	130.7	132.4	132.6	131.9	133.3	133.6
HU	127.5	127.4	127.7	128.4	130.2	129.9	128.6	125.9	121.7	120.2	119.1	119.4	120.7	121.2	122.1	122.4	123.2	123.3	123.8	124.2
MT	111.4	111.2	112.5	113.7	115.4	117.3	117.9	116.1	111.9	113	113.9	115.5	115.2	115.5	116.2	118.2	118.4	118.9	119	118.3
NL	113.1	113.7	115.3	116.9	117.5	117	117	115.7	113.1	111.7	112.6	113.2	113.7	114.3	114.5	115.4	116.2	116.4	115.9	115.2
AT	115.8	116.4	116.4	117.4	118.8	118.9	117.6	115.5	113.6	112.6	113.4	114.6	114.5	115.3	117.1	118.5	119.4	120	120.1	120.1
PL	128.8	131	132.7	135.6	137.5	138.5	139.5	139	139.6	140.3	140.9	143	143.9	145.5	147.5	148.7	150.3	152.1	153.6	155.3
PT	108	108	107.9	109	109	108.7	108.2	107	104.5	104.9	105.5	105.4	106.3	106.6	106.8	106.4	105.7	105.4	104.7	103.4
RO	146.1	148.6	151.3	155	159.9	161.4	161.2	158.4	153.7	151.2	149.9	149	148.1	148.6	147.4	148.8	150.4	150.6	152.3	152.1
SI	132.9	134.6	137.3	137.8	140	141.3	141.8	136.4	128.9	128.1	128.5	128.3	128.5	129.9	130.5	131.3	130.9	130.7	130.2	129.3
SK	145.3	148.9	152.4	161.8	157.9	159.9	161.9	163.7	149.9	151.9	153.9	156	157.3	158.6	160.1	161.3	162.6	164	165.3	166.7
FI	123.3	124.9	125.7	127.1	126.5	126.6	126.2	123.1	115.4	114.1	115.7	115.2	116.2	120	119.6	121.9	122.2	122.1	123.4	123.5
SE	121.9	122.5	123.4	125.1	123.6	123.5	123.4	118.7	115.8	115.9	116	117.1	119.8	122.2	123.8	126.2	126.7	128.1	129.2	127.7
UK	120.3	121.7	123.2	124	124	122.5	120.1	117.3	115.5	115.3	115.5	116.4	116.9	118.2	119	118.4	118.7	118.6	119.3	118.9

Notes: Numbers are indexes relative to 2000 so that it can be appreciated how much the series has grown in the boom years, and compare it with the extent of the contraction. The shaded cells denote a decrease in value vis-à-vis the previous quarter.

Source: Eurostat, Quarterly National Accounts and own calculations.

Figure 1.2. Number of countries with decreasing GDP vis-à-vis the previous quarter



Source: Eurostat, Quarterly National Accounts

Table 1.1 also illustrates how many European economies are slipping into a second recession, this time due to the uncertainty surrounding the EU sovereign debt crisis which has weakened demand, along with the phasing out of fiscal stimulus measures in some EU countries and the US. Indeed, apart from countries that entered the recession with serious structural public deficits, notably Greece, in some Member States the low revenues caused by the sluggish economic activity add to the troubles of the financial system —notably its exposure to the real estate market— triggering a fresh sovereign debt crisis[3], which is likely to be at the origin of the slowdown or even the reversal of the recovery

Figure 1.2 illustrates this reversal. Most EU countries grew for several quarters in a row in 2010 but in the course of 2011 it became obvious that an increasing number of them were experiencing again a contraction on a quarter-to-quarter basis. By the last quarter of the year 15 Member States reported a decrease in activity with respect to the previous quarter. In this respect, although the main stimulus measures in 2009-10 undoubtedly cushioned the negative impact of the crisis and supported growth along with the relaxation of monetary policy, EU economies have struggled to gain momentum as the stimulus measures were withdrawn.

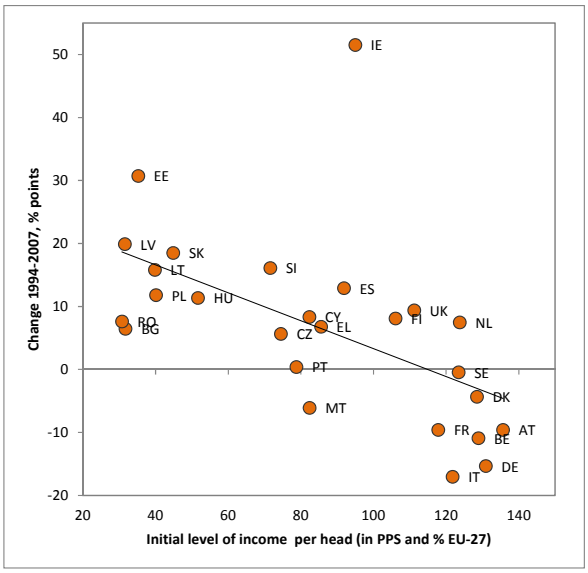
EU Member States have been affected in a different way both in terms of the initial contraction and the subsequent (weak) recovery. Within the EU large

[3] When a the crisis is large enough to drag down an exposed financial sector, efforts from the government to prevent a meltdown of the financial system increase the risk that private debt —e.g. mortgage backed assets in private banks balances— becomes public via the bail-out of the troubled banks. This risk is at the origin of the subsequent sovereign debt crisis. This is what happened in Ireland in 2011 and with Spain in 2012 and it is a classical feature of this type of recessions (see Reinhart and Rogoff (2011)).

capital flows accumulated substantial imbalances along the boom period 2000-07. As a consequence, at the end of this period the international financial position of some Member States was seriously distorted, either becoming large debtors or creditors. On the basis of these flows countries can be classified basically in four groups.[4] In the first group we find countries that were net lenders in this period 2000-07, like Belgium or the Netherlands. In a second group we have Germany or Sweden that started the boom period being borrowers and became large net lenders. Countries in this group became net lenders because others, the third group, became large net borrowers. Within the former, however, we find different underlying reasons to become net borrowers. For example, in the case of Greece at the origin of its borrowing we find large and persistent public deficits financed with public debt mostly placed abroad, mostly to financial institutions in France or Germany.[5] In the case of Spain or the UK the driving force were mispriced domestic assets, in particular houses, so it is private institutions leverage (banks and households) what we find behind the aggregate net borrowing.[6] Some EU-12 Member States like the Baltic Republics suffered from bubbles probably associated with the large inflow of capital, otherwise typical of the rapid catch-up process in which they are immersed (see Figure 1.3); in these cases the causality is probably the reverse: the capital inflows generated the mispriced assets rather than the other way around. Finally, Portugal and Italy show a remarkably weak growth performance, mostly because of low productivity growth (see Table 1.3 opposite).

Each of these groups was affected differently during the initial recession, and has different pattern and drivers of recovery. There is one aspect, however, in which most countries behave similarly: exports are recovering strongly for most countries, probably reflecting an independence of internal developments and the healthy condition of many non-EU economies. In countries affected by serious internal bubbles, the recession can be seen as a correction to come back to more realistic asset prices. In these economies, private agents like households and banks, are immersed in a deleverage process that is by definition slow and tough. Indeed, the excess investment in mispriced assets (e.g. houses), whose prices are only sluggishly returning to normal lower levels[7], has left many agents highly indebted with less assets to back their debt (e.g. a large mortgage for a house that is not worth the mortgage).

Figure 1.3. The catch-up process of the EU-12 countries 1994-2007. Changes in relative income (EU-27=100) and initial level of income



Note: Income is expressed relative to the EU-27=100. A negative value means that the country has lost income relative to the average. In other words, it denotes a growth rate below the average growth rate.

Source: AMECO database and own calculations.

This argument can be illustrated comparing the UK, a net significant borrower, and Sweden, a net lender. Figure 1.4 shows how at the onset of the recession GDP reacted similarly in both countries. Underlying, however, were quite different reactions of the different components of aggregate demand. In both countries investment reacted similarly to the uncertain business conditions. However, the main driver in the Swedish recession was the external sector and uncertain business conditions as reflected by the drop in investment: in five quarters both investment and exports had contracted by 20%. In the case of the UK it was households'

4 See the discussion section 1.3 in the European Competitiveness Report 2011.

5 See the BIS Quarterly Review, June 2010 "International banking and financial market developments".

6 The European Competitiveness Report 2010 examines changes in the behavior of investment in dwellings in EU Member States in the period 2000-07.

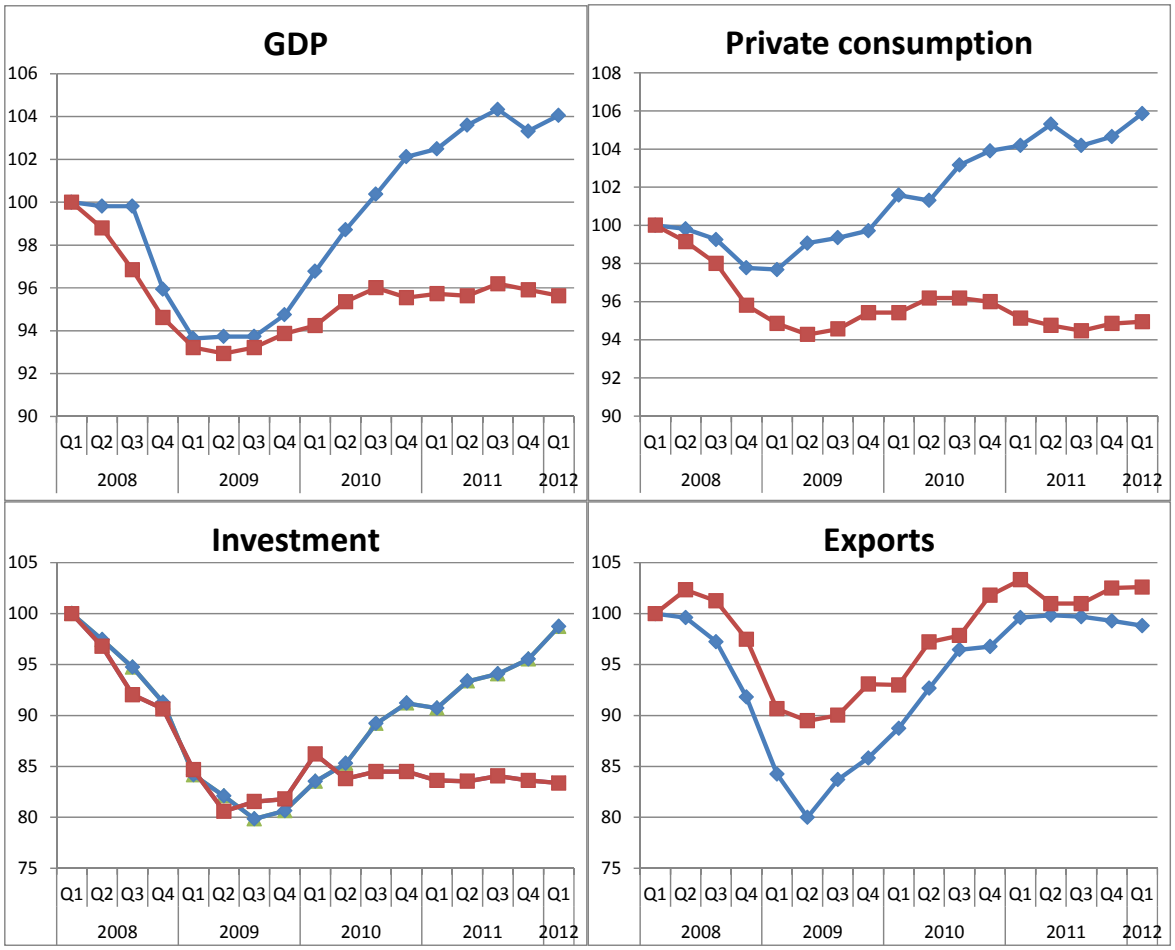
7 There are several reasons why prices may take long to adjust. First, households tend to hold the property in the hope that the price will recover in the future and in order to minimize losses. Second, for analogous reasons, banks tend to refinance loans to developers in order to delay the realization of losses. Both strategies result in a low number of properties on sold in the market, and hence a low pressure on observed prices to go down.

consumption that dragged down income: compared to a mild and brief contraction in Sweden, UK private consumption contracted more than double and has not recovered yet. [8]

And yet, there is one aspect that most EU Member States have in common with Sweden and the UK: the relatively strong recovery of exports. A glance at Table 1.7 in the appendix shows a heterogeneous behaviour across countries when comparing exports and income. This is a recall that the external sector can soften the impact of a recession and contribute to a recovery but cannot fully compensate for other internal factors that ultimately must lead the recovery. In particular, it is unlikely that a weak internal demand can be compensated by external demand in medium to large countries.

[8] Details of the reaction of different components of aggregate demand can be found in Table 1.7 in the appendix. It may be noted that this chart would not look very different if UK and Sweden would be replaced, for example, by Spain and Germany, so it does not seem that belonging to the euro or not is making any significant difference as far as the recovery is concerned. The development of internal imbalances seems to have played a more important role.

Figure 1.4. The recession: A comparison of Sweden (blue) and the UK (red); indexes, 2008Q1=100



Note: Exports include goods and services
Source: Eurostat, Quarterly National Accounts.

1.2 EMPLOYMENT AND PRODUCTIVITY

The evolution of employment and unemployment reflects the way the crisis is shared among all actors in the economy. In Table 1.2 we can see that at the EU level employment, compared to some Member States, has remained remarkably stable, with a contraction of 3% between mid-2008 and the end of 2010.[9] But this aggregate relative stability masks considerable heterogeneity at the Member State level. For instance, in countries such as Belgium or Germany the crisis has hardly affected the level of employment whereas in countries such as Spain employment was still contracting going into 2012, down 14% on the peak value in the last quarter of 2007.

Institutional differences and the accumulation (or not) of internal and external imbalances are key to understanding the labour market performance across Member States. In particular, Member States affected by an oversized construction sector are among those most affected by large contractions of employment (see Figure 1.7 below) and large increases in unemployment. The reason is that in these countries the construction sector has to be downsized so the changes in employment are permanent – labour hoarding only makes sense to preserve firm-specific human capital when the downturn is perceived to be temporary.

[9] A more detailed description of recent trends and development can be found in the European Commission's Labor Market Review (available at: http://ec.europa.eu/economy_finance/publications/european_economy/labour_market_en.htm).

Table 1.2. An overview of the recession: Employment in 2007-11; index, 2000Q2=100

	2007				2008				2009				2010				2011			
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
27	106.7	108.4	109.5	109.2	108.7	109.7	110.5	109.6	107.6	107.9	107.9	107.3	106.0	107.2	107.8	107.3	106.6	107.7	108.0	107.4
BE	105.4	105.4	106.3	107.8	107.8	107.1	108.2	108.2	107.2	106.9	106.9	107.9	108.2	107.6	108.7	110.4	108.0	110.1	108.8	110.0
BG	109.4	113.3	115.2	115.0	114.3	117.0	118.6	116.8	113.4	114.6	114.0	110.2	104.8	107.0	108.0	105.1	100.5	102.2	105.0	102.8
CZ	104.0	105.0	105.6	106.1	105.9	106.9	107.1	107.5	105.5	105.3	105.0	105.0	102.9	104.1	104.8	104.8	103.8	104.7	105.1	104.7
DK	102.2	102.8	102.6	101.7	102.5	104.4	105.1	104.5	101.9	101.5	101.7	99.1	98.0	98.7	99.0	98.1	97.3	98.3	98.8	97.8
DE	102.0	103.6	105.0	105.3	103.9	104.3	106.5	106.7	104.4	104.7	104.7	106.6	104.8	105.5	106.2	106.8	106.6	108.2	109.0	109.6
EE	112.8	114.6	115.4	113.6	114.1	114.7	115.6	114.0	106.8	104.5	104.1	101.2	96.3	97.2	101.8	104.0	103.2	105.1	109.9	107.5
IE	124.5	125.7	128.5	127.7	127.5	125.9	126.4	122.2	117.4	115.7	114.7	112.7	110.7	110.8	110.5	108.7	107.5	108.2	107.6	107.7
EL	109.3	110.7	111.3	110.7	110.5	112.3	112.5	111.6	109.9	111.0	111.3	109.7	108.4	108.6	107.9	105.3	102.7	101.9	100.1	96.5
ES	129.9	132.0	132.8	132.6	132.1	132.2	131.7	128.5	123.5	122.6	122.1	120.6	119.0	119.5	120.0	119.0	117.4	118.4	117.5	115.1
FR	108.8	110.4	111.5	110.9	111.1	112.0	112.6	111.6	110.6	111.2	111.4	110.0	110.1	111.2	111.7	110.5	110.3	111.4	111.7	110.6
IT	109.2	111.1	111.7	111.2	110.5	112.4	112.1	111.4	109.5	110.7	109.9	109.3	108.5	109.7	108.8	109.4	109.1	110.2	109.5	109.4
CY	126.1	128.7	129.1	130.7	128.7	130.1	129.6	130.7	127.7	129.9	129.3	129.5	128.4	131.2	130.5	130.7	128.3	129.1	126.3	125.6
LV	113.7	115.9	118.2	120.5	118.9	118.6	117.8	113.6	109.2	104.3	101.6	99.2	97.3	99.4	102.2	101.3	100.7	102.8	104.8	105.2
LT	107.2	109.8	110.9	108.0	107.2	108.2	109.0	107.0	101.9	100.8	100.9	98.1	94.3	94.2	96.2	97.3	95.1	97.7	97.8	98.0
LU	112.5	111.2	113.8	113.0	109.9	115.5	112.8	110.5	117.7	120.5	120.1	119.3	120.8	120.9	122.1	122.3	125.3	122.2	124.2	122.8
HU	102.5	103.5	103.6	102.6	100.9	101.5	102.9	101.8	98.8	99.6	99.2	99.2	97.5	99.1	100.2	99.8	97.9	99.9	101.1	100.9
MT	107.1	110.2	110.0	109.6	109.8	111.7	113.7	111.8	111.7	111.8	112.1	111.7	112.6	113.6	115.0	114.1	116.6	116.4	117.9	116.2
NL	105.4	106.9	107.7	107.6	107.4	108.4	109.0	109.1	108.7	108.3	108.2	107.5	104.7	105.4	105.7	105.7	105.0	105.3	105.6	105.9
AT	105.8	107.9	109.4	107.7	107.4	109.6	110.4	109.4	107.4	108.8	109.8	108.9	107.3	108.7	110.6	110.5	108.6	110.5	112.1	111.1
PL	103.3	105.4	107.3	108.0	108.0	109.2	111.3	111.3	109.4	110.3	111.5	110.7	108.5	111.3	112.7	111.9	110.6	112.5	113.3	112.7
PT	102.1	102.4	103.3	103.3	103.4	104.2	103.5	103.1	101.7	101.2	99.8	99.8	99.5	99.3	98.9	98.6	97.5	97.8	97.2	94.9
RO	88.0	91.7	93.2	89.2	88.9	92.0	93.2	89.8	88.4	91.2	92.8	88.3	87.6	92.4	92.5	88.8	89.1	90.2	90.5	88.7
SI	106.7	110.4	111.8	109.7	109.1	111.0	114.5	112.3	107.8	109.3	110.8	109.7	108.0	108.2	107.8	107.5	103.7	105.0	105.8	104.6
SK	111.7	112.2	113.5	115.0	114.6	115.2	118.5	118.1	114.5	114.0	113.4	111.6	109.4	110.8	111.8	112.1	111.7	112.8	113.3	112.5
FI	101.4	106.1	106.7	104.3	103.8	108.1	107.9	105.3	102.7	104.8	104.0	101.1	100.0	104.2	104.4	101.7	100.7	105.0	105.1	102.6
SE	107.4	110.0	112.4	110.0	109.3	111.6	113.0	109.9	107.8	109.1	109.5	107.3	106.8	109.8	111.7	110.0	109.7	112.4	113.8	111.4
UK	105.3	105.8	106.7	107.2	106.9	107.0	107.1	106.8	105.7	104.7	105.1	105.1	104.0	104.5	105.7	105.3	105.1	105.1	105.3	105.4

Notes: The numbers are indexes relative to 2000 illustrating the degree of growth in the boom years, and to compare it with the amplitude of the contraction. The shaded cells denote a decrease in value vis-à-vis the previous quarter.

Source: Eurostat, Labour Force Survey (LFS) quarterly data.

From the institutional point of view, differences can also be linked to distortions induced by labour market regulations. For instance, unemployment rose much less steeply in the US than in the EU Members States badly hit by the crisis, where labour regulations are more stringent and tend to result in wage rigidities in a way or another. And it is not only the degree of stringency but also the distorting nature of certain institutions. For instance, within the EU, the Spanish labour market stands out for its dual nature, with overprotected stable contracts on one side and workers on fragile temporary contracts on the other side. This explains the overreaction of unemployment because adjustment tends to be in terms of employment (reduction of temporary workers) rather than wages (influenced by the stable workers).[10]

On the positive side, as this is a demand-driven recession, it is likely that after the recovery, in the medium to long term, the labour market will recover its trend previous to the crisis (see Table 1.3). Currently some Member States are undergoing a large restructuring to bring down some oversized sectors, notably the construction sector. But large structural (sectoral) readjustments in the longer-term are not likely to follow unlike what happened in the 1980's when entire industrial sectors, notably heavy industries, underwent a severe restructuring. The exception to this rule is probably Ireland and Spain where the bubble grew out of attracting a considerable number of foreign workers (see table 1.3) and increasing notably the activity rate. In this countries the labor market is likely to slow down for some years to come.

[10] For the dual labour market see chapter 3 in Employment in Europe 2010 (European Commission (2010a)). For a comparative analysis between France and Spain see Bentolila et al. (2011).

Table 1.3. Real GDP, productivity, and components, changes 1998-2007

	1998-2007			1998-2007			
	Real GDP per head	Real GDP	Population	Real GDP per hour	Average hours	Employment rate	Activity rate
European Union	21.4	25.3	3.2	..	..	..	..
Belgium	17.9	22.8	4.1	12.7	-1.3	1.8	4.1
Bulgaria	76.4	63.6	-7.2	51.9	0.6	3.7	11.3
Czech Republic	46.1	46.5	0.3	51.3	-4.3	1.0	-0.1
Denmark	15.3	18.7	3.0	10.3	2.6	1.1	0.7
Germany	15.5	15.8	0.3	16.9	-5.2	0.7	3.5
Estonia	89.8	82.9	-3.6	..	..	4.9	6.7
Ireland	44.0	69.3	17.5	27.3	-4.6	3.1	14.9
Greece	38.6	43.2	3.3	28.4	-2.1	3.2	6.9
Spain	23.2	39.1	13.0	4.8	-4.2	8.6	12.9
France	14.4	21.5	6.2	16.2	-6.2	2.7	2.2
Italy	10.0	14.8	4.3	4.9	-4.4	5.9	3.5
Cyprus	22.2	41.1	15.4	14.8	-2.7	1.2	8.1
Latvia	109.9	98.2	-5.6	..	..	9.6	9.5
Lithuania	85.6	76.5	-4.9	63.7	4.7	10.2	-1.7
Luxembourg	38.9	57.0	13.0	17.7	12.8	-1.5	6.3
Hungary	40.1	37.2	-2.1	36.4	-5.3	1.1	7.3
Malta	17.0	24.2	6.2	15.6	-3.2	0.0	4.7
Netherlands	19.7	24.8	4.3	16.4	-2.4	0.7	4.6
Austria	20.5	25.4	4.1	18.7	-3.4	0.0	5.1
Poland	44.5	43.9	-0.4	47.7	-1.8	0.6	-0.9
Portugal	11.8	17.0	4.7	14.7	-4.4	-3.3	5.4
Romania	60.0	53.2	-4.3	..	..	..	..
Slovenia	45.7	48.4	1.8	..	..	2.8	4.8
Slovakia	54.1	54.2	0.1	51.6	-5.1	1.7	5.4
Finland	33.5	37.1	2.6	24.7	-2.9	5.2	4.8
Sweden	30.2	34.5	3.4	25.6	-2.7	2.1	4.3
United Kingdom	27.0	32.4	4.3	25.9	-3.6	0.9	3.7

Note: Changes in real GDP per head are decomposed in two ways. The first is to disentangle changes in GDP from changes in population. The second decomposition examines the individual effect of changes in productivity, the number of hours, the employment rate and the activity rate.
Source: AMECO database and own calculations.

1.3 THE SECTORAL PERSPECTIVE

In the short-run, however, some industries, notably those producing consumer durables and equipment goods, are bond to suffer still a long period of weak demand. Indeed, the sectoral dimension of the crisis does not reveal exceptional patterns with the exception of the construction sector in countries affected by a real estate bubble. Indeed, if in absolute terms this crisis is exceptional for its size, in relative terms the pattern of the downturn across sectors is the usual one in which durable consumption and equipment goods have suffered the largest contractions in activity.[11] On their side, services and non-durable consumption goods have been less affected, both in terms of value added and employment, because there are smaller items (relative to the household's budget) and basic needs that cannot be postponed as durable goods can be.[12] This pattern is reflected in Figure 1.7 where it is clear that industry, and in particular manufacturing, is bearing a disproportionate share of the burden of the crisis across all EU Member States.

As mentioned, the one remarkable supply-side feature of this crisis is the oversizing of the construction sectors in countries affected by a real estate bubble**.** Table 1.5 shows that in the boom period 2000-08 construction was almost the only economic sector that experienced substantial growth, and it did so in those countries that were most affected by the bubble. The only exception is Ireland and Denmark. In the case of Denmark, the difficulty to attract workers limited the growth of the sector.[13]

11 If anything, the sector of motor cars and machinery played a more important role in the 2008-2009 crisis. A comparison of the sectoral composition of the downturns in 2008-2009 and previous downturns can be found in section 2.1 "Sectoral performance in the current crisis" of the Product Market Review 2009.

12 In bad times households tend to postpone the purchase of durable goods, typically large and expensive items such as cars and some electric appliances that do not need replacing in the short-term. Analogously, liquidity- and/or credit-constrained firms tend to postpone investment decisions when business conditions are uncertain. This is a well-documented empirical regularity in normal business cycles but also in recessions: see Hall (2005, table 2.4) for a summary of the behaviour of sectors in recessions in the US in 1948-2001.

13 As a matter of fact, in most countries the construction sector grew labour-intensively with productivity dropping significantly. In that sense Denmark was an exception and productivity in fact grew. See the discussion in chapter 1 in European Competitiveness Report 2011.

Table 1.4. The sectoral structure of European economies, share of value added in GVA, 2008

		EU-27	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	IT	CY
A	Agriculture, forestry and fishing	1.7	0.7	7.2	2.3	1	0.9	3	1.6	3	2.5	1.8	2	2.3
B-E	Industry (except construction)	19.7	17.9	21.8	31.2	19.5	25.9	19.8	23.5	12.7	17	13.6	20.4	9.3
C	Manufacturing	15.8	15	:	24.3	12.8	22.2	15.4	21.2	9.1	13.9	11.3	17.6	6.9
F	Construction	6.9	5.8	9.3	6.8	6	4.2	9.9	7.2	6	13.6	6.6	6.4	13.2
G-I	Trade, transport, accomodation	19.4	20.7	20.8	20.2	19.7	16	22.7	15.4	29.5	23.1	18.4	20.3	24.1
J	Information and communication	4.6	4.2	6	5.1	4.3	3.9	4.7	2.4	3.7	4.1	5	4.4	4
K	Financial and insurance activities	5.2	5.3	6.4	4	6.1	3.8	4.3	10.3	4.4	5.4	3.6	5.3	7.8
L	Real estate activities	10.4	9.5	9	6.6	9.9	12	10.2	9	12.2	6.8	13.7	12.8	9.9
M-N	Professional, scientific and technic	10.2	12.9	4.6	7.2	7.7	11.7	8.3	9.5	5.8	7.3	12.5	8.6	6
O-Q	Public administration, defence, edu	18.3	21.1	12.4	14.4	22.5	17.1	14.7	18.4	18.2	16.7	21.4	16.5	19.6
R-U	Arts, entertainment and recreation	3.4	2	2.6	2.2	3.3	4.5	2.5	2.6	4.5	3.4	3.3	3.3	3.7

		LV	LT	HU	MT	NL	AT	PL	PT	SI	SK	FI	SE	UK
A	Agriculture, forestry and fishing	3	3.6	4	1.5	1.7	1.6	3.7	2.4	2.4	4.1	2.7	1.7	0.7
B-E	Industry (except construction)	15.1	21.5	25.5	17.5	19.5	22.7	24.1	17.3	25.3	28.7	24.6	21.5	15.4
C	Manufacturing	10.8	17.6	21.6	15.5	12.8	19	17.7	13.7	21.3	22.4	21.5	17.1	10.2
F	Construction	10.1	11.2	4.9	4.8	5.9	7.1	7.7	7.3	8.4	10	7.3	5.2	7.6
G-I	Trade, transport, accomodation	26.9	28.2	18.7	22.9	19.3	22.4	25	23	20.9	22.5	17.2	18.2	18.7
J	Information and communication	4.2	3.4	5.2	5.4	5	3.3	4.1	3.8	4	4	4.8	5.3	6.2
K	Financial and insurance activities	4.9	3.3	4.1	4.5	5.7	5.4	5.3	7.7	4.7	3.3	2.8	3.9	8.9
L	Real estate activities	8.4	6.9	8.3	6.2	8	9	6.1	8.3	7.3	6	10.8	9.3	8.4
M-N	Professional, scientific and technic	7.6	5.7	8.2	7.4	12.3	8.9	6.9	6.6	8.9	7.1	7.5	9	11.9
O-Q	Public administration, defence, edu	16.5	14.6	18	18.6	20.3	16.9	13.9	21	15.5	12.1	19.2	23	18.9
R-U	Arts, entertainment and recreation	3.3	1.7	3	11.2	2.4	2.7	3.4	2.7	2.6	2.2	2.9	2.9	3.2

Note: The shading emphasizes sectors with higher weight in overall economic activity within the country.
Source: Eurostat, National Accounts aggregates and employment by branch (NACE Rev.2).

Table 1.5. Changes in the sectoral structure of European economies, changes in share of value added in GVA, 2000-08

NACE		EU-27	BE	BG	CZ	DK	DE	EE	IE	EL	ES	FR	IT	CY
A	Agriculture, forestry and fishing	-0.6	-0.6	-5.4	-1.3	-1.5	-0.2	-1.8	-1.8	-3.6	-1.7	-0.7	-0.8	-1.5
B-E	Industry	-2.3	-4.0	0.6	0.3	-1.6	0.7	-1.8	-10.3	-1.3	-3.8	-4.2	-2.2	-2.9
C	Manufacturing	-2.7	-3.7		-1.6	-2.6	-0.1	-1.6	-11.1	-1.8	-4.0	-3.9	-2.5	-2.8
F	Construction	0.9	0.6	4.2	0.2	0.5	-1.1	4.0	0.0	-1.2	3.3	1.6	1.3	4.4
G-I	Trade, transport, accomodation	-0.3	1.5	-0.1	-2.6	-0.5	-0.1	-1.7	0.6	2.3	-0.5	0.2	-1.6	-2.8
J	Information and communication	-0.1	0.3	2.9	0.8	0.1	-0.3	-0.3	-0.9	-0.1	-0.4	0.1	0.1	-0.6
K	Financial and insurance activities	0.4	-0.8	4.0	1.2	1.4	-0.6	0.3	2.9	-1.2	0.8	-0.9	0.5	0.4
L	Real estate activities	0.7	0.0	-4.2	0.0	0.0	1.1	-2.6	2.0	0.8	0.6	2.0	1.9	0.4
M-N	Professional and scientific activities	0.5	1.9	0.5	1.5	1.2	0.8	3.5	3.0	1.5	1.1	1.2	-0.1	0.8
O-Q	Public administration, education, etc.	0.5	1.3	-3.5	0.3	0.5	-0.3	0.5	4.5	1.7	0.7	0.5	0.9	1.6
R-U	Arts, entertainment and recreation	0.0	0.0	1.2	-0.5	-0.1	0.0	0.1	0.0	1.0	-0.3	0.1	0.0	0.1

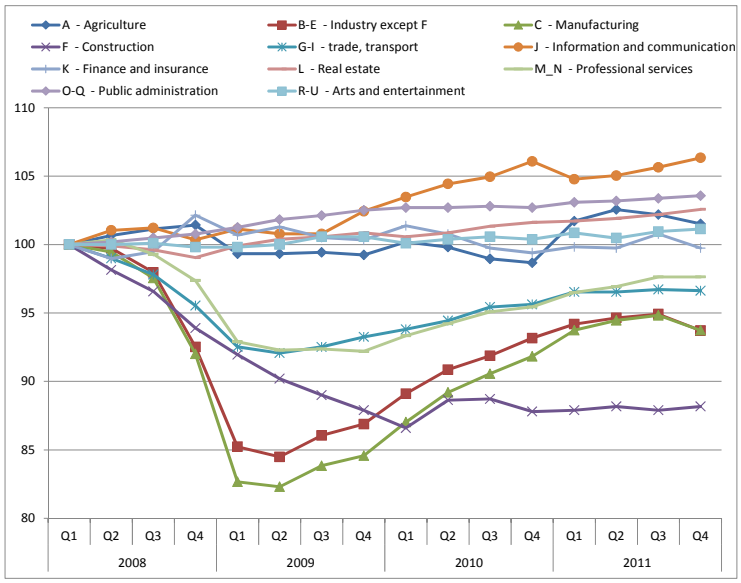
		LV	LT	HU	MT	NL	AT	PL	PT	SI	SK	FI	SE	UK
A	Agriculture, forestry and fishing	-1.5	-2.7	-1.9	-0.8	-0.8	-0.3	-1.2	-1.2	-1.0	-0.4	-0.8	-0.3	-0.3
B-E	Industry	-3.5	-2.2	-1.6	-6.8	0.4	-1.0	0.8	-3.0	-2.8	-0.2	-3.4	-2.7	-4.9
C	Manufacturing	-3.6	-1.2	-1.3	-6.2	-1.8	-1.1	0.5	-3.4	-3.1	-1.5	-4.1	-4.2	-5.0
F	Construction	3.3	5.2	-0.4	0.2	0.2	-0.6	-0.1	-0.9	1.7	2.8	1.0	0.9	1.1
G-I	Trade, transport, accomodation	-1.1	1.6	2.0	-4.8	-2.0	-0.5	-0.8	-0.1	2.1	-0.3	0.0	1.1	-1.9
J	Information and communication	-1.6	-1.3	0.4	0.7	0.2	0.0	0.7	0.2	0.1	0.5	0.1	0.1	-0.2
K	Financial and insurance activities	1.8	1.3	0.4	-2.0	-0.4	-0.2	0.3	2.1	-0.2	1.1	-1.6	-0.6	3.7
L	Real estate activities	0.4	0.0	-0.6	0.6	-0.2	0.7	-0.5	0.5	-0.6	-2.1	1.0	-1.0	0.3
M-N	Professional and scientific activities	2.2	1.8	1.5	2.2	1.0	2.1	0.5	0.8	1.8	0.9	2.2	1.2	0.5
O-Q	Public administration, education, etc.	-0.5	-3.1	0.2	2.4	1.7	-0.1	0.6	1.2	-0.6	-2.3	1.1	0.9	1.7
R-U	Arts, entertainment and recreation	0.4	-0.7	-0.2	8.3	-0.1	0.0	-0.1	0.5	-0.7	0.1	0.3	0.3	-0.1

Note: Figures are the difference in the share of the sector in gross value added between 2008 and 2000. The shading emphasizes sectors with larges changes, either shrinking (red) or expanding (blue) relative to other sectors within the country.

Source: Eurostat, National Accounts aggregates and employment by branch (NACE Rev.2).

These patterns are obvious at the EU-27 level (Figure 1.5). During the crisis it is industry, and in particular manufacturing, that has taken the brunt of the contraction, although presumably to recover afterwards. Construction, on the contrary, is undergoing a severe adjustment process in some Member States so that its contraction will probably be more persistent. The disruption of economic activity and, in particular, of manufacturing, has an obvious impact not only on trade and transport but also on professional services, much of whose output goes into the industry.

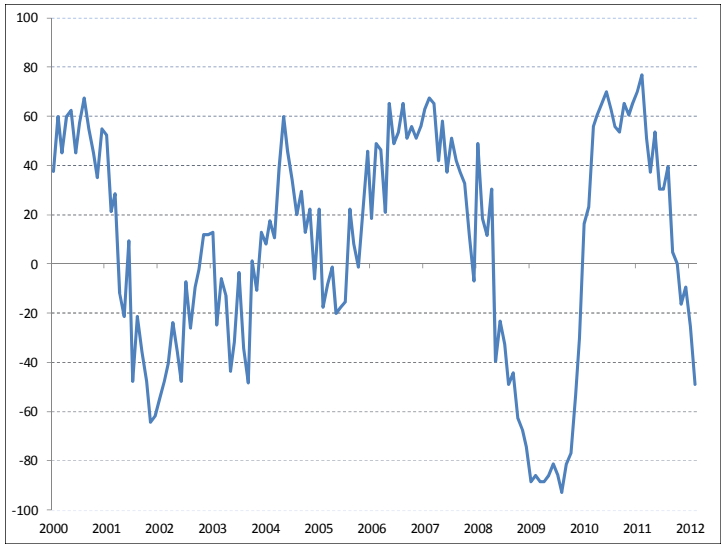
Figure 1.5. The sectoral profile of the contraction in the EU-27: Real value added per sector; index, 2008Q1=100



Source: Eurostat, Quarterly National Accounts by 10 branches.

Finally, the double-dip pattern shown in Table 1.1 above at the aggregate is also reflected at the sectoral level. Figure 1.6 shows the number of sectors that report at any given month a contraction with respect to the previous month. By the beginning of 2012 the index was –40% meaning that only 30% of sectors reported an increase in activity while 70% were contracting (and hence 30 – 70 = –40).

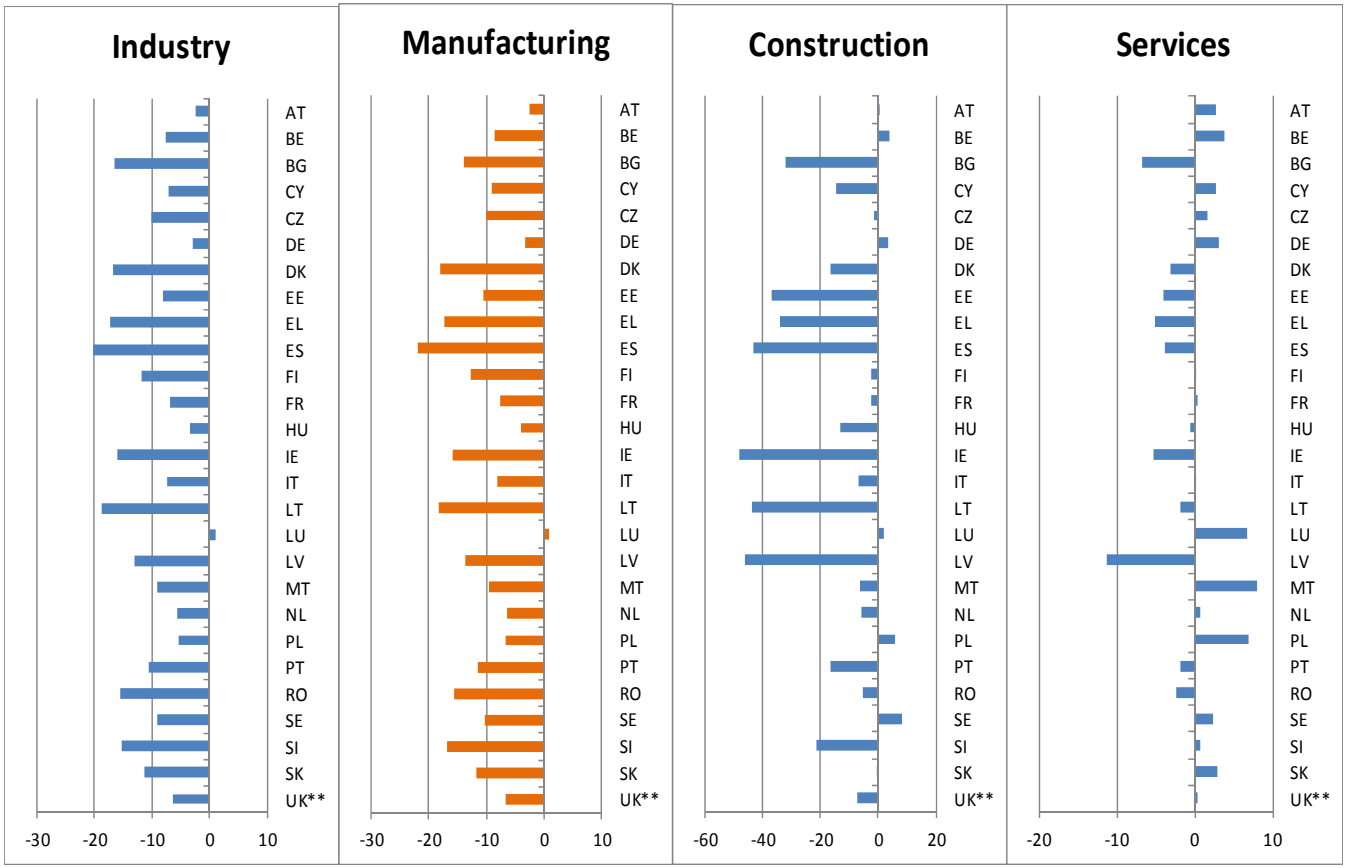
Figure 1.6. A qualitative-quantitative assessment of the relapse. The diffusion index



Note: The diffusion index is defined as the difference between the percentage of manufacturing industries that are expanding and of those that are declining. The index ranges from -100 to 100. 'Expanding' and 'declining' mean positive and negative growth rates respectively. The total number of industries used in the calculations is 93 (defined in terms of the 3-digit level of NACE Rev. 2). For more details see the European Union Industrial Structure 2011.

Source: Short-term Industrial Outlook, April 2012, DG Enterprise and Industry, European Commission.

Figure 1.7. Changes in employment per Member State by economic activity, percentage change 2008-11*



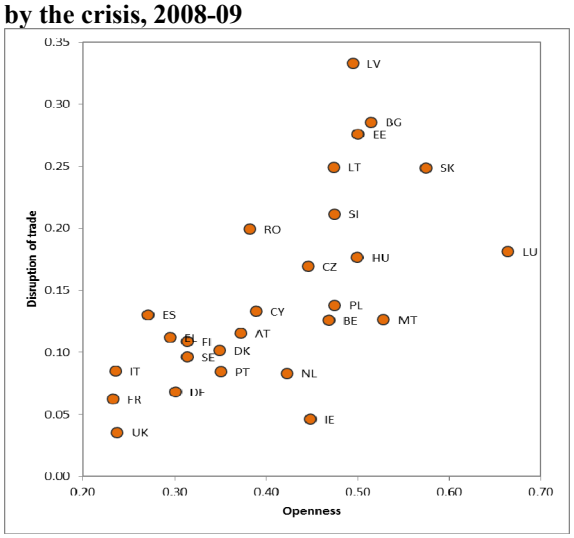
* Data for 2011 not available for three countries: UK uses 2009 while Ireland and France use 2010.
Note: Each category corresponds to the NACE rev. 1.1 sections: Agriculture, A and B; Industry, C, D and E; Construction, F; Services, from G to P; Manufacturing, D.

Source: AMECO database, Commission services.

1.4 THE DISRUPTION OF TRADE

This crisis has been described as unprecedented because of its simultaneous depth and scope. In turn, the scope is reflecting an increasingly interconnected world. Below it is shown that European economies are particularly open and integrated

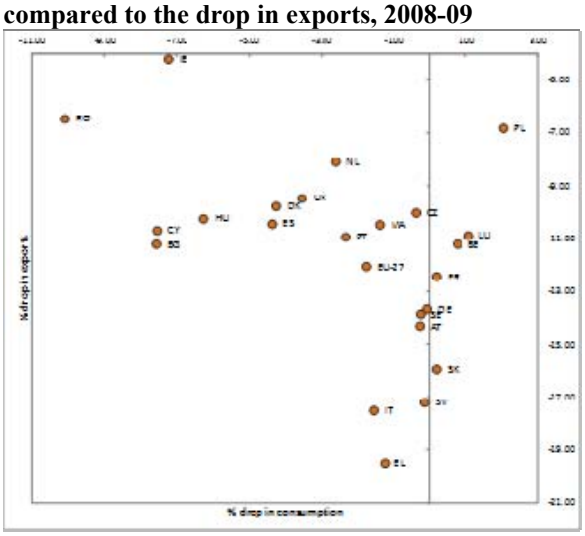
Figure 1.8. Openness and the disruption of trade by the crisis, 2008-09



Note: The disruption of trade index is the reduction in the share of imports in aggregate demand *m* with positive sign and corrected by the corresponding contraction of GDP *y*, that is, $-[(m' - m) - (y' - y)]$. Openness is exports as a percentage of GDP.

Source: AMECO database and own calculations.

Figure 1.9. The initial drop in consumption compared to the drop in exports, 2008-09



Note: The Baltic States are not represented in the chart for the sake of readability; their figures are beyond the lower limits of both axes.

Source: AMECO database, Commission services.

In the boom period 2000-07 preceding the recession many EU Member States were not directly affected by internal imbalances.[14] These countries were affected by two transmission mechanisms. One is exposure to private or public debt in troubled economies. The other is trade linkages and the corresponding uncertainty about business conditions that spreads across borders because our interconnectedness. Figure 1.9 relates the initial drop in consumption with the drop in exports at the onset of the crisis. Countries far away from the vertical axis like Denmark, Spain, Romania or the UK are countries with internal imbalances where consumption dropped simultaneously to exports and investment. Countries close to the axis like Germany, Sweden or France can be interpreted to be affected only indirectly through trade linkages and general uncertainty to the first group of countries and the overall uncertainty about business conditions.[15]

Openness is an important part of the explanation of the diffusion of the crisis. However, it could also become a component of the recovery. EU countries not affected by internal imbalances may act as a locomotive for growth in the rest of the UE at least in the short-term. Strong growth in other regions of the world in particular emerging economies in Asia and South America, which are growing more rapidly and have been much less affected by the crisis, may as well boost external demand for EU countries, depending on their trade orientation. That may explain the positive evolution of exports in 2010-11, strongly growing in all EU Member States with the sole exception of Greece and Finland.[16] However, this effect is not sufficient to compensate for the unfavourable evolution of domestic demand. Therefore while exports are indeed recovering swiftly and vigorously, income recovery remains elusive in many Member States.

[14] The Alert Mechanism Report COM(2012) 68 monitors internal imbalances looking at changes in deflated house prices, private sector credit flow, private sector debt, general government debt and a 3 year average of unemployment rate. This chapter is primarily concerned with private sector debt and in particular with households' leverage.

[15] Table 1.7 in the appendix to this chapter details the reaction of the different components of GDP as well as net exports for all EU Member States.

[16] See Table 1.7 in the appendix and the Short-term Industrial Outlook, July 2012, DG Enterprise and Industry, European Commission.

Box 1.1. External demand, long-term growth and competitiveness

In times of recession, when internal demand is weak, it makes all sense to rely on external demand to accelerate the recovery. Indeed, there is some consensus in the economics profession that **short-term** increases in aggregate **demand** — including increases in external demand, the demand for exports of an economy — can increase the domestic product in the short-term even beyond the obvious increase in income due to increasing sales abroad. Indeed, via some chain or multiplier effect, the increase in income may be even larger than the demand stimulus.[17] In that sense, strong growth in other regions can be excellent news for mature economies in the short term and for export-led catching-up economies in the medium term.

In the **long-term**, however, and for advanced economies without natural resource endowments, only **technical change** can sustain growth of income per head. From this longer-term perspective, the connection between trade and growth has less to do with the mere exchange of goods and services and more with competitive pressures as well as the exchange of ideas that comes along with trade. Empirical evidence is elusive but points in that direction: openness increases the exposure to foreign technology, equipment goods, management techniques, and so on. Competitive pressures provide the incentives to adopt these technologies and help the market select the most productive firms.[18] Openness often comes hand in hand with mobility of persons: engineers visiting providers, students completing their curricula abroad, migrants that leave and eventually return with new ideas.[19] If the institutional setting is the right one,[20] technologies are adopted, new businesses are started that introduce new processes and commodities, and so on.

This distinction between the short and the long term is important. External demand can help recover in the short-term when internal demand is comparatively weak. In the long-term, however, growth is only possible through **openness** and **structural reforms** that change the ability and incentives to adopt and develop new technologies.

17 Incidentally, the belief that the multiplier is larger than unity constitutes the ground on which fiscal stimulus are justified. If the government narrows to increase public expenditure, and income increases more than proportionally, there is room to boost demand in the short-term and, at the same time, increase revenues enough to pay back the debt. This is the classical so-called Keynesian approach to fighting recessions.

18 This is an old idea recently partially formalized in Melitz (2003). Although the paper focuses on the (static) gains from trade liberalization, it is easy to see how these competitive pressures will also provide incentives to adopt and develop new technologies sustaining (dynamic) long-run growth. For an overview of this literature see Bustos (2010), Lileeva and Trefler (2010) or Constantini and Melitz (2008) among others.

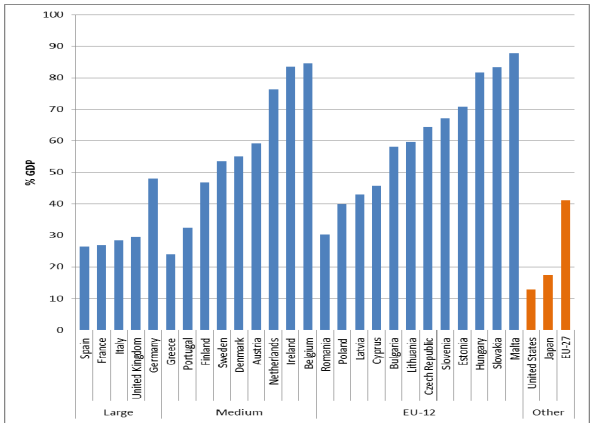
19 See, for example, Legrain (2008) for a description of the development of the electronics industry in Taiwan and its connection with Taiwanese migrants in the US.

20 See the 12 pillars of competitiveness mentioned in the Global Competitiveness Report 2012, World Economic Forum.

1.5 TRENDS IN THE EXTERNAL SECTOR. OPENNESS

The external sector in Europe is characterized by a notable degree of integration. In this open landscape, four countries stand out. Among the medium- and small-sized countries of the EU-15, Belgium, the Netherlands and Ireland are very open economies. In the case of Belgium and Netherlands, historical reasons as well as a small size and a geographical location may explain much of this openness. The case of Ireland, despite its peripheral location, can be explained again on its small size and on recent trends that have to do with the English language and a tax regime favourable to the establishment of many foreign services and manufacturing corporations for their operations in Europe. The take-off of Ireland as a hub for many multinational corporations is likely explained by these reforms and, in any case, is reflected in an already large 48% in 1983 to an outstanding 80% before the crisis in 2008.

Figure 1.10. Exports of goods and services (including intra-EU trade) as a percentage of GDP, 2008

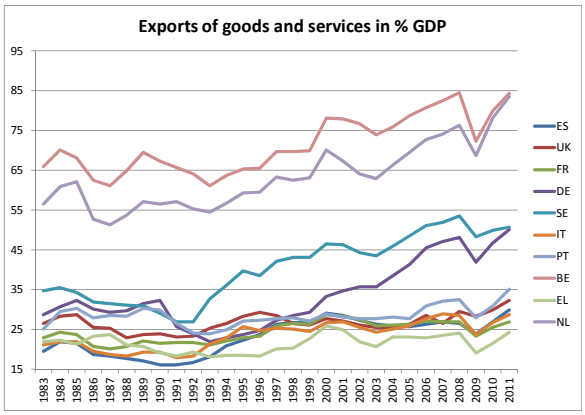


Note: The criteria to classify countries is by population. Luxembourg (175%) excluded for the sake of readability of the chart.

Source: AMECO database, Commission services.

The fourth country in question is Germany and constitutes a notable case. Among the big countries it has a degree of international integration which is quite high. As Figure 1.11 and Figure 1.12 show, this is a relatively recent phenomenon that took-off in the early 1990s. But the underlying drivers of these changes are not clear. Below the case of Germany is examined in some depth.

Figure 1.11. Exports of goods and services as a percentage GDP, recent evolution, selected countries



Source: AMECO database, Commission services.

Most EU Member States display an increasing trend in the value of exports relative to GDP due to the increasing globalization of EU economies as well as European economic integration itself. After the impulse of the Single European Act, this is mostly reflecting increasing integration in world markets.[21]

But this trend has been particularly pronounced in four countries within EU-15 Member States. Belgium and the Netherlands have been already signalled as particular cases. Sweden, on its side, is probably regaining its place in the international scene after a period of poor performance during and after the crisis of the 1970s. The case of Germany, however, is less easy to explain and is the only one that affects a large country; the largest economy of the EU indeed. As illustrated in Figure 1.12, larger countries have smaller external sectors (as a percentage of GDP) because more trade occurs within its borders.[22] For example, and to support the

[21] In the case of goods, the share of EU exports over total exports of all Member States has been quite stable in the last 20 years. See the discussion in section 1.6 below.

[22] The larger an economy, the larger the variety of goods, and hence the less need for trade. In the limit the planet has zero

assertion above, Sweden has now the degree of openness expected for a country of its size.

Germany, on the contrary, was on the average in 1995 (see again Figure 1.12) with total exports being 24% of GDP. Yet, in 2007 and given its size it should still be around 25, and nonetheless its exports represent currently up to 47% of GDP.

One possible explanation lies in the internationalization of the value chain. As a large manufacturer, Germany has close ties with some of its neighbours such as the Czech Republic, Slovakia and Hungary. However, evidence remains elusive: trade in intermediate goods, commodities used to produce other commodities, has not grown faster than general trade. The share of exports of intermediate goods to total exports has remained remarkably stable over this period (Table 1.6).[23] It grows in absolute terms hand in hand with the general level of openness. The so-called internationalization of the value chain seems to be an absolute, not a relative, phenomenon.

Figure 1.14 suggests that through trade the country is strongly specializing in manufactures but no single trade partner explains this trend. For example, China or Poland has become important markets for Germany but are not yet comparable to France, the US, or Italy.[24] The figure shows how exports have grown similarly for all trade partners with no overwhelming importance of any individual partner. All in all it seems that further research is needed to understand the increasing internationalization of the German economy.

In short, the increasing internationalization of the German economy remains to some extent a puzzle. It is not even clear that it is a positive development: see the controversy that followed the Bazaar effect suggested in Sinn (2006).

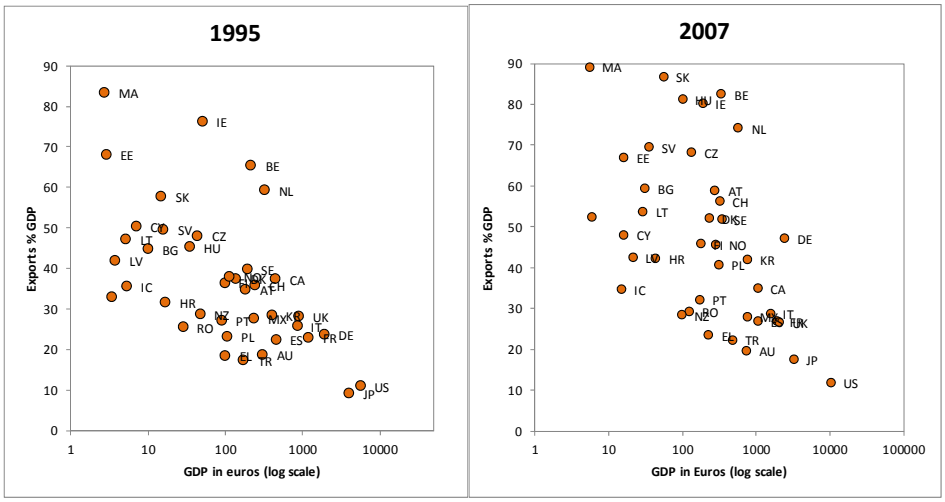
---

trade with the rest of the universe, at least so far; this point was famously made in Krugman (1978).

23 Actually the share is stable not only for Germany but for the EU as a whole as well (See Chapter 2 in European Competitiveness Report 2010).

24 The picture is slightly different for imports. China has become a major source of German imports. In this respect, however, Germany is no different from many other advanced economies, and while Chine has become an important source of imports (9% total), traditional trade partners still constitute the bulk of German imports.

Figure 1.12. Changes 1995-2007 in openness relative to the size of the economy



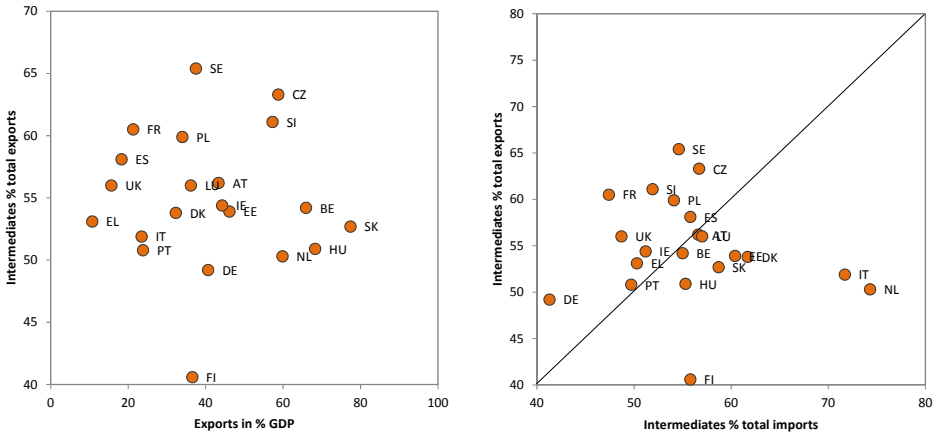
Source: AMECO database, Commission services.

Table 1.6. Share of exports of intermediate goods to total exports

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Austria	57.1	55.5	56.4	55.9	55.2	55.4	52.7	55.2	56.2	56.6	57.1	55.8	57.8
Belgium	51.6	51.9	53.5	50.8	48.6	49.7	51.5	52.7	54.3	55	56.5	54	57.6
Czech Re	61.2	61.2	62.8	61.4	60.6	61.1	60.6	58.7	57.1	56.7	56.7	54.1	53.8
Denmark	38	38.2	39	37.9	37.6	38.8	39.8	39.9	41.8	41.3	40.4	41.4	39.8
Estonia	56.6	60	51.9	54.7	58.9	59.2	56.7	58.7	62.7	61.7	60.9	59.2	59.6
Finland	60.8	61.2	60.5	58.8	59.3	60.1	63.5	59.7	60.8	60.4	59.3	62	68.7
France	49.9	49.8	50.4	48.6	47.7	47.5	47.8	48.6	49.5	50.3	50.8	48	49
Germany	49.7	49.2	50.7	48.8	48.5	48.9	49.5	49.7	50.7	50.6	51.1	47.3	48.9
Greece	45	45.8	53.1	51	49.6	48.1	50.9	51.6	56.2	55.8	56	51.4	54.2
Hungary	54.7	53.7	54	53.3	51.3	52.9	51.5	52.7	51.3	47.4	46.7	43.4	46
Ireland	58.2	58.5	61.2	59.2	57.6	55.6	54.1	55	53	55.3	56.3	53.9	54.4
Italy	47.4	47	48.2	47.9	47	48.2	48.8	49.9	50.9	51.2	51.5	49.4	51.8
Luxembo	..	70.7	68.8	63.1	63.4	66	70.1	68.2	71.8	71.7	74	68.9	73.1
Netherlan	54.9	51	53.3	52.1	52.8	53.8	53.7	56.8	58.3	57	59.3	56.8	58.6
Norway	61.3	60.1	66.4	61.9	63.5	65.3	69.3	70.8	72.5	74.3	72.5	67.5	70.7
Poland	48.1	49.6	52.9	52	52.7	55	55.2	54.2	54.8	55.3	53.1	47.2	50.8
Portugal	42.5	44.3	46.8	46.2	48.4	50.1	51.5	50.6	53.4	54.1	53	51.5	56
Slovak Re	59.3	57.8	58.6	59.5	59.5	58	58.9	57.7	53.1	49.7	49.8	48.3	49.5
Slovenia	50.4	52.2	53.5	53.8	52.9	53.8	54.8	54.2	56.4	54.6	55.1	51.4	55.2
Spain	47.9	47.8	49.2	48.6	47.6	47.9	48.7	50	51.1	51.9	54.2	49.2	52.3
Sweden	58.8	57.1	56.8	57.9	57	54.8	57.3	56.2	57.9	58.7	60.3	58.1	60.2
United Ki	46.5	46.7	46.8	46.4	46.3	46.2	47.2	48.2	49.9	48.7	49.6	48.2	47.9

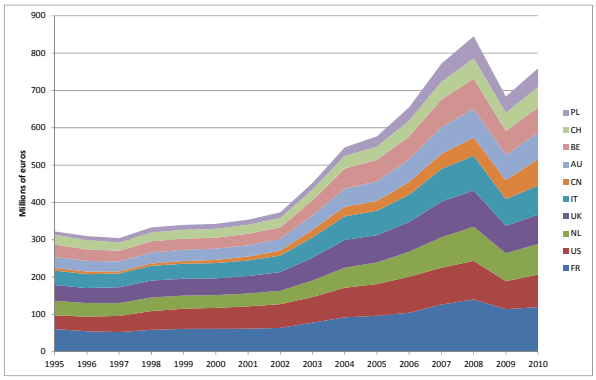
Source: OECD STAN Bilateral Trade Database.

Figure 1.13. The international of value chains: Openness and exports and imports of intermediate goods



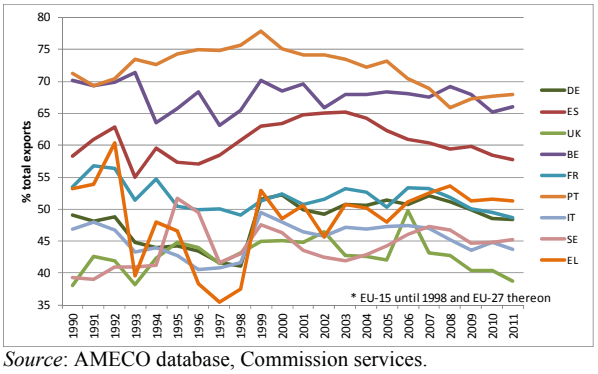
Source: OECD STAN Bilateral Trade database and AMECO database, Commission services.

Figure 1.14. German exports in current prices, main trade partners



Source: OECD STAN Bilateral Trade database.

Figure 1.15. The share exports of goods to the EU over total exports, selected countries



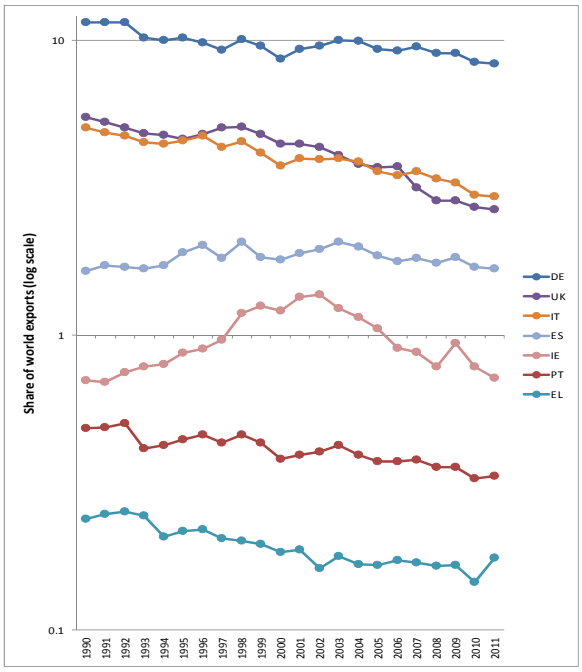
Source: AMECO database, Commission services.

1.6 THE BOOM PERIOD 2000-07 AND IMBALANCES

The trends mentioned above do not seem to have been altered significantly by the events that preceded the recession. Mispriced assets have the potential to distort the real economy, for instance diverting capital to mispriced property or stocks instead of productive investments. In that sense, the risk is that the imbalances not only feed the current recession but also hamper future productivity growth because of this inefficient allocation of capital.

If the boom years did not reveal any obvious impact of the accumulated imbalances, the subsequent recession and the current sovereign debt crisis do not seem to have had impact on external performance as measured by the share of exports in world exports.[25] Figure 1.16 represents the international market share for the economies in trouble with Germany as a comparison. There is a decreasing trend most likely due to a composition effect because of increasing globalization.[26] Some other long-term trends are also apparent: Italy and the UK are losing market share relatively faster than other EU countries, or the Spanish share remaining remarkably constant along this period. Other than that, the build-up of the imbalances and the burst of the bubble do not seem to have harmed the ability of these countries to export.

Figure 1.16. Export market shares, selected countries



Note: Share of exports of goods including intra-EU trade over total exports. This excludes services; in the light of section 1.4 above, it is important to keep this in mind to interpret correctly the series of the UK, IE and EL.

Source: AMECO database, Commission services

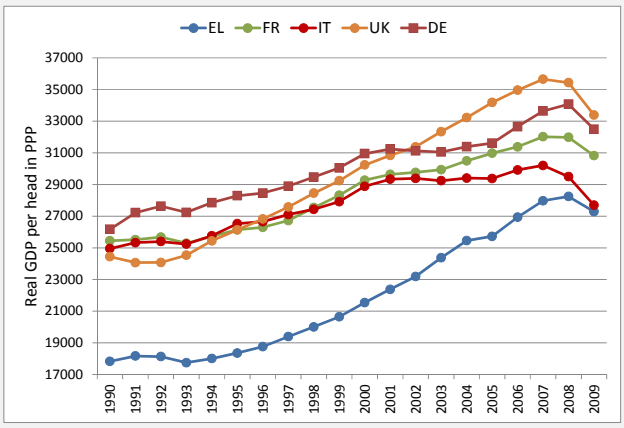
[25] Of course, this does not mean that trade was not affected by the crisis. The implication is rather that the EU was not impacted differently from the average trading country in the world.

[26] A decreasing share can be due to poor performance (exports growing more slowly than other countries) or to a composition effect (volume of trade growing because of new actors coming in). When all major industrial powers are losing trade shares, the composition effect is the only reasonable hypothesis: it is developing countries joining international trade.

Box 1.2. Competitiveness and public finances: The case of Greece

Despite current turmoil, Greece performed reasonably well in the years preceding the crisis. After a period of relative depression in the 1980s, the country took-off in 1993 for a long period of sustained growth. During the boom years Greece had improved by 40% its relative position in the distribution of income in the EU. That was reflecting true improvements in standards of living: since the take-off, and before the crisis, Greek GDP per head in purchasing power standards had closed significantly the gap with the EU average, and had reached similar levels to Italy by 2007.[27] At the same time, the external performance of the country was relatively stable in goods (see Figure 1.16 above) while section 1.9 discusses the notable performance of the export of services.[28]

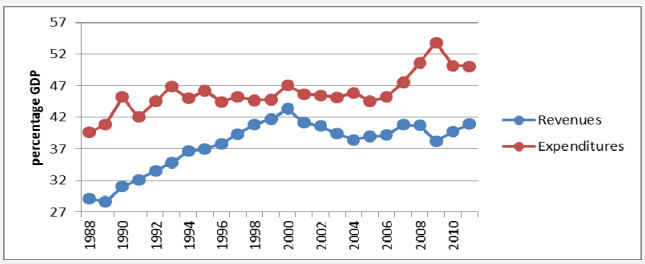
Real income growth. Comparison with selected EU-15 Member States



Source: Penn World Table 7.0, CIC, University of Pennsylvania.

At the beginning of the expansion period, growth came along with an increase in government revenues almost closing the gap with expenditures in a decade. Then, in 2000, the trend is reversed and despite ongoing growth of income government revenues as a percentage of GDP start to lag significantly below expenditures that remained constant. With the exception of Hungary, no other EU Member State runs so large public deficits in the booming years immediately before the recession.

Public revenues and expenditures in Greece



Source: AMECO database, Commission services.

It seems, then that the Greek problem is more related to the ability of the government to raise revenues rather than the ability of its industry to exports goods and services.[29] Alas, if the accumulation of public debt did not seem to affect the real economy, it does not seem that the same is true for the uncertainty surrounding the resolution of the crisis as well as the drastic measures that try to bring public expenditures and revenues closer. In Table 1.1 Greece appears as the only country that has been in recession since the onset of the crisis.

As for the future, while the country has been successfully growing in these past two decades, catch-up is still partial. If the economy seems to keep up the pace of development of the EU, and even improve its relative position, in many respects Greece is still well below the EU average. Indeed, despite progress, Greece could improve sensibly along a number of dimensions (income per head, labour market participation, etc.). Most notably, it is still a much closed economy: for its size, exports relative to GDP ought to be around 50% but they represent hardly 25% (see Figure 1.12 above). In the sections below it is shown that Greece is at the bottom of the class when it comes to business environment as measured by the Doing Business indicators. Improvements in these areas would certainly help the country leap ahead.

---

27 Data for the nominal comparison, is from the AMECO database, GDP a current market prices, EU-15=100. For the PPS comparison, Penn World Table.

28 The reader may also refer to the more systematic analysis of export performance in chapters 3 in the monograph devoted to the recovery of trade in the Quarterly Report of the Euro Area 2012-2.

29 See Darvas (2010) for a review of the European fiscal crisis in comparison to the US with a special reference to the case of Greece and the revenue-side of the problem. See also Henning and Kessler (2012) for a more general comparison of the building of the American and European monetary, fiscal and banking area.

1.7 THE INCREASING WEIGHT OF EXPORTS OF SERVICES

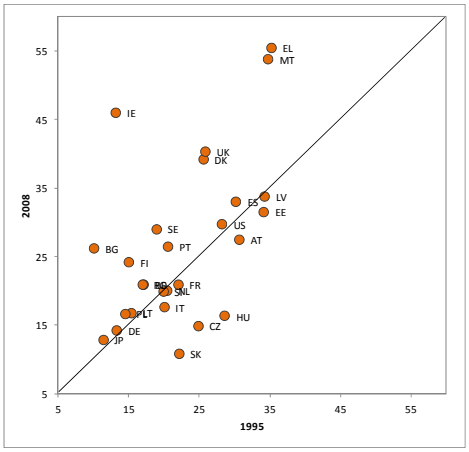
Together with increasing openness, a sign of these last decades is the growing importance of services in international trade: financial services, civil construction, transport, environmental services, and so on.[30]

Exports of services constitute an important share of total exports for the EU and as a whole, close to 25% for the EU-15 in 2008 after a long period of moderate but constant increase. Together with the US, with services weighting 29% of total exports, the EU is one of the most important providers of services in the world. The aggregate figure, however, masks considerable heterogeneity within the EU. Several groups can be distinguished.

Countries like Germany, France, or Italy are traditional exporters of manufactures. The service sector contributes relatively little to exports. The fast catch-up process of Slovakia, the Czech Republic or Hungary is mostly based on FDI inflows that explain important increases in exports of manufactures. From these countries most exports are goods rather than services. Countries like UK, Greece, Ireland, Denmark and Malta stand out for the large weight of services in their exports. Furthermore, these countries have shown an important increase in the last years. For instance, in Greece it has moved from an already high 35% in 1995 to close to 55% in 2008.

The ultimate explanation for these changes differs across countries. The UK is the largest economy of the EU where services have grown to be so important, and a glance at Table 1.5 makes obvious that it is closely linked to the expansion of the financial sector: between 2000 and 2008 Financial and Insurance activities have gained almost 4 percentage points of weight in gross value added, a change that reflects the size of a sector that today represents close to 10% of GDP, the highest share in the EU together with Ireland. The case of Greece, instead, is linked to the transport sector, most likely because of the traditional importance of the cabotage industry.

Figure 1.17. The weight of exports of services in total exports; comparison 1995-2008

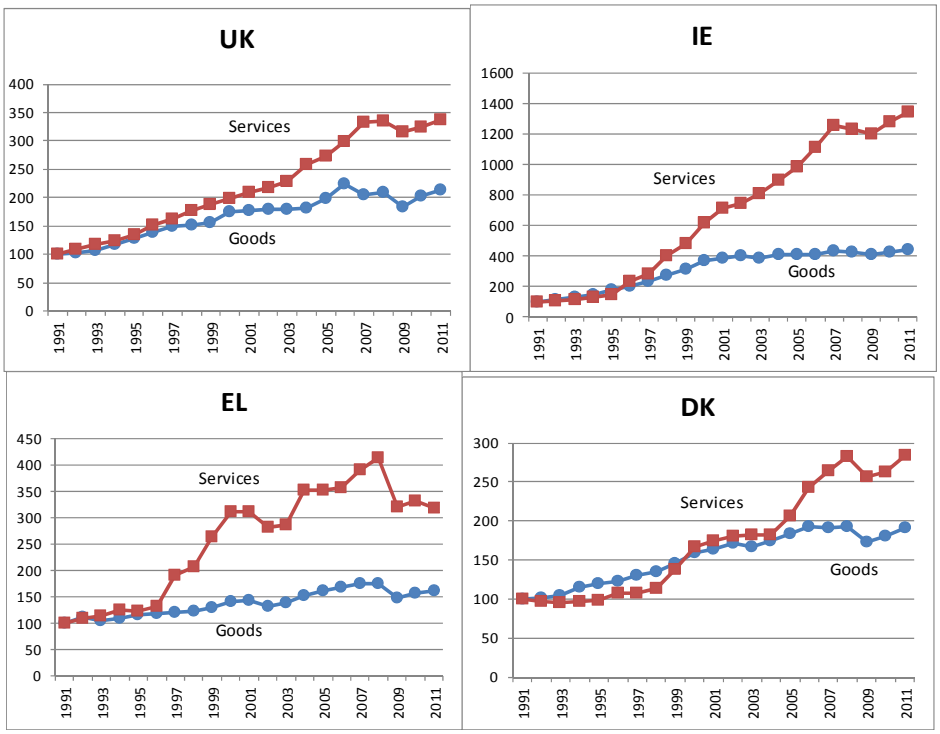


Source: AMECO database, Commission services.

It may be worth noting that these notable increases in shares reflect real growth of exports of services rather than shrinking exports of goods. These four services' exporters have experience large real increases of exports of services, in the case of Ireland reaching a ten-fold increase in since 1991 (see Figure 1.17). This contrasts with more manufacturing-oriented exporters like Germany or France where the share of services in exports is moderate, between 15% and 25%, and has remained stable. In these countries the real evolution of services lags moderately the real increase of merchandise exports, maybe reflecting poor domestic performance in services.

[30] The UN *Manual on Statistics of International Trade in Services 2010* distinguishes: Business services, Communication services, Construction and related engineering services, Distribution services, Educational services, Environmental services, Financial services, Health-related and social services, Tourism and travel-related services, Recreational, cultural, and sporting services, Transport services, Other services not included elsewhere.

Figure 1.18. Some services' exporters. Real growth of exports of goods and services; index, 1991=100



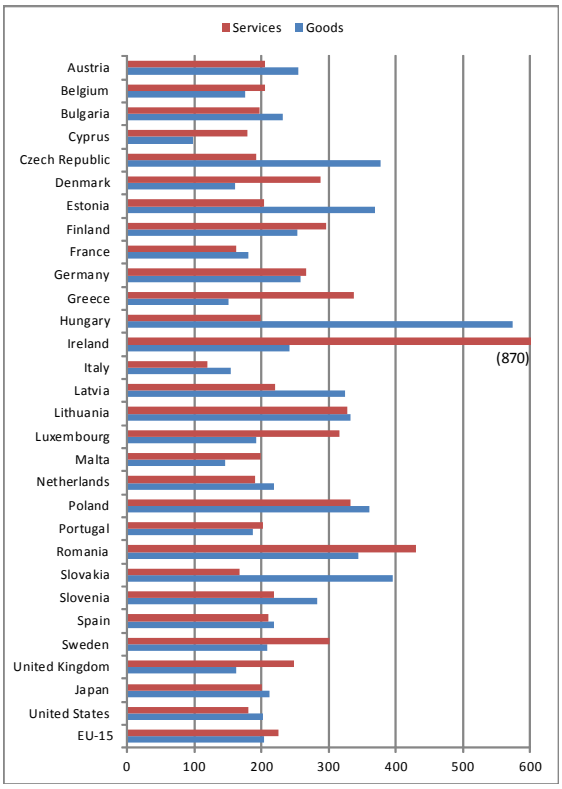
Source: AMECO database, Commission services.

At the aggregate EU level, the importance of services' exports has increased moderately from 20 to 25% between 1991 and 2011 but it is still relatively lower than the US and definitively higher than Japan, a classical exporter of manufactures.

In real terms, aggregate EU changes are aligned with those of Japan and the US with exports of goods growing at a similar pace to services, an indication that the patterns described above do not reflect a general pattern but rather the relative specialization of these countries as service providers.

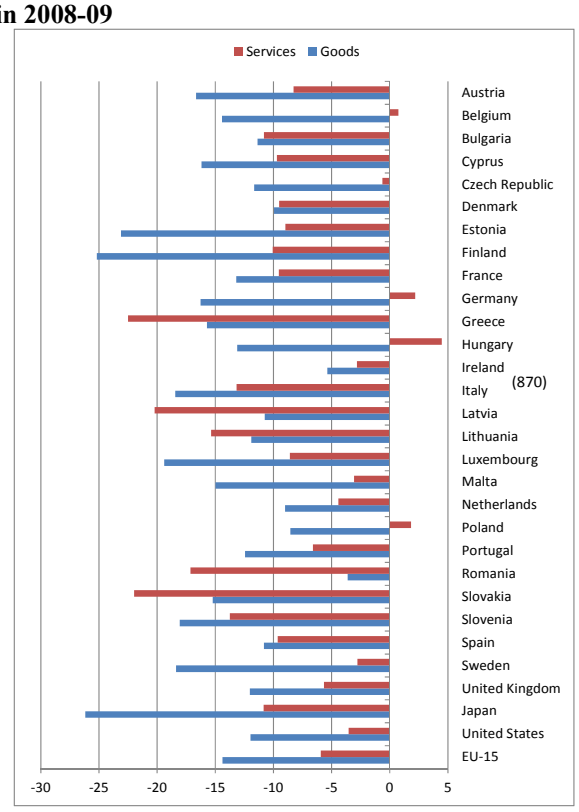
.

Figure 1.19. Real growth of exports of goods and services in 1995-2008; index 1995=100



Source: AMECO database, Commission services.

Figure 1.20. The contraction of exports: Real percentage change of exports of goods and services in 2008-09



Source: AMECO database, Commission services.

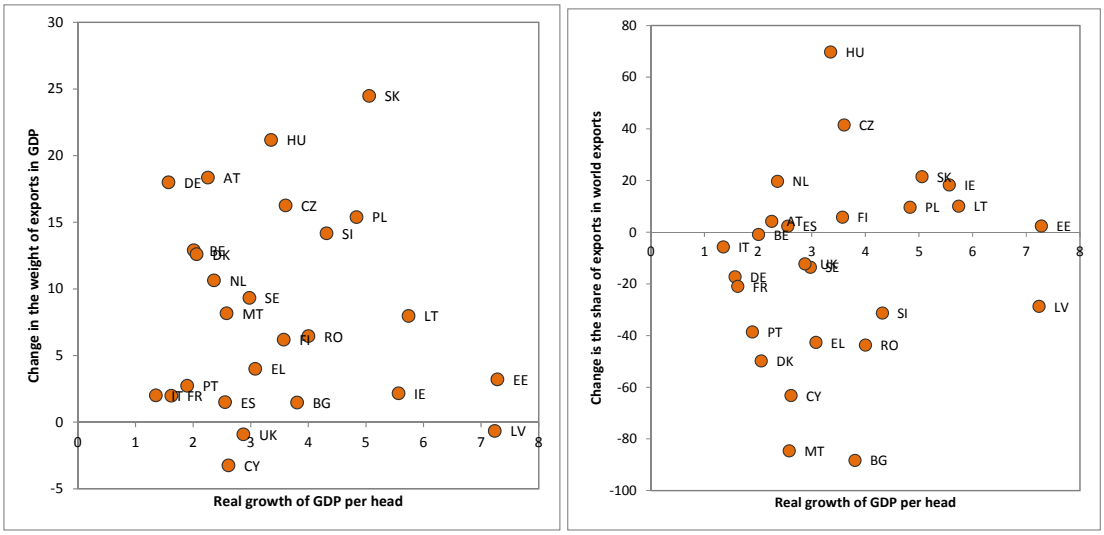
Finally, in the current circumstances it is legitimate to ask whether it is goods or services that are more resilient along a recession. The answer is that it depends on the services. In Figure 1.20 one can see that there is no clear association across Member States. The UK or Denmark, more focused on financial services, exports of goods havecontracted more than trade in services. In Greece, on the contrary, services have contracted more, most likely because of the reliance on cabotage and the contraction in international trade (and hence in international transport services). In other countries, the weight of business services links more tighly manufacturing with services.

1.8 ABOUT THE IDEA OF PERFORMANCE

Having examined recent trends and developments of the external sectors begs the question of whether a good external performance is good per se or the reflection of a buoyant economy capable to produce commodities demanded in the international markets. Taking the increase in income per head as a performance index, the correlation with the variation in export openness is positive but weak in the medium term.[31] This is most likely due to factors other than exports contributing to growth. This is shown by the high dispersion of the observations in Figure 1.21.

[31] The literature on the export-led growth hypothesis examines whether exports induce changes in the rate of technical change. That is, the possibility that exports can induce sustained growth beyond the obvious instantaneous impact on income. If this literature is inconclusive, this is reflected in this weak relationship observed in EU recent experience.

Figure 1.21. Exports and income growth



Note: The change in the weight of exports is the comparison of the average 1995-98 and 2004-08, in % points GDP. The change in the share of exports in world exports compares the average 1993-96 and 2005-08 and is adjusted by initial level of income in euros to compensate the fact that, mechanically, in countries growing fast, exports tend to grow fast as well.

Source: AMECO database, Commission services.

Indeed, net exports have an obvious immediate contribution to income in the short term. Hence, as mentioned above, a good net export "performance" will soften the impact the recession. In the longer term, however, even if it is clear that trade, or more generally openness, is essential for growth and development, the relationship is less direct than it is often assumed. As an exchange of goods and services it has a direct welfare effect: it allows consumers to access to a larger variety of commodities. This is, after all, the main reason why we export: to afford imports. In the long-run, however, as discussed in Box 1.1, it is not trade in the narrow sense of exchange (exports for imports) but openness in general (including foreign investment and investment abroad, migrants, exchanges of students, tourism, etc.) that exposes an economy to foreign technology, equipment goods, management techniques, and so on. Openness helps technologies to circulate and provide the incentives to be adopted. Indeed, technologies are adopted and further developed because competitive pressures of foreign firms (both in the domestic and foreign market) provide the incentive to local firms to improve performance.

The ability of an open economy to effectively adopt and develop new ideas, in turn, is likely to depend on the environment created by the level of education, the legal system, the quality of administration and so on. This environment is what the Doing Business rank is trying to capture.

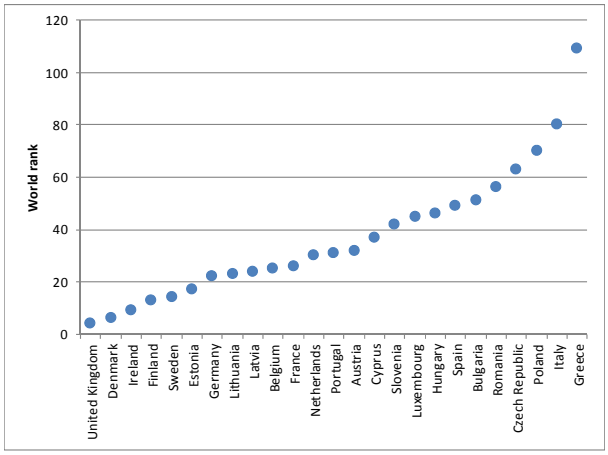
Box 1.3. Chapters of the Ease of Doing Business index

The World Bank's Ease of Doing Business attempts to measure some key elements of doing business, from the number of days required to start a business to the number of documents needed to export. This is a brief description of the contents of each section:

Starting a Business	Procedures (number)	Paying Taxes	Payments (number per year)
	Time (days)		Time (hours per year)
	Cost (% of income per capita)		Profit tax (%)
	Paid-in Min. Capital (% of income per capita)		Labor tax and contributions (%)
Construction Permits	Procedures (number)		Other taxes (%)
	Time (days)		Total tax rate (% profit)
	Cost (% of income per capita)	Trading Across Borders	Documents to export (number)
Registering Property	Procedures (number)		Time to export (days)
	Time (days)		Cost to export (US$ per container)
	Cost (% of property value)		Documents to import (number)
Getting Credit	Strength of legal rights index (0-10)		Time to import (days)
	Depth of credit information index (0-6)		Cost to import (US$ per container)
	Public registry coverage (% of adults)	Enforcing Contracts	Procedures (number)
	Private bureau coverage (% of adults)		Time (days)
Protecting Investors	Extent of disclosure index (0-10)		Cost (% of claim)
	Extent of director liability index (0-10)	Closing a Business	Recovery rate (cents on the dollar)
	Ease of shareholder suits index (0-10)		Time (years)
	Strength of investor protection index (0-10)		Cost (% of estate)

Figure 1.22 shows how spread EU countries are in the Ease of Doing Business world rank. Greece ranked 109 out of 180 ranked countries, meaning that EU Member States are ranked over the first two thirds of the support of the distribution. Below it is discussed that this can be seen as room for easy improvements.

Figure 1.22. Ease of Doing Business world Bank, EU Member States

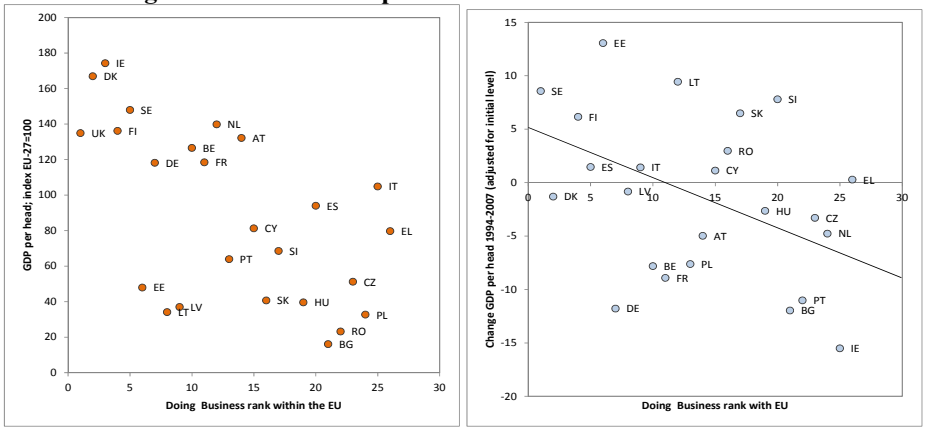


Source: World Bank, Ease of Doing Business database.

In Figure 1.23 a clear relation arises between the Doing Business rank and the level of income per head. This scatter plot is most likely capturing something very relevant.[32] The position in the rank entails large differences in the level of income per head. It should be noted that the relation with growth is less obvious. Correcting growth by the initial level of income (catching-up countries are expected to grow faster), the relation with the Doing Business rank is quite weak: at most slightly negative and with a large dispersion around the mean relation.

[32] The disclaimer implicit in the use of the expression "most likely" is due to the possibility that this chart reflects the reverse causality: e.g. rich countries can afford an efficient administration.

Figure 1.23. Ease of Doing Business and GDP per head



Note: The change in GDP per head is adjusted by initial level of income to compensate the fact that countries with a lower initial level of income tend to grow faster.

Source: World Bank, Ease of Doing Business database and AMECO database, Commission services.

1.9 CONCLUSIONS

Europe is the largest trading block in the world. EU economies are characterized by a notable degree of openness: both within the EU and by a strong integration in world markets. This chapter suggests that a good export performance is mostly reflecting something that is going well domestically: a buoyant economy able to produce commodities that meet the test international markets. For instance, a good record of exports of manufactures cannot be possible without a solid manufacturing base. Another way to see it is to consider the connection between trade and overall economic performance as conditional on many factors, most notably internal factors such as the Ease of Doing Business. For foreign new ideas, techniques and machines to impact the productivity, an economy must provide with the right incentives to adopt these technologies, a sound financial system to fund new investments, or the legal framework that eases the creation of new businesses.

This is not only a long-term issue. The elusive recovery of income in many EU Member States despite the swift recovery of exports during this recession points as well in the direction of the weight of internal factors. To see this, note that countries without internal imbalances, whose income is recovering from the initial contraction, are also those countries in which imports are recovering as fast as exports. Countries stagnating show a recovery of exports – external demand is independent of internal developments – but not of imports or other components of internal demand. It may be worth noting that an immediate corollary to this observation is that devaluations are only one of the instruments in the policy toolbox to fight the consequences of a recession. Both euro and non-euro Member States are witnessing strong increases in exports, but some countries see their income stagnate while others are recovering fast, and this in both groups. Factors other than price-competitiveness seem to be playing a determinant role.[33]

The importance of domestic conditions relative and in combination to external performance has a different meaning depending whether we focus in the short or in the long term. In the short-term, the denouement of the recession requires internal imbalances to be corrected, in particular leverage by private agents in countries with severe imbalances accumulated. The role of policy there is to strike a delicate balance between government finances equilibrium and stimulus measures to soften the impact of the adjustment as much as possible. And of course, even if exports alone cannot pull EU economies out of the recession, they constitute a precious positive stimulus.

In the long-run growth will be enhanced and sustained by a combination of many factors, with openness and a business-friendly environment being two key ingredients. In a time when government finances are under stress, revising the regulatory environment or increasing the efficiency of the administration alongside an ambitious external trade agenda may be seen as cost-effective measures. The large impact of the Doing Business rank in the level of income and the considerable heterogeneity within the EU suggests that there being room for easy improvements, easy in the sense that most chapters of the index concern regulation rather than expenditures. Of course, it may not be "easy" in the sense that vested interests may resist changes, but together with other far-reaching reforms, like labour market of tax reforms, they may put the basis for strong growth in the forthcoming years.

[33] On the limited role of price-competitiveness, see chapters 1 and 2 in the monograph devoted to the recovery of trade in the Quarterly Report of the Euro Area 2012-2.

REFERENCES

Bentolila, S., Cahuc, P., Dolado, J.J. and Le Barbanchon, T. (2011), ´Two-Tier Labor Markets in the Great Recession: France vs. Spain´, *Economic Journal*, forthcoming.

Bustos, P. (2011), ´Trade Liberalization, Exports, and Technology Upgrading: Evidence on the Impact of MERCOSUR on Argentinian Firms´, *American Economic Review*, 101(1), 304-340.

Costantini, J.A. and Melitz, M.J. (2008), ´The Dynamics of Firm-Level Adjustment to Trade´, in Helpman, E., Marin, D. and Verdier, T. (eds.) *The Organization of Firms in a Global Economy*, Cambridge, MA: *Harvard University Press.*

Darvas, Z. (2010) ´Fiscal federalism in crisis: lessons for Europe from the US´, Bruegel Policy Contribution 2010-07.

European Commission (2009), *Economic Crisis in Europe: Causes, Consequences and Responses*, European Economy 2009-7, Directorate-General Economic and Financial Affairs, European Commission.

European Commission (2010a), *Employment in Europe 2010*, Directorate-General Employment and Social Affairs, European Commission.

European Commission (2010b), ´Surveillance of Intra-Euro-Area Competitiveness and Imbalances´, Directorate-General Economic and Financial Affairs, European Commission.

European Commission (2012), *Quarterly Report of the Euro Area*, 11(1).

Hall, R.E. (2005), ´Job Loss, Job Finding, and Unemployment in the U.S. Economy over the Past Fifty Years´, *NBER Macroeconomics Annual*, 101-137.

Henning, C.R. and Kessler, M. (2012), *Fiscal federalism: US history for architects of Europe's fiscal union,* Bruegel.

Krugman, P. (1978), ´The Theory of Interstellar Trade´, *mimeo*, Princeton University.

Legrain, P. (2008), *Immigrants: Your Country Needs Them*, Abacus.

Lileeva, A. and Trefler, D. (2010), ´Improved Access to Foreign Markets Raises Plant-level Productivity... For Some Plants´, *Quarterly Journal of Economics*, 125(3), 1051-1099.

Melitz, M.J. (2003), ´The impact of trade on intra-industry reallocations and aggregate industry productivity´, Econometrica, 71(6), 1695-1725.

Reinhart, C.M. and Rogoff, K.S. (2011), *This Time Is Different: Eight Centuries of Financial Folly*, *Princeton University Press*.

Sinn, H-W. (2006), ´The Pathological Export Boom and the Bazaar Effect: How to Solve the German Puzzle´, The World Economy, Wiley Blackwell, vol. 29(9), pages 1157-1175.

UN (2010), *Manual on Statistics of International Trade in Services 2010*. United Nations.

Wolf, M. (2012), ´What was Spain supposed to have done?´, *Financial Times*, 25 June 2012.

World Bank (2012), *Doing Business 2012. Doing Business in a More Transparent World.* World Bank.

APPENDIX. STATISTICS

Table 1.7. Changes in GDP components during the recession

	2008-2009										
		Consumption		Investment		Government		Exports		Imports	
	GDP	Growth	*Share*	Growth	*Share*	Growth	*Share*	Growth	*Share*	Growth	*Share*
European	-4.31	-1.77	*57.08*	-12.46	*20.81*	2.06	*20.65*	-12.05	*40.89*	-12.16	*40.04567*
Belgium	-2.84	0.76	*50.83*	-8.11	*21.54*	0.84	*22.41*	-11.21	*83.21*	-10.73	*80.00*
Bulgaria	-5.48	-7.56	*70.38*	-17.59	*32.97*	-6.48	*15.63*	-11.22	*55.46*	-20.97	*77.95*
Czech Rep	-4.70	-0.38	*47.32*	-11.49	*27.60*	3.80	*18.54*	-10.01	*72.67*	-11.64	*67.85*
Denmark	-5.83	-4.24	*49.21*	-13.40	*20.60*	2.54	*26.53*	-9.77	*54.40*	-11.64	*51.71*
Germany	-5.13	-0.08	*55.32*	-11.41	*18.40*	3.32	*18.29*	-13.62	*47.85*	-9.23	*40.63*
Estonia	-14.26	-15.61	*56.41*	-37.86	*32.13*	-1.58	*17.73*	-18.64	*75.45*	-32.38	*83.83*
Ireland	-6.99	-7.23	*48.10*	-28.81	*23.79*	-3.74	*16.86*	-4.20	*84.96*	-9.30	*72.28*
Greece	-3.25	-1.26	*72.34*	-15.16	*22.63*	4.83	*17.96*	-19.48	*24.28*	-20.20	*38.39*
Spain	-3.74	-4.35	*56.90*	-16.57	*28.86*	3.73	*19.33*	-10.42	*26.62*	-17.25	*32.13*
France	-2.73	0.18	*57.01*	-9.04	*20.48*	2.28	*23.64*	-12.42	*27.01*	-10.84	*28.83*
Italy	-5.49	-1.56	*58.42*	-11.73	*20.65*	0.78	*20.02*	-17.51	*28.20*	-13.37	*27.82*
Cyprus	-1.85	-7.54	*71.08*	-9.73	*22.68*	6.83	*18.24*	-10.68	*46.91*	-18.58	*59.29*
Latvia	-17.73	-22.65	*70.03*	-37.38	*28.50*	-9.42	*16.80*	-14.08	*48.86*	-33.33	*65.75*
Lithuania	-14.84	-17.53	*67.96*	-39.53	*25.90*	-1.44	*15.88*	-12.48	*60.72*	-28.34	*73.32*
Luxembou	-5.30	1.08	*34.70*	-13.02	*22.95*	4.81	*15.52*	-10.86	*177.00*	-12.04	*150.42*
Hungary	-6.80	-6.24	*53.44*	-10.98	*22.58*	-0.63	*20.90*	-10.23	*90.88*	-14.77	*88.81*
Malta	-2.71	-1.40	*64.14*	-17.47	*15.44*	-1.34	*21.53*	-10.46	*90.41*	-11.30	*91.12*
Netherland	-3.54	-2.58	*45.79*	-10.20	*20.47*	4.84	*25.25*	-8.08	*74.11*	-7.99	*65.70*
Austria	-3.81	-0.28	*52.27*	-8.35	*21.07*	0.25	*18.45*	-14.34	*58.73*	-13.82	*51.50*
Poland	1.63	2.02	*61.93*	-1.23	*22.62*	2.14	*17.90*	-6.81	*41.64*	-12.43	*45.71*
Portugal	-2.91	-2.33	*65.92*	-8.61	*22.32*	4.74	*20.41*	-10.92	*31.94*	-10.02	*41.32*
Romania	-6.58	-10.08	*77.63*	-28.09	*34.77*	3.06	*14.49*	-6.45	*34.66*	-20.54	*59.19*
Slovenia	-8.01	-0.15	*52.39*	-23.32	*29.21*	2.86	*17.99*	-17.19	*69.89*	-19.63	*72.47*
Slovakia	-4.93	0.18	*54.45*	-19.69	*25.22*	6.12	*16.69*	-15.94	*85.88*	-18.14	*84.78*
Finland	-8.35	-2.73	*51.36*	-13.26	*20.37*	1.11	*21.13*	-21.52	*48.61*	-16.44	*42.36*
Sweden	-5.03	-0.26	*47.98*	-15.46	*20.15*	2.16	*25.29*	-13.83	*53.00*	-14.26	*46.61*
United Kin	-4.37	-3.54	*63.71*	-13.39	*17.43*	-0.06	*21.14*	-9.45	*28.05*	-12.22	*30.62*

	2009-2010										
		Consumption		Investment		Government		Exports		Imports	
	GDP	Growth	*Share*	Growth	*Share*	Growth	*Share*	Growth	*Share*	Growth	*Share*
European	2.04	1.02	*58.59*	-0.19	*19.04*	0.69	*22.03*	10.90	*37.58*	9.76	*36.76331*
Belgium	2.27	2.48	*52.72*	-0.72	*20.37*	0.16	*23.25*	9.92	*76.04*	8.67	*73.50*
Bulgaria	0.39	0.11	*68.83*	-18.28	*28.74*	1.89	*15.46*	14.73	*52.09*	2.41	*65.17*
Czech Rep	2.74	0.61	*49.46*	0.10	*25.64*	0.56	*20.20*	16.44	*68.62*	16.04	*62.91*
Denmark	1.30	1.88	*50.05*	-3.76	*18.95*	0.28	*28.89*	3.23	*52.13*	3.49	*48.52*
Germany	3.69	0.61	*58.26*	5.51	*17.18*	1.68	*19.91*	13.73	*43.57*	11.71	*38.87*
Estonia	2.26	-1.74	*55.52*	-9.08	*23.28*	-1.07	*20.35*	22.53	*71.59*	20.56	*66.11*
Ireland	-0.43	-0.91	*47.98*	-25.06	*18.21*	-3.12	*17.45*	6.31	*87.51*	2.71	*70.49*
Greece	-3.52	-3.63	*73.83*	-15.00	*19.84*	-7.15	*19.46*	4.20	*20.21*	-7.25	*31.66*
Spain	-0.07	0.77	*56.54*	-6.31	*25.02*	0.23	*20.83*	13.47	*24.77*	8.89	*27.62*
France	1.48	1.36	*58.72*	-1.16	*19.15*	1.22	*24.86*	9.74	*24.32*	8.78	*26.43*
Italy	1.80	1.16	*60.85*	2.11	*19.29*	-0.59	*21.35*	11.59	*24.61*	12.69	*25.50*
Cyprus	1.14	1.26	*66.96*	-1.71	*20.86*	0.84	*19.85*	3.68	*42.69*	4.90	*49.19*
Latvia	-0.34	0.44	*65.84*	-12.25	*21.69*	-9.66	*18.50*	11.48	*51.03*	11.52	*53.28*
Lithuania	1.44	-4.87	*65.82*	1.00	*18.39*	-3.29	*18.37*	17.36	*62.39*	17.27	*61.70*
Luxembou	2.68	2.13	*37.04*	2.98	*21.07*	2.91	*17.18*	2.84	*166.59*	4.58	*139.72*
Hungary	1.26	-2.17	*53.76*	-9.67	*21.57*	-2.09	*22.29*	14.29	*87.54*	12.81	*81.22*
Malta	2.29	-1.66	*65.00*	9.85	*13.10*	0.56	*21.83*	17.71	*83.20*	13.67	*83.07*
Netherland	1.69	0.40	*46.24*	-4.38	*19.06*	0.96	*27.44*	10.79	*70.62*	10.55	*62.67*
Austria	2.31	2.17	*54.19*	0.08	*20.08*	-0.18	*19.23*	8.29	*52.30*	8.02	*46.14*
Poland	3.90	3.17	*62.16*	-0.16	*21.99*	4.13	*17.99*	12.09	*38.19*	13.88	*39.38*
Portugal	1.40	2.12	*66.31*	-4.11	*21.01*	0.93	*22.02*	8.79	*29.30*	5.38	*38.29*
Romania	-1.65	-0.43	*74.72*	-2.09	*26.76*	-4.42	*15.98*	14.05	*34.70*	11.87	*50.34*
Slovenia	1.38	-0.68	*56.87*	-8.31	*24.35*	1.47	*20.12*	9.54	*62.91*	7.16	*63.32*
Slovakia	4.18	-0.71	*57.38*	12.38	*21.30*	1.12	*18.62*	16.55	*75.93*	16.35	*73.00*
Finland	3.73	2.98	*54.51*	2.59	*19.28*	0.18	*23.31*	7.82	*41.62*	7.74	*38.62*
Sweden	6.13	3.67	*50.39*	7.68	*17.94*	1.88	*27.20*	11.75	*48.09*	12.72	*42.08*
United Kin	2.09	1.24	*64.27*	3.14	*15.79*	1.48	*22.09*	7.37	*26.56*	8.59	*28.11*

	2010-2011										
		Consumption		Investment		Government		Exports		Imports	
	GDP	Growth	*Share*	Growth	*Share*	Growth	*Share*	Growth	*Share*	Growth	*Share*
European	1.54	0.14	*58.01*	1.33	*18.62*	-0.06	*21.73*	6.32	*40.85*	3.92	*39.54186*
Belgium	1.89	0.74	*52.83*	5.11	*19.78*	0.80	*22.77*	4.78	*81.74*	4.90	*78.10*
Bulgaria	1.67	-0.56	*68.64*	-9.69	*23.40*	0.55	*15.69*	12.80	*59.53*	8.52	*66.48*
Czech Rep	1.65	-0.48	*48.44*	-1.16	*24.98*	-1.39	*19.77*	10.96	*77.77*	7.50	*71.05*
Denmark	1.00	-0.51	*50.34*	0.39	*18.00*	-1.02	*28.60*	6.78	*53.12*	5.20	*49.57*
Germany	3.00	1.47	*56.53*	6.41	*17.48*	1.39	*19.53*	8.25	*47.79*	7.42	*41.88*
Estonia	7.64	4.18	*53.35*	26.79	*20.70*	1.64	*19.68*	24.87	*85.78*	27.03	*77.94*
Ireland	0.70	-2.70	*47.74*	-10.61	*13.71*	-3.70	*16.98*	4.11	*93.43*	-0.70	*72.71*
Greece	-6.91	-7.12	*73.75*	-20.75	*17.48*	-9.11	*18.73*	-0.33	*21.83*	-8.10	*30.44*
Spain	0.71	-0.14	*57.02*	-5.13	*23.45*	-2.18	*20.89*	8.97	*28.13*	-0.14	*30.09*
France	1.68	0.38	*58.65*	2.86	*18.65*	0.83	*24.80*	4.90	*26.29*	4.55	*28.33*
Italy	0.43	0.25	*60.46*	-1.86	*19.35*	-0.90	*20.85*	5.63	*26.98*	0.42	*28.23*
Cyprus	0.48	0.16	*67.04*	-13.78	*20.27*	-4.66	*19.79*	3.62	*43.77*	-4.97	*51.01*
Latvia	5.47	4.43	*66.35*	24.62	*19.10*	1.29	*16.77*	12.59	*57.07*	20.72	*59.62*
Lithuania	5.87	6.11	*61.72*	17.05	*18.31*	0.37	*17.52*	13.65	*72.19*	12.72	*71.33*
Luxembou	1.55	1.82	*36.84*	7.66	*21.14*	4.13	*17.22*	1.73	*166.85*	3.24	*142.30*
Hungary	1.69	0.01	*51.94*	-5.45	*19.24*	-0.37	*21.55*	8.39	*98.81*	6.32	*90.48*
Malta	2.06	3.07	*62.49*	-13.42	*14.07*	3.90	*21.46*	1.01	*95.74*	-0.97	*92.31*
Netherland	1.17	-1.08	*45.65*	5.83	*17.92*	0.19	*27.25*	3.78	*76.94*	3.50	*68.13*
Austria	3.11	0.61	*54.11*	5.66	*19.64*	2.65	*18.76*	6.70	*55.36*	6.97	*48.72*
Poland	4.35	3.06	*61.73*	8.26	*21.13*	-1.32	*18.03*	7.48	*41.20*	5.77	*43.17*
Portugal	-1.61	-3.91	*66.78*	-11.39	*19.86*	-3.86	*21.92*	7.40	*31.44*	-5.51	*39.79*
Romania	2.45	1.31	*75.65*	6.31	*26.64*	-3.53	*15.53*	9.86	*40.24*	10.48	*57.26*
Slovenia	-0.17	-0.27	*55.72*	-10.67	*22.02*	-0.93	*20.14*	6.81	*67.98*	4.67	*66.92*
Slovakia	3.35	-0.36	*54.68*	5.69	*22.98*	-3.53	*18.08*	10.79	*84.95*	4.46	*81.53*
Finland	2.85	3.33	*54.12*	4.63	*19.07*	0.83	*22.51*	-0.82	*43.26*	0.05	*40.12*
Sweden	3.94	2.12	*49.22*	5.83	*18.20*	1.77	*26.11*	6.76	*50.63*	6.10	*44.69*
United Kin	0.65	-1.22	*63.73*	-1.20	*15.95*	0.07	*21.96*	4.59	*27.94*	1.20	*29.89*

Source: AMECO database, Commission services, and own calculations

Table 1.8. The average weight of services in total exports

	1991-94	1995-98	1999-2002	2003-06	2007-11
European Union (15 countri	21.92	21.18	22.97	24.02	25.56
Belgium	20.68	17.53	19.78	19.79	22.43
Bulgaria	6.15	18.96	30.13	32.99	25.55
Czech Republic	22.28	24.75	18.02	13.89	15.04
Denmark	27.93	26.60	31.97	34.25	38.35
Germany	13.45	13.74	13.98	13.93	14.80
Estonia	29.42	36.10	33.46	31.51	31.14
Ireland	14.43	15.28	23.52	36.51	46.69
Greece	33.96	41.18	52.83	54.26	53.70
Spain	33.26	29.84	32.00	32.15	32.61
France	23.83	21.61	21.43	21.00	21.30
Italy	22.42	20.39	19.81	19.61	18.16
Cyprus		73.67	81.95	83.72	84.50
Latvia	33.14	37.41	35.07	31.17	31.83
Lithuania	11.41	19.09	21.47	20.61	17.36
Luxembourg	59.12	65.00	71.77	74.48	80.26
Hungary	27.91	25.85	18.58	15.39	17.28
Malta	37.38	37.91	34.73	40.59	53.18
Netherlands	21.49	21.01	21.72	21.15	20.67
Austria	33.58	29.29	27.42	27.26	27.78
Poland	15.34	19.88	20.11	14.76	16.60
Portugal	24.43	19.94	21.67	22.95	26.95
Romania	14.42	15.78	14.81	15.38	17.75
Slovenia	16.56	19.63	17.78	17.89	19.92
Slovakia	25.71	19.40	16.31	11.89	9.74
Finland	15.30	14.10	16.63	18.79	25.19
Sweden	21.43	19.58	23.30	25.25	29.93
United Kingdom	25.86	27.54	31.78	36.04	40.44
Turkey	36.76	42.65	36.79	24.36	21.34
Iceland	28.42	30.24	33.56	37.09	33.55
Norway	27.92	26.01	25.03	23.29	22.77
Switzerland	25.74	25.87	26.17	27.31	30.32
United States	29.38	28.36	29.20	30.47	30.49
Japan	11.83	11.74	11.32	12.61	12.85
Canada	13.61	12.95	12.98	13.48	14.65
Mexico	15.92	9.84	7.55	6.76	5.51
Korea	13.43	16.16	15.41	12.99	12.84
Australia	22.21	23.75	23.14	22.89	20.20
New Zealand	21.52	24.18	25.77	27.86	22.21

Source: AMECO database, Commission services.

CHAPTER 2. THE EU INDUSTRY IN THE GLOBAL VALUE CHAIN

On-going globalisation has changed the economic landscape. Many products used to be produced locally from mainly domestic resources. This meant that most of the value chains or production processes were located in the country where firms had their headquarters. Technological development has facilitated the geographical fragmentation of production processes, resulting in the emergence of global value chains. Different parts of firms' production processes are now located in different parts of the world, according to the comparative advantages of the locations. This 'slicing up of the value chains' has given rise to increased trade flows of goods and services in the world economy. A large share of this trade is intra-firm trade in intermediate goods, conducted by multinational companies. The use of imported intermediate goods in manufacturing industries has increased globally, thereby involving more industries and countries in the value chains.

The increasingly important role of global value chains for the EU industry is emphasised in the EU flagship initiative 'An integrated industrial policy for the globalisation era' which states: 'The EU needs to pay greater attention to the manufacturing value-chain … Industry is increasingly dependent on inputs of raw material and intermediate goods, and is also crucially dependent on the business services industries that add value and help to design and market new goods and services. This new perspective requires a different approach to industrial policy that takes increased account of the interlinkages' (European Commission, 2010). This initiative identifies a number of policy areas that would help EU firms to reap the benefits of globalisation and to compete on global markets. The design of appropriate policies requires better understanding of the development and prospects of global industrial value chains. This chapter tries to respond to this need by looking for empirical answers to the following questions:

- What have been the main changes in industries' value chains since 1995?
- How have the inter-industry and inter-regional linkages within the EU and in extra-EU relations developed?
- How do these compare with inter-industry and inter-regional linkages in the US, Japan and other countries?
- What was the impact of the 2008/09 economic recession on the offshoring decisions of EU firms?
- What are the effects of the crisis on vertical specialisation and value chains in industries producing chemicals, machinery and equipment, electrical and optical equipment and transport equipment?
  What types of firms are more likely to offshore parts of their supply chain?
- What leads firms to offshore and what drives the decisions with respect to the characteristics of the host and destination country and those of the offshoring firms?
- What are the preferred target countries for relocating production for European manufacturing companies?

Is offshoring related to framework conditions in the different locations?These questions are addressed by focusing largely on four important manufacturing industries, classified according to NACE Rev. 1.1: chemicals, chemical products and man-made fibres (DG); machinery and equipment (DK); electrical and optical equipment (DL); and transport equipment (DM). The first questions are addressed in Section 2.2, which analyses patterns and trends in vertical specialisation across countries. The analyses for the four selected industries are preceded by overviews of the patterns for total exports, manufacturing exports and services exports. Section 2.3 focuses on the changes in trade patterns of the four individual manufacturing industries by geography. The analyses differentiate between the use categories of products: trade in parts and components is important for industries producing machinery and equipment, electrical and optical equipment and transport equipment, while trade in semi-finished products is important for the chemicals industry. Section 2.4 focuses on offshoring decisions at company level; it contains analyses of the motives and determinants of company strategies with respect to the relocation of production. A summary and conclusions are provided in Section 2.5.

2.1 THE MANY FACETS OF INTERNATIONAL PRODUCTION INTEGRATION

Many different concepts are used in analysing the internationalisation of production. Examples include 'global production sharing', '(international) fragmentation', 'slicing up the value chain', 'vertical specialisation', 'international (out)sourcing', 'offshoring', 'global supply chains', 'global value chains', etc. Here, an account of the most widely used categories is given. A rigorous, precise and accurate definition is used as a starting point, and other categories are related to that.'Offshoring' and 'offshore outsourcing' refer to a company's decision to transfer certain activities that have so far been carried out inside the company to either another unit of the firm in a foreign location (intra-firm or captive offshoring) or to an independent firm (offshore outsourcing).

Offshoring and offshore outsourcing are sometimes referred to as (international) relocation (OECD, 2004; UNCTAD, 2004; Kirkegaard, 2005). These and related terms are used in rather an unsystematic way in the literature — something that needs to be considered in any discussion. [34]

'Offshoring' is also widely used to denote the relocation of processes to foreign countries, regardless of their links to the relocating company (see, for example, Olsen, 2006; Bertoli, 2008; Jabbour, 2010). In this case, attention is focused only on the movement of production and related jobs between countries. Similarly, some papers make no distinction between offshoring and offshore outsourcing: they are usually both referred to as offshoring (see, for example, Görg et al., 2008; Wagner, 2011). Here again the emphasis is on the moving of the activities abroad from the home country. [35]

Other approaches rely on various trade data to analyse changes in the structure of global production and the increase in trading links across countries. One such approach concerns the trade in parts and components. Yeats (1997) was the first to use these data to try and measure the phenomenon; he called it 'production sharing'. Other studies with the same approach include Ng and Yeats (1999) and Kaminski and Ng (2001). Trade in intermediates is a similar concept often used in empirical analyses on which other approaches are based on. International fragmentation (e.g. Jones and Kierzkowski, 1990) places more emphasis on production activities, with fragmentation being defined as the splitting of production processes into parts that can be done in different countries (see, for example, Baldone et al., 2001, in the European context).[36] Vertical specialisation (Hummels et al., 2001) is based on trade between different countries, each specialising in a particular production stage. The authors make the connection between the fragmentation of production and exports by sector by calculating direct and indirect (through suppliers) imports that are then incorporated into the exports of a given country, in order to determine that country's specialisation.

International 'trade in tasks' (reflecting a finer division of labour across countries) — as opposed to trade in finished goods (e.g. Grossman and Rossi-Hansberg, 2008) — refers to captive offshoring and offshore outsourcing. This approach is used in many theoretical models.

Furthermore, two further concepts describe the phenomenon of Western European firms concentrating their offshoring and offshore outsourcing activities in Central and Eastern Europe (Jacoby, 2010). 'Nearshoring' — as opposed to 'farshoring' — emphasises the geographical proximity between the offshoring and outsourcing company and its affiliate/partner. 'Nearsourcing' is used as an equivalent to 'nearshoring' (ACM, 2006). For example, in the US, 'nearshoring' is referred to in the context of relocations to Canada or Mexico (Olsen, 2006). Similarly, in Europe, 'nearshoring' is usually used in the context of offshoring and offshore outsourcing to Central and Eastern Europe. A key aspect of nearshoring is the fact that global value chains are more regional than global (De Backer and Yamano, 2011). The term 'backshoring' or 'reshoring' is used when previously captive offshored or offshore outsourced activities are brought back to the original location.

As is obvious from the existing diversity of definitions, the old approaches and the widely-used existing data are not considered adequate or appropriate to grasp all the aspects of this phenomenon. For example, at the macro-level, the concepts 'offshore outsourcing' and 'offshoring' are differently connected to foreign direct investment (FDI) and foreign trade. Offshore outsourcing is usually not connected to FDI, but is usually connected to international trade. In the case of captive offshoring, an initial FDI project of the vertical type is always involved, and later the

34 Bhagwati et al. (2004) drew attention to the problem of the lack of a consistent use of definitions.

35 The Eurostat survey uses the term 'international sourcing'. According to Alajääskö (2009), captive offshoring is about twice as common as offshore outsourcing in the sample.

36 In addition to the economics literature, papers on these concepts can be found in the business, management and economic geography literature; understandably, the focus of these is different.

output is exported to other affiliates and sold to the local affiliate of the same company. In captive offshoring all these transactions remain within the boundaries of the company, in contrast to offshore outsourcing. So both flows of FDI and foreign trade are involved.

Table 2.1 – Understanding intra-firm or captive offshoring, outsourcing and offshore outsourcing

Location of production	Internalised (inside the company)	Externalised (outside the company, outsourcing to an independent firm)
Home country	Production kept in-house at home	Outsourcing (at home)
Foreign country (offshoring)	Intra-firm (captive) offshoring	Offshore outsourcing

Source: UNCTAD (2004).

Thus neither the available FDI data nor the foreign trade data are able to fully cover developments connected to offshoring and offshore outsourcing. It must also be emphasised that widely-used measurements based on trade statistics should be used with caution. It could be misleading to use trade statistics designed to collect trade flows in final products, because of the increase of trade in parts and components or intermediaries. For example, revealed comparative advantage indicators, specialisation indices or classification according to the technology content of products may give an erroneous result concerning the specialisation and role of a given country in the international distribution of labour.

Different methods are applied in this chapter to take account of the many aspects of the internationalisation of production. Section 2.3 builds on the measurement of vertical specialisation, which is derived from a global input-output matrix combining industry-level information on sourcing structures with detailed trade data. Section 2.4 is based on trade data that differentiate between the various end-use categories of traded products, which allows the effects of the crisis to be captured. Finally, Section 2.5 builds on firm-level data to shed light on micro-economic aspects of the internationalisation process.

2.2. CHANGES IN INDUSTRIES' VALUE CHAINS SINCE 1995

International linkages vary across industries, and change over time. Not only do countries have to rely on imports of products not produced domestically, e.g. raw materials, but industries are likely to participate in the international division of labour, by offshoring the production of semi-finished products or via inputs of parts and components or assembly activities. This section analyses vertical specialisation patterns and the respective changes over time for EU-27 industries, drawing comparisons with the US and Japan in the period from 1995 until recent years. Particular questions to be addressed are whether and to what extent the import content of exports has changed over the longer term and in more recent years? Have there been any major shifts with respect to source patterns by geographical regions, and are there significant differences across countries? Have the industries examined in more detail here faced significant changes in vertical specialisation patterns compared to overall patterns?

Methodologically, the chapter builds on the measurement of vertical specialisation developed by Hummels et al. (2001). It uses a global input-output table, which provides a more precise metric of vertical specialisation. The use of a global input-output table allows for not only differentiating direct imports from different countries but also indirect imports from different countries arising from the flows of intermediate goods in different parts of the value chains. The data used for this section are the world input-output tables from the World Input-Output Database (WIOD) project, which have recently become available. [37]

This approach facilitates more detailed analyses of changes in the international sourcing structures. By using information from the WIOD it is possible to analyse the structures of sourcing and vertical specialisation. Hummels et al. (2001) recommended a widely used measure of vertical integration, which has subsequently been extended and made more sophisticated. In this study, a slightly more generalised measure of vertical integration is used, which takes full advantage of a global input-output table. A global matrix such as this allows the calculation of the global Leontief inverse matrix, from which a vertical specialisation indicator can be calculated. Such a measure of vertical specialisation is closely related to the concept of output multipliers, and therefore also to backward (and forward) linkage indicators, cf. Box 2.1. [38]

37 See the Annex for a short description and www.wiod.org for a detailed description of the world inpout-output database. The WIOD project was funded by the FP7 SSH research programme

38 See Stehrer et. al., (2012) for a more detailed description.

BOX 2.1 – A GENERALISED MEASURE OF VERTICAL SPECIALISATION

The most widely used measure of vertical specialisation is the VS measure proposed in Hummels et al. (2001) which pre-multiplies the domestic Leontief inverse by the import coefficients matrix and expresses the resulting matrix sum as a ratio to total gross exports.[39] A more sophisticated measure, VS1, pre-multiplies the domestic Leontief inverse by the import matrices for each individual partner country; the results are then summed together and expressed as a ratio to total gross exports.

These measures, however, do not take account of all inter-country linkages, i.e. imports from a country might (directly and indirectly) include imports from other countries, or even the country under consideration. The availability of a world input-output table therefore allows these inter-regional linkage effects to be taken into account. This would suggest an appropriate indicator – VS2 – using the Leontief inverse of the global input-output table times the vector of exports of the reporter country under consideration and summed over all partner countries. This can be expressed as a share of total gross output produced for production of this export vector. Formally, this can be expressed as

$$VS2^{r} = \frac{1}{1'(I-A)^{-1}x^{r}}(1^{-r})'(I-A)^{-1}x^{r}$$

Let C denote the number of countries and N the number of industries. The vector $\mathbf{x}^{r}$ denotes an NCx1 vector with country *r*'s exports included in the appropriate elements of the vector and zeros otherwise. The vector $\mathbf{1}^{-r}$ denotes a summation vector (of dimension NCx1) with 0 in country *r*'s appropriate elements of the vector and 1 otherwise, i.e. summing over all partner countries. Similarly, $\mathbf{1}$ denotes a summation vector of ones of dimension NCx1, summing over all countries. Matrix **A** denotes the coefficient matrix, i.e. inputs per unit of gross output, and **I** is the identity matrix, both are of dimension NCxNC. The prime indicates the transpose of the respective vectors.

When examining particular regions or sectors, the summation and export vectors $\mathbf{1}^{-r}$ **and** $\mathbf{x}^{r}$ have to be adjusted accordingly (i.e. summing up over only those partner countries that are of interest). In case that one is interested in only one particular industry the export vector contains exports of this industry only and 0's otherwise and the summation vector $\mathbf{1}^{-r}$ contains a one for that industry and 0's otherwise. Using gross output associated with the production of the particular exports, i.e. $\mathbf{1}'(\mathbf{I}-\mathbf{A})^{-1}\mathbf{x}^{r}$ the sourcing structure to produce a particular vector of exports is expressed as a percentage of total production needed for these exports. This can further be broken down by individual partner countries or groups of partner countries.

Multiplying the Leontief inverse by the total export vector, including the intermediates, involves a certain degree of 'double-counting'. One possibility to remedy this would be to use exports of final demand goods only. Empirically, it does not make a big difference when expressed as a share of gross output to be produced, however, and is more akin to the original measure proposed in Hummels et al. (2001). It should be noted that this measure is closely linked to the linkage indicators – or, more specifically, to the backward linkage measure – and the concept of (simple output) multipliers, which are also based on the Leontief inverse. Therefore, one would expect, first, a country to be more vertically integrated the higher its (backward) linkages. If this country's output should increase (e.g. by assembly of final products), it needs more inputs from other countries, and thus its backward linkages are higher and it is more vertically integrated.

Secondly, this also explains why larger countries tend to be less vertically integrated in the global economy, since large countries source relatively more from their domestic economy. Conversely, smaller countries are not able to produce all the inputs themselves and thus tend to be more vertically integrated. For a more detailed discussion, see Stehrer et al. (2012a) and the literature cited therein.

[39] The Leontief inverse is used in input-output analysis in order to take into account that the output of a certain industry i needs the outputs of a number of other industries n in order to satisfy the demand for a product from industry i.

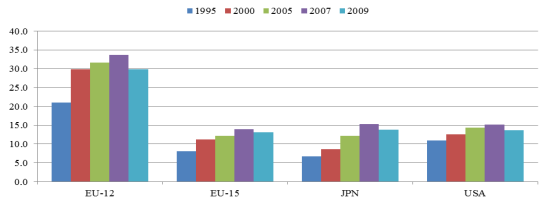
2.2.1 International linkages and the foreign content of exports

The aggregate results for EU, US and Japan are presented before the four selected industries are analysed. For the economy-wide analyses, the EU-27 is split into the EU-15 and the EU-12, as the latter group shows a particular pattern in the European division of labour. The EU-15, Japan and the US show initial low levels for the foreign content of exports of between 5% and 10%. In 1995 the figure for the US was comparable to that for the EU-15 in 2000. The vertical specialisation is higher in the EU-12 countries and, even in 1995, the EU-12 countries had a much higher vertical specialisation than the other countries. This was partly due to the strong backward linkages these countries already had as providers of intermediate inputs for (mainly) the EU-15, but was also due to the fact that the country group consists of relatively small countries. Their integration intensified even further over time, peaking in 2007 at about 34%.

In the three other countries and regions, the foreign content of exports increased to levels of about 14–16%. The particularly strong increase experienced in the EU-12 countries points to the strong integration process with the EU since 1995, generated especially by production networks.

During the recent economic crisis, however, the foreign content dropped slightly, by 1–2 percentage points, in three of the regions. As the data end in 2009, this drop might also have been driven by an industry composition effect, since it was particularly sectors with stronger production linkages that were affected more severely by the crisis. The decrease was even stronger for the EU-12 countries, with a drop of about 4 percentage points.

Figure 2.1 Foreign content of total exports (%)



Source: WIOD.

Breaking down Figure 2.1 by source region shows how the sourcing structure at economy-wide levels has changed over time. Table 2.2 provides information on the geographical structure of the foreign content of exports across source regions over time for the EU, Japan and the US.

The table shows the foreign content of exports and the domestic content highlighted in grey. As shown, the domestic content is relatively high in all countries: it is lowest in the EU-12, standing at 66.4% in 2007, and higher for the other economies: around 85%. In all cases, the domestic share has decreased.

Table 2.2 – Content of total exports, by partner

	EU-12					EU-15				
	1995	**2000**	**2005**	**2007**	**2009**	**1995**	**2000**	**2005**	**2007**	**2009**
BRII	3.1	2.8	2.6	2.6	2.1	0.8	0.9	1.3	1.5	1.3
Canada	0.2	0.2	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.3
China	0.2	0.8	2.1	3.4	4.8	0.4	0.8	1.3	2.0	2.8
EU-12	79.0	70.2	68.4	66.4	70.1	0.6	0.9	1.3	1.6	1.6
EU-15	13.1	18.4	18.6	18.6	15.7	92.0	88.8	87.8	86.0	86.8
Japan	0.5	1.1	1.1	1.2	0.9	1.0	1.1	0.8	0.8	0.7
Korea	0.3	0.5	0.7	0.9	0.8	0.3	0.4	0.5	0.4	0.4
Mexico	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1
USA	1.1	1.9	1.4	1.4	1.3	1.8	2.5	1.8	1.9	1.8
Rest of world	2.4	4.0	4.7	5.1	4.0	2.8	4.1	4.6	5.2	4.3

	Japan					USA				
	1995	**2000**	**2005**	**2007**	**2009**	**1995**	**2000**	**2005**	**2007**	**2009**
BRII	0.5	0.5	0.8	1.1	0.9	0.4	0.5	0.7	0.8	0.7
Canada	0.2	0.2	0.2	0.2	0.2	1.4	1.6	1.7	1.7	1.4
China	0.5	0.9	2.2	3.1	3.8	0.6	0.9	2.0	2.7	3.3
EU-12	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.1
EU-15	1.4	1.7	2.1	2.4	1.9	2.8	3.1	3.4	3.3	2.7
Japan	93.3	91.3	87.8	84.7	86.2	1.9	1.6	1.3	1.2	0.9
Korea	0.6	0.7	0.9	1.1	0.7	0.5	0.6	0.6	0.5	0.4
Mexico	0.0	0.1	0.1	0.1	0.1	0.6	0.9	0.9	1.0	0.9
USA	1.3	1.5	1.3	1.5	1.2	89.0	87.5	85.7	84.8	86.3

Note: BRII comprises Brazil, Russia, India and Indonesia.

Source: WIOD.

The financial crises had a severe impact on global trade and thus also on the trend of increased vertical specialisation. In order to analyse the long-term trends, the year 2009 has therefore been omitted from the following analysis. In 2007, the BRII group accounted for about 10% or less of the import content of most countries, with a larger share for the EU-15. It is interesting to note that this group — although it includes India, which is comparable in size to China — does not account for higher shares of vertical integration, particularly not where the US is concerned. Canada is important for the US, even more so than Mexico. China accounts for about 10% of the foreign content of exports in the EU-12, 15% in the EU-15, 20% in Japan and about 18% in the US. China has surpassed the EU-12 as a source for the EU-15 in recent years. The EU-12 countries are only important as a source for the EU-15, where it accounts for about 12%. On the other hand, the EU-15 countries are very important for the EU-12, which use a lot of EU-15 outputs to produce their own exports.

The EU-15 accounts for about 16% and 20% of the foreign content of Japanese and US exports. The EU-15 share of Japanese exports decreased from 1995 to 2007. The Japanese share of EU-15 and US exports decreased from 1995 to 2007, the largest declines being recorded for exports to the US. As can be expected, the US is the main market for Mexico, making up about 5% of its export content, but the figure is considerably smaller for the other countries under consideration. Finally, US output accounts for about 13% of the foreign content of EU-15 exports and 10% of Japan's. The content of exports from the rest of the world (ROW) is particularly high in the EU-15 and Japan. It should be noted that the ROW includes countries like Switzerland and Norway and Turkey, which have strong trade relations with the EU countries. On the other hand, the ROW group includes a number of Latin and South American countries, important for the US, and a host of Asian countries with strong production networks, important for Japan.

The most impressive development has been the rise in the importance of China. The Chinese share of the foreign content of EU-12 exports increased from a negligible figure in 1995 to 10% in 2007. Its share of EU-15 exports increased from slightly above 5% to about 15%. The increase was even more marked in Japan, where China's share rose from about 7% to 20%, cf. Table 2.3.

Table 2.3. Geographical structure of the foreign content of exports, 1995 and 2007

	1995				2007			
	EU-12	**EU-15**	**Japan**	**USA**	**EU-12**	**EU-15**	**Japan**	**USA**
BRII	15.0	10.4	7.3	3.9	7.7	11.0	7.1	5.2
Canada	0.7	3.3	3.2	13.0	0.8	2.2	1.6	11.4
China	1.2	5.4	7.4	5.5	10.2	14.5	20.0	17.5
EU-12	-	7.8	0.5	0.8	-	11.5	1.0	1.2
EU-15	62.4	-	21.5	25.7	55.3	-	15.9	21.6
Japan	2.4	11.9	-	17.4	3.5	5.9	-	7.7
Korea	1.4	3.2	8.4	5.0	2.8	3.1	7.1	3.5
Mexico	0.2	1.1	0.6	5.3	0.4	1.2	0.7	6.4
USA	5.3	22.0	19.1	-	4.1	13.4	9.9	-
ROW	11.4	34.8	32.0	23.4	15.3	37.3	36.8	25.5

Note: BRII comprises Brazil, Russia, India and Indonesia. The columns sum to 100
Source: WIOD.

The increase in the Chinese share from 1995 to 2007 may have taken place at the expense of other foreign sources or domestic sourcing. Table 2.4 below, which presents the changing share pattern in percentage points, can be used to analyse whether the rise of China in world trade and vertical specialisation has been at the expense of other countries.

With a few exceptions, the changes are positive, implying that, in terms of vertical specialisation, partner countries did not crowd each other out; instead China's share grew mainly at the expense of domestic sourcing in the period 1995–2007.

The Chinese share of other countries exports increased until 2007 and continued to grow during the crisis (up to 2009, the last year for which data are available). However, the overall share of the foreign content of exports decreased between 2007 and 2009. For example, in the EU-12, domestic sourcing increased by about 4 percentage points; in the EU-15 it increased by less than 1 percentage point and in the US and Japan domestic sourcing increased by about 1.5 percentage points, c.f. Table 2.4.

Table 2.4 – Changes in the geographical structure of production integration (percentage points)

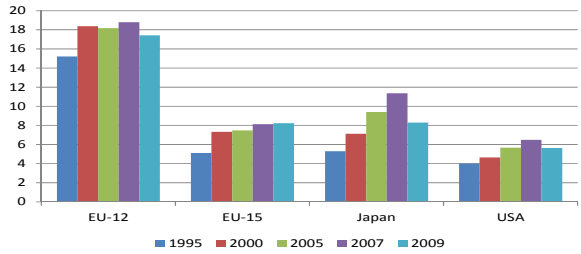
	1995–2007				2007–09			
	EU-12	EU-15	JPN	USA	EU-12	EU-15	JPN	USA
BRII	-0.6	0.7	0.6	0.4	-0.5	-0.2	-0.2	-0.1
Canada	0.1	0.0	0.0	0.3	-0.1	-0.1	0.0	-0.3
China	3.2	1.6	2.6	2.0	1.3	0.7	0.8	0.7
EU-12	-12.7	1.0	0.1	0.1	3.7	0.0	0.0	0.0
EU-15	5.5	-5.9	1.0	0.5	-2.9	0.8	-0.6	-0.5
Japan	0.7	-0.1	-8.6	-0.7	-0.2	-0.2	1.5	-0.3
Korea	0.6	0.2	0.5	0.0	-0.1	0.0	-0.4	-0.1
Mexico	0.1	0.1	0.1	0.4	0.0	0.0	0.0	-0.1
USA	0.3	0.1	0.2	-4.2	-0.1	0.0	-0.3	1.6
Rest of world	2.7	2.4	3.5	1.3	-1.2	-0.9	-0.7	-0.7

Note: BRII comprises Brazil, Russia, India and Indonesia. The columns sum to 0.0
Source: WIOD

Before analysing the four selected industries, an overview is provided of changes in the vertical specialisation in manufacturing and services. As in the case of total exports, the degree of vertical specialisation in the EU-12 is relatively high. This is mostly due to the strong backward linkages with industries in the EU-15. Starting at lower levels, the foreign content of exports in EU-15 and Japanese industries increased to around 8 % in 2009. The crisis seems not to have had as big an impact on the global value chains of EU-15 services as it has in the other regions. A small increase was recorded for the EU-15 between 2007 and 2009, due to the increased share of Chinese production in EU-15 services exports.

The foreign content of Japanese exports, which increased rapidly up to 2007, was severely hit by the crisis and decreased by some 3 percentage points between 2007 and 2009. The decrease can largely be explained by the large fall in Japanese services exports. Consequently, the share of services of total exports also decreased. The largest decreases were recorded in the sectors Water transport and Wholesale trade and commission trade, NACE codes 61 and 51 respectively, which account for a relatively large proportion of Japanese services. The decrease in theforeign content of Japanese exports mostly affected EU-15 and Korean producers, c.f. Figure 2.2. [40]

Figure 2.2 Foreign content of services exports (%)



Source: WIOD.

The foreign content of manufacturing exports is higher than for total exports and services exports in all countries and regions. The largest differences in the degree of foreign content of exports between the total economies and the manufacturing industries are seen in the EU-12 and the US. The strong backward linkages between the EU-12 and EU-15 are mainly due to EU-12 manufacturing industries providing intermediate inputs for manufacturing to the EU-15. Large multinational enterprises in the US manufacturing sector account for much of the foreign content of total US exports. Domestic sourcing in Japanese manufacturing industries did not increase as much as in the services industries. The increase was more in line with the other regions. Since most of the vertical specialisation process takes place within manufacturing industries, developments over time for manufacturing exports reflect the development over time for total exports. Domestic sourcing decreased from 1995 to 2007 but increased from 2007 to 2009, with the exception of Chinese sourcing, c.f. Table 2.5.

[40] See also the analyses of energy content in Japanese services exports in Chapter 3.

Table 2.5 – Content of manufacturing exports, by partner

	EU-12					EU-15				
	1995	2000	2005	2007	2009	1995	2000	2005	2007	2009
BRII	3.5	2.8	2.7	2.7	2.3	0.9	1.0	1.5	1.8	1.5
Canada	0.2	0.2	0.2	0.3	0.2	0.3	0.3	0.3	0.3	0.3
China	0.3	0.3	2.5	4.0	5.7	0.5	0.9	1.6	2.4	3.3
EU-12	76.7	66.6	65.0	62.6	66.2	0.7	1.0	1.5	1.9	1.9
EU-15	14.7	20.9	20.8	20.8	17.7	91.2	87.7	86.4	84.1	85.0
Japan	0.6	1.3	1.3	1.3	1.1	1.1	1.3	0.9	0.9	0.8
Korea	0.3	0.5	0.8	1.1	1.0	0.3	0.4	0.5	0.5	0.5
Mexico	0.0	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.1
USA	1.1	2.0	1.4	1.5	1.4	1.9	2.6	1.9	1.9	1.9
Rest of world	2.6	4.4	5.1	5.6	4.4	3.1	4.6	5.2	5.9	4.9
	Japan					**USA**				
	1995	2000	2005	2007	2009	1995	2000	2005	2007	2009
BRII	0.5	0.5	0.8	1.2	1.0	0.5	0.7	0.9	1.0	0.8
Canada	0.2	0.2	0.2	0.2	0.2	1.8	2.0	2.2	2.2	1.9
China	0.5	1.0	2.3	3.3	4.0	0.8	1.2	2.7	3.5	4.5
EU-12	0.0	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.2	0.2
EU-15	1.5	1.8	2.2	2.5	2.0	3.4	3.8	4.3	4.2	3.5
Japan	93.1	91.1	87.3	84.0	85.6	2.5	2.1	1.7	1.6	1.2
Korea	0.5	0.6	0.9	1.0	0.7	0.7	1.1	0.8	0.7	0.6
Mexico	0.0	0.1	0.1	0.1	0.1	0.8	1.1	1.2	1.3	1.2
USA	1.4	1.6	1.4	1.6	1.2	86.2	84.4	81.8	80.7	82.3

Note: BRII comprises Brazil, Russia, India and Indonesia. The table shows the foreign content of exports and the domestic content highlighted in grey.
Source: WIOD

When looking at the four selected industries, it is evident that vertical integration of the EU-12 industries is higher than that of other countries. This is to be expected due to strong production and backward linkages in the EU: an increase in the output of a final product in an EU-12 country triggers significant demand in other sectors and in EU-15 countries, implying strong backward linkages. The integration of production in the EU-12 industries — indicated by a low domestic share in Table 2.6 — is particularly strong in electrical products and transport equipment, and only slightly weaker in machinery. It is far lower in chemicals, whose production relies less on intermediates sourced from other countries. The EU-15, Japanese and US industries show fairly similar vertical integration patterns, though these tend to be somewhat lower for Japan in most industries. Generally, vertical integration is relatively higher in machinery and transport equipment, i.e. industries characterised by larger international production networks

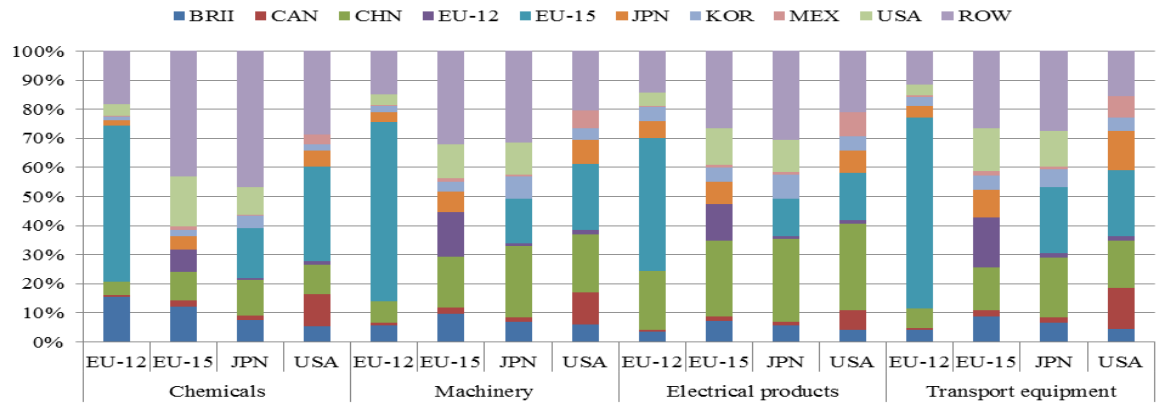
Table 2.6 – Vertical integration, 2007, in %

	Chemical, chemical products and man-made fibres				Machinery and equipment				Electrical and optical equipment				Transport equipment			
	EU-12	EU-15	JPN	USA	EU-12	EU-15	JPN	USA	EU-12	EU-15	JPN	USA	EU-12	EU-15	JPN	USA
BRII	5.0	1.7	1.3	0.9	2.1	1.4	1.1	1.2	1.6	1.3	1.0	0.9	1.7	1.4	0.9	1.0
Canada	0.2	0.3	0.3	1.8	0.3	0.3	0.2	2.1	0.3	0.3	0.2	1.4	0.3	0.4	0.2	3.3
China	1.5	1.3	2.1	1.7	2.7	2.5	3.7	3.8	9.6	4.9	4.8	6.3	2.8	2.3	2.8	3.7
EU-12	67.6	1.1	0.1	0.2	63.7	2.2	0.1	0.3	52.6	2.3	0.1	0.3	59.1	2.8	0.2	0.3
EU-15	17.4	86.0	3.0	5.4	22.4	85.5	2.4	4.4	21.7	81.3	2.2	3.5	26.8	83.8	3.0	5.3
Japan	0.6	0.7	82.6	0.9	1.2	1.0	84.8	1.6	2.7	1.4	83.1	1.6	1.7	1.5	86.7	3.1
Korea	0.4	0.3	0.7	0.4	0.8	0.5	1.2	0.8	2.4	0.9	1.4	1.1	1.3	0.7	0.8	1.1
Mexico	0.1	0.1	0.1	0.6	0.1	0.2	0.1	1.2	0.2	0.2	0.1	1.7	0.2	0.3	0.1	1.8
USA	1.3	2.4	1.7	83.6	1.4	1.7	1.7	80.8	2.2	2.4	1.9	78.8	1.6	2.4	1.6	76.9
Rest of world	5.9	6.0	8.1	4.7	5.4	4.7	4.8	3.9	6.7	5.0	5.1	4.5	4.6	4.3	3.6	3.5

Note: BRII comprises Brazil, Russia, India and Indonesia.
Source: WIOD.

With respect to geographical structure, foreign partners' shares of exports in the four selected industries in 2007 are presented in Figure 2.3. The EU-12 sourced most of their intermediates from the EU-15, with significant input also from China in electrical products and from BRII in chemicals. Japan also had a slightly larger share than other industries. It is interesting to note that the EU-12 share is no more than 20% for these industries, which serves to illustrate the EU-12's strong backward linkages with respect to the EU-15, and the EU-15's weaker backward linkages with respect to the EU-12. The highest EU-12 share of EU-15 exports is in transport equipment where there are strong international networks in the motor vehicles industry. Intermediates from the US and China, especially in electrical products, account for large shares of EU-15 industrial exports. Japanese intermediates account for a smaller share of EU-15 industrial exports. China, the EU-15 and, to a lesser extent, the US are the main sources for Japanese industries. The large shares of intermediates sourced from the ROW should be noted. These reflect the importance of South-East Asian production networks for Japanese industries. The relatively high Korean share in Japanese industries illustrates this phenomenon. Finally, important shares for the US industries can be seen for Canada and the EU-15. The EU-15 share of US exports is higher than the corresponding US share of EU-15 exports. Mexican industries seem less integrated in US industries' value chains than their Canadian counterparts. An exception is the relatively high share of Mexican sourced intermediates in US electrical products exports. The rest of the world also provides inputs, with a share of about 20% on average.

Figure 2.3 – Geographical structure of the foreign content, by industry, 2007



Note: BRII comprises Brazil, Russia, India and Indonesia.
Source: WIOD.

The change in sourcing patterns in 1995–2007 and 2007–2009, is similar to that for the total economy discussed above. In particular, over the period 1995–2007, other partners were not squeezed out. Instead sourcing from other countries increased with foreign intermediates substituting for domestic intermediates. On the other hand, domestic share increased at the expense of that of other countries over the crisis period, with the exception of Chinese intermediates. Particularly strong declines were observed in the EU-12. Due to the strong backward linkages of these countries and low demand for products assembled in the EU-12, the demand for EU-15 components fell, c.f. Table 2.7.

Table 2.7 – Changes in geographical sourcing patterns (in percentage points)

	Chemicals, chemical products and man-made fibres				Machinery and equipment				Electrical and optical equipment				Transport equipment			
	EU-12	EU-15	JPN	USA	EU-12	EU-15	JPN	USA	EU-12	EU-15	JPN	USA	EU-12	EU-15	JPN	USA
	1995–2007															
BRII	1.1	0.8	0.8	0.5	-0.1	0.7	0.6	0.6	0.1	0.7	0.6	0.4	-0.3	0.6	0.5	0.5
CAN	0.1	0.1	0.0	0.5	0.1	0.0	0.0	0.4	0.2	0.0	0.0	0.2	0.1	0.1	0.0	0.2
CHN	1.3	1.1	1.9	1.3	2.5	2.1	3.2	3.0	9.2	4.2	4.2	5.2	2.5	1.9	2.4	2.9
EU-12	-9.1	0.5	0.1	0.1	-12.7	1.4	0.1	0.2	-17.6	1.7	0.1	0.2	-13.3	2.0	0.2	0.2
EU-15	3.5	-6.0	1.2	1.8	5.9	-6.3	1.1	0.6	1.3	-7.3	1.0	0.0	6.9	-7.2	1.0	1.0
JPN	0.1	-0.1	-10.6	-0.5	0.6	-0.1	-9.0	-1.0	1.5	-0.5	-9.8	-1.8	0.5	-0.2	-7.1	-1.0
KOR	0.1	0.1	0.4	0.0	0.5	0.2	0.6	0.2	1.8	0.4	0.7	-0.3	0.7	0.4	0.5	0.3
MEX	0.1	0.1	0.0	0.2	0.1	0.1	0.1	0.5	0.1	0.1	0.1	0.8	0.1	0.2	0.1	0.7
USA	0.1	0.5	0.4	-6.1	0.1	-0.1	0.4	-5.9	0.0	-0.5	0.2	-4.6	0.3	0.4	0.2	-6.0
ROW	2.7	2.8	5.8	2.2	3.0	2.0	2.8	1.4	3.4	1.4	3.0	0.0	2.5	1.9	2.2	1.1
	2007–2009															
BRII	-0.4	-0.2	-0.2	0.0	-0.6	-0.3	-0.2	-0.3	-0.1	-0.1	-0.2	-0.2	-0.3	-0.2	-0.2	-0.2
CAN	-0.1	0.0	0.0	-0.2	-0.1	-0.1	-0.1	-0.3	-0.1	-0.1	-0.1	-0.3	-0.1	-0.1	-0.1	-0.6
CHN	0.7	0.7	0.3	0.9	1.0	0.9	1.0	1.3	4.0	1.4	1.5	1.0	1.1	1.0	0.6	1.5
EU-12	1.7	0.1	0.0	0.0	4.8	-0.1	0.0	-0.1	2.5	0.1	0.0	-0.1	4.9	0.0	0.0	-0.1
EU-15	-0.9	0.0	-0.1	-0.1	-3.4	1.0	-0.6	-1.0	-3.7	0.5	-0.5	-0.9	-4.1	0.5	-0.8	-0.8
JPN	-0.1	-0.1	1.8	-0.1	-0.2	-0.2	1.6	-0.3	-0.6	-0.3	1.3	-0.5	-0.3	-0.2	2.0	-0.5
KOR	-0.1	0.0	-0.2	-0.1	0.0	-0.1	-0.3	-0.1	-0.2	-0.2	-0.4	-0.3	-0.1	0.1	-0.2	-0.1
MEX	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.3	0.0	-0.1	0.0	0.0
USA	0.0	0.2	-0.2	0.0	-0.1	-0.1	-0.4	1.9	-0.2	-0.2	-0.4	3.2	-0.1	-0.2	-0.4	1.6
ROW	-0.9	-0.5	-1.4	-0.4	-1.5	-1.1	-1.0	-1.1	-1.6	-1.1	-1.1	-1.6	-0.9	-0.9	-0.8	-0.8

Note: BRII comprises Brazil, Russia, India and Indonesia.

Source: WIOD.

2.3. EFFECTS OF THE CRISIS ON TRADE AND INTERNATIONAL SUPPLY CHAINS

This section analyses the effects of the 2008 trade slump on EU-27 trade structures, compared to other major economies such as the US and Japan. Of particular interest is whether the geographical sourcing patterns by industry are different to those before the crisis. The analysis allows an assessment to be made as to whether the crisis has led to a change in the structure of vertical specialisation in this respect. Particular attention is paid to international supply structures with respect to traded intermediates, and in particular semi-finished products and parts and components in the industries concerned.

The analysis will be based on the UN Comtrade data, providing exports and imports at the HS 6-digit level, which allows for differentiation by broad end-use categories (BEC) and NACE industries. The time period covered is 2005–10. Methodologically, the study builds on recent attempts to decompose the trade slump (see e.g. Aurújo, 2009; Haddad et al., 2010; Levchenko and Lewis, 2009).

2.3.1 Geographical evolution of trade structures during the crisis

While the crisis had a major impact on all major economies, the more rapid recovery of countries such as China has had an impact on its main trading partners, e.g. Japan. Figure 2.4 presents data on changes in the imports of the EU-12, the EU-15, Japan and the US, by trading partner, as a percentage of total trade in 2007. It is immediately apparent that the 'Chemicals' and 'Electrical and optical equipment' industries have recovered faster than the other two industries. In all of the advanced economies considered, imports in the chemical industries in 2010 reached or surpassed 2007 levels. Japan, in particular, increased its imports dramatically, with those from the EU-15 rising by 34% and from the US by 25% relative to the initial trade values with these partners. Imports from the EU-15 and EU-12 rose in all the economies considered — with the exception of the EU-15 itself.

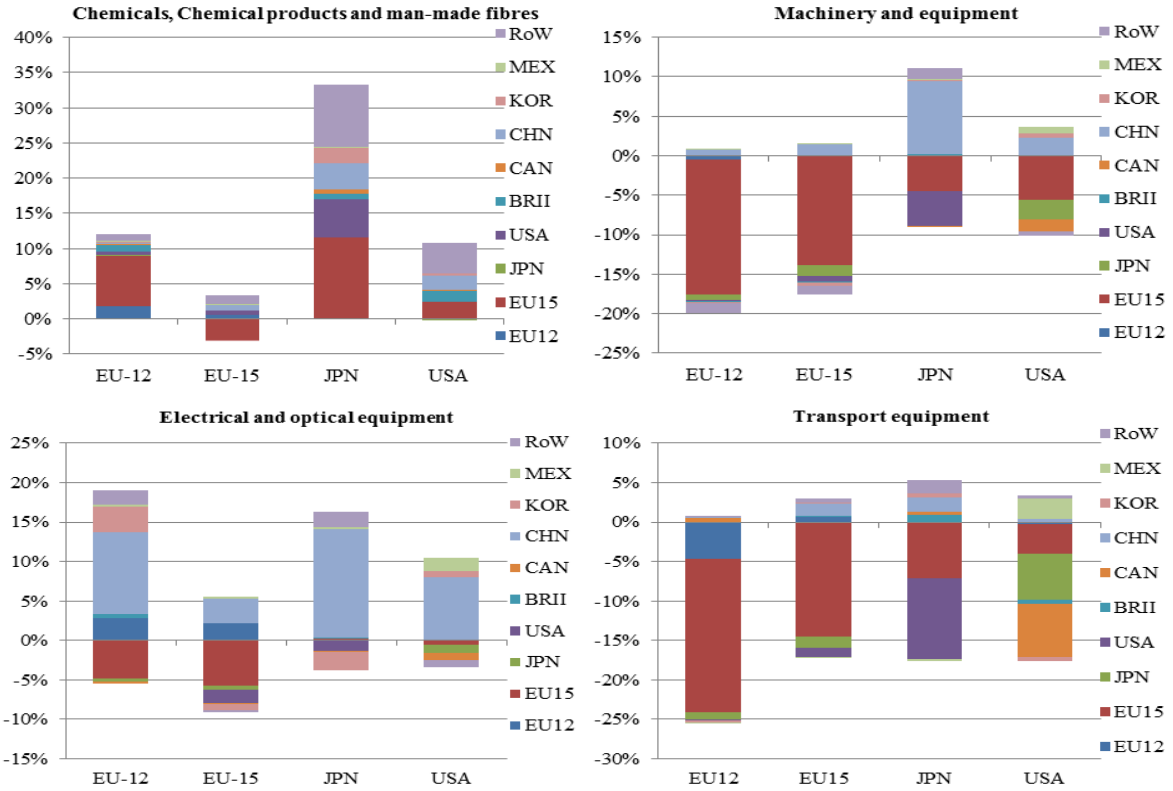
The 'Electrical and optical equipment' industry provides the most striking example of rising imports from China. Not only have exports to China increased for almost all reporters and industries, but so have imports from China. This is

exceptional, given the economic crisis. Relative to imports from China in 2007, they have increased by 59% for the EU-12, 19% for the EU-15, 39% for Japan and 25% for the US. Imports from the EU-12 have also risen quite substantially for all reporting countries. While the EU-12 is not a major trading partner of Japan and the US, and import levels are therefore quite low, intra-EU-12 trade increased by 30% and imports from the EU-15 by 24% (see Stehrer et al. 2012b for details).

The two industries 'Machinery and equipment' and 'Transport equipment' are both characterised by a sharp decline in imports from the EU-15, Japan and the US. Imports from the EU-15 decreased in most countries by more than 20%. This has had a large impact on the total imports in these industries as the EU-15 is a major trading partner of all the reporters considered. In relative terms, most of the other major advanced economies did not perform any better. Imports from Japan decreased by 25–28% for 'Transport equipment', and Japanese imports from the US also plummeted by 25–28%. On the other hand, transatlantic linkages remained comparatively stable, as EU-27 imports from the US only declined by 11–16%.

Overall, imports from China rose in all major economies during this period. Firms maintained their sourcing connections with China, even though imports from almost all other major trading partners fell. These findings are in line with the results of the analyses in the previous section, which showed that China is essentially the only country with growing shares in extra sourcing.

Figure 2.4 – Changes in imports (2007–10) of total imports in 2007(%)



Source: UN Comtrade; authors' calculations.

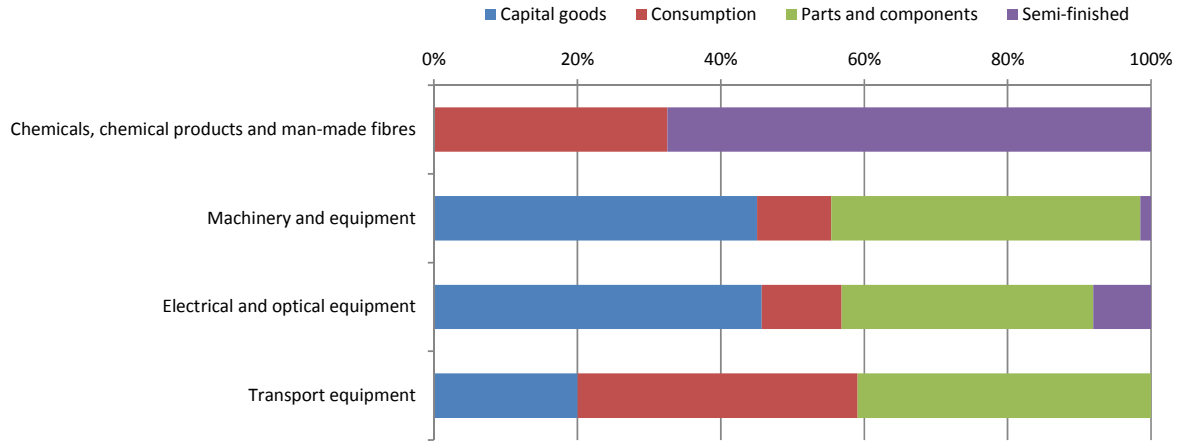
2.3.2 Decomposition of trade by product usage

This section presents a more in-depth analysis of trade during the crisis by adding another layer. By decomposing the imports of an industry into trade in parts and components, semi-finished products, consumption and capital goods, it is possible to take a detailed look at vertical changes in trade. Figure 2.5 provides an overview of the import composition of each industry. Trade in parts and components constitutes a major part of total trade in the 'Machinery and equipment', 'Electrical and optical equipment' and 'Transport equipment' industries.

Particularly in 'Machinery and equipment', the trade in parts and components was growing strongly before the crisis, with an annual rate of 19%, exceeding the growth rate in consumption goods (9%) and capital goods (16%).Trade in parts and components does not play a role in the chemical industry, where semi-finished products are the dominant trade element, comprising 67% of total imports.

The composition looks similar for EU-27 exports, albeit with slightly lower shares of capital and consumption goods.

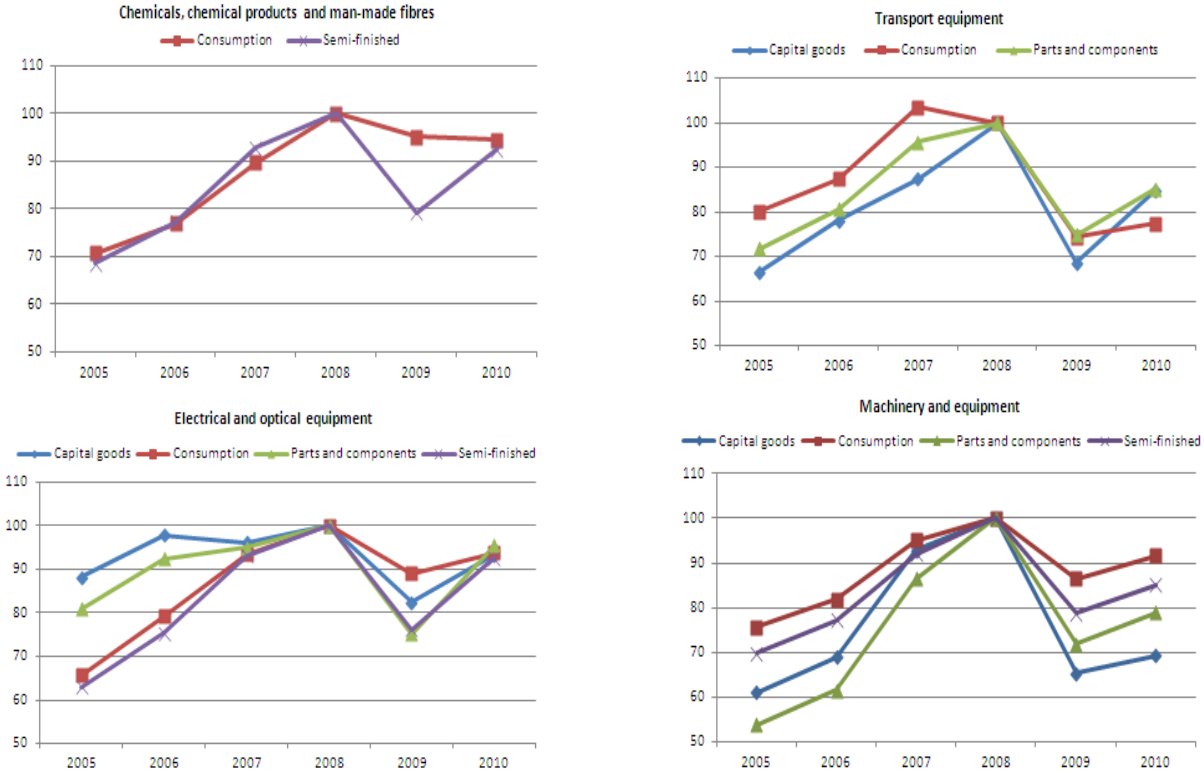
Figure 2.5 – Decomposition of EU-27 imports, by use categories, 2010



Source: UN Comtrade; authors' calculations.

Figure 2.6 shows the development of EU-27 imports by use categories. In most industries, there is a sharper decline in imports of semi-finished products and parts and components than in imports of consumption goods. There are two reasons for this strong decrease in intermediate products. The first is that, as countries become more vertically specialised, the processing of a product at various production stages tends to involve a number of countries. For this reason, trade declines not only by the value of the finished products which are exported, but also by the value of all the intermediate trade flows that have been traded to create it (see also Yi, 2009; Bergoeing et al., 2004).

Figure 2.6 – Development of EU-27 imports, by use categories (2008=100)



Source: UN Comtrade; authors' calculations.

Inventory management of firms is another reason for the downturn in trade in intermediate products during crisis periods, (Alessandria et al., 2011). As a reaction to the demand shock, retailers and manufacturers not only reduce their orders by the amount of the demand shock, but also reduce their inventories. This decrease in inventories can be seen in aggregate statistics over the recent crisis. Each supplier faces not only the demand shock from the customer, but also the inventory effect at each production stage. The effect is thus aggravated as one moves up the supply chain, from end consumer to raw material supplier (Altomonte et al., 2011). The more complex the supply chains and the more they are spread across countries, the more noticeable is this so-called 'bullwhip' or 'Forrester effect' (Forrester, 1961) in international trade patterns. The decline in intermediates in 'Transport equipment' has not been quite as big as for consumer goods. This is partly explained by 'just-in-time' production, which leads to minimal inventories and therefore a small bullwhip effect.

Finally, EU-27 trade is analysed with respect to the partner countries and use category. Trends before the crisis (2005–07) are compared with those during the crisis (2008–10). To do this, annual changes in imports in the EU-27 are calculated for each industry, use category and partner (Table 2.8).

Before the crisis, EU-27 imports of semi-finished chemical products from advanced countries increased much faster than imports of consumer goods. The opposite is true of trade with the EU-12, where trade in consumer goods increased most. This indicates that the EU-12 countries strengthened their position as a final producer of chemical products.

'Machinery and equipment' registered the strongest growth rates in imports of parts and components. The annual growth in EU-27 imports between 2005 and 2007 is impressive: 62% for China, 47% for Japan, 43% for Korea, 26% for the EU-12 and 20% for the EU-15. The role of the US in the EU-27 production networks has been decreasing, relatively speaking, as imports of parts and components grew by 'only' 10%. During the crisis, imports of parts and components and semi-finished products fell more than imports of consumption goods. Also, the trade in capital goods dropped significantly as firms extended their investments. On the geographical front, it is clear that there was a similar fall in imports in the EU-27, the US and Japan (mostly between 10% and 20%), while imports from China increased slightly overall.

Table 2.8 – EU-27 imports by partner, industry and use category: import share of partner in 2007, annual growth 2005–07 and 2008–10 (%)

		Partner																					
NACE	Use category	EU-12			EU-15			JPN			USA			BRII			CHN			KOR			RoW		
		2007	05-07	08-10	2007	05-07	08-10	2007	05-07	08-10	2007	05-07	08-10	2007	05-07	08-10	2007	05-07	08-10	2007	05-07	08-10	2007	05-07	08-10
	Chemicals																								
	Consumption (33%)	3.3	30	10	76.4	11	-6	1.1	5	-8	8.2	8	6	0.5	10	24	1.1	25	2	0.3	59	-50	9.0	16	5
	Semi-finished (67%)	3.4	21	-7	67.0	14	-5	2.1	10	-3	9.0	15	-4	2.9	27	-5	2.1	23	4	0.5	18	0	13.0	20	0
	Machinery and equipment																								
	Capital goods (45%)	5.2	26	-8	63.6	19	-21	6.3	14	-21	5.6	15	-18	0.8	28	-16	7.1	46	-4	1.5	30	-26	10.0	22	-18
	Consumption (10%)	14.4	22	-2	48.1	6	-10	1.5	-1	-6	3.1	9	-13	0.3	-6	17	20.9	16	5	2.2	3	1	9.5	18	-4
	Parts and components (44%)	8.8	26	-15	60.0	20	-15	6.7	47	-12	7.3	10	-8	1.2	29	-14	5.7	62	0	0.9	43	-11	9.4	28	-6
	Semi-finished (1%)	15.5	19	-17	55.0	11	-10	2.4	12	0	2.9	13	-12	1.3	16	-22	13.3	22	4	0.4	0	7	9.2	17	-2
	Electrical and optical eqpt.																								
	Capital goods (46%)	6.8	11	4	42.8	2	-9	4.5	-8	-6	10.5	12	-11	1.0	15	1	19.6	11	7	3.2	-11	-22	11.6	0	-1
	Consumption (11%)	18.9	47	4	34.9	10	-9	3.0	3	-10	6.2	6	2	0.6	0	-15	17.6	26	-3	2.8	34	-11	15.9	7	-1
	Parts and components (35%)	7.0	19	-2	42.2	6	-6	5.5	-8	-17	7.7	-2	-9	0.8	18	-2	13.5	20	10	4.6	23	10	18.6	7	-2
	Semi-finished (8%)	17.7	21	-4	47.8	17	-8	2.8	23	-1	3.4	11	-3	1.1	24	-7	12.8	24	3	1.1	46	10	13.2	22	1
	Transport equipment																								
	Capital goods (20%)	4.7	30	-15	67.7	18	-13	1.5	23	-12	10.7	-5	-20	1.1	29	28	1.5	23	46	2.3	-1	16	10.5	1	-12
	Consumption (39%)	9.4	34	0	71.2	10	-14	7.6	7	-21	3.5	29	-32	0.5	13	6	0.5	26	-9	3.1	4	-26	4.2	19	-3
	Parts and components (41%)	12.8	20	-4	66.7	13	-11	3.2	9	-6	8.4	10	-1	1.1	16	-10	1.3	26	6	0.6	48	11	6.0	18	-7

Notes: The first (grey) column for each country is the share of this partner in EU-27 imports in this category in 2007. The second column is the annual growth rate in 2005–07 and the third column is the growth rate for 2008–10.

Source: UN Comtrade; authors' calculations.

'Transport equipment' registered a significant drop in imports of consumption goods from the US (-32%), Japan (-21%) and Korea (-26%) — far greater than intra-EU-27 changes (-12%). On the other hand, overseas production network linkages remained fairly stable or were further strengthened, as in the case of China and Korea, while imports of parts and components from the EU-15 dropped by 11%.

Finally, Japan's traditional image as a prominent player in the 'Electrical and optical equipment' market seems to be starting to crumble. Even before the crisis, EU-27 imports of capital goods and parts and components were falling by 8% on an annual basis. This trend continued during the crisis, with the largest drop in parts and components trade (17%). By contrast, the importance of the EU-12, China and Korea increased significantly before the crisis, and China and Korea even increased their trade levels during the crisis in capital and parts and components. China's role as an assembly country and provider of consumption goods has decreased in very recent years, whereas its direct integration into production networks as a provider of parts and components has increased.

2.4. OFF-SHORING DECISIONS OF EU MANUFACTURING FIRMS

This section analyses the decision by European manufacturing firms to move their production to locations abroad (referred to as offshoring). There is a strong relationship between offshoring and the trade in intermediates, analysed in the previous section. If firms move production activities to their own or independent firms abroad, this will inevitably increase the imports of intermediates. However, offshoring may also go beyond a simple substitution of domestic production by imports. If new production facilities abroad have larger capacity than the previous activities at home, this can lead to positive 'second-round effects' (when the new locations need a higher amount of input or support from the home base). Offshoring is not only a strategy to cut costs, but is also driven by the need to open up new markets and to operate close to key clients.

Against this background, this section investigates the following questions: Which types of European manufacturing firms offshore their production activities? What are the main destination countries for offshoring? How is offshoring related to innovation and company performance? What are the short-term and long-term trends in offshoring? Has the 2008/09 economic crisis altered or even halted the trend towards stronger fragmentation of firms' global production chains? Or, on the contrary, have companies become more active again so as to better control their cost base at a time when production volumes are falling?

The data come from the European Manufacturing Survey (EMS), a survey of product, process, service and organisational innovation in European manufacturing. EMS data are available for the two periods mid-2004 to mid-2006 and 2007 to mid-2009. The sample includes firms from the four industrial sectors; they are studied in more detail below.

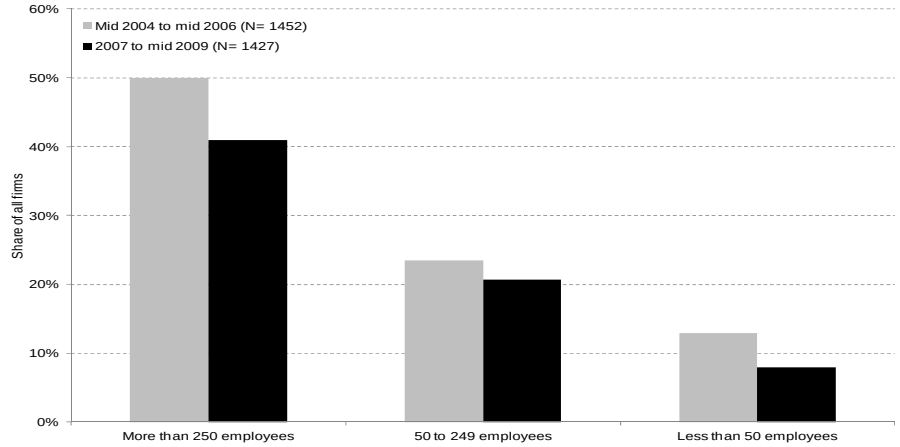
2.4.1 Which firms offshore?

Around 20% of all firms in the four manufacturing sectors, covered by the 2009 survey, moved part of their production offshore to their own or independent firms abroad in the period from 2007 to mid-2009. Germany, the largest country in the sample, has a share of offshoring firms of around 16% in the four manufacturing sectors mentioned above.

If the two periods — mid-2004 to mid-2006 and 2007 to mid-2009 — are compared, six out of seven countries show a decrease in the proportion of firms with offshore production. Manufacturing firms were less inclined to offshore during the crisis of 2008/09. European manufacturing companies tended to maintain production at home and make use of the capacity at their existing locations, rather than look for new offshoring ventures.

Production offshoring is a strategy favoured by large firms in particular (see Figure 2.7). In 2007-2009 some 41% of the firms with more than 250 employees relocated parts of their production abroad, whereas the corresponding share among small firms of less than 50 employees was only 8%. During the crisis, offshoring decreased in all firm size categories.

Figure 2.7 – Share of firms with production offshoring, by size category



Source: European Manufacturing Survey 2006, 2009.

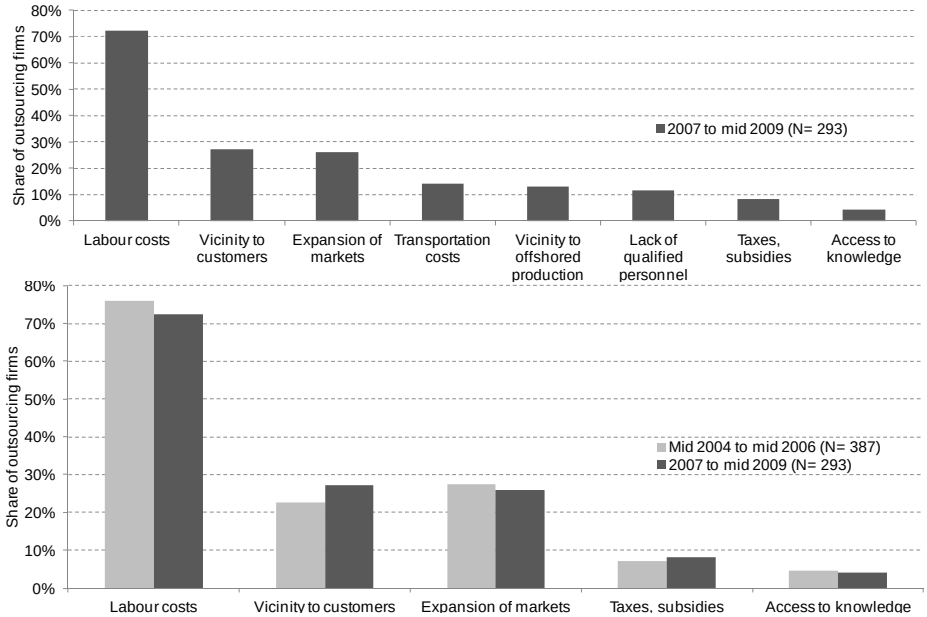
Firms in the electrical and optical equipment industry and automotive and transport equipment manufacturers are particularly active in production relocation (25% and 24% respectively), followed by machinery and equipment manufacturers (18%) and the chemical industry (14%). The chemical industry has traditionally been quite reserved about production relocation, due to the high capital intensity, the high degree of process integration and the low labour intensity of its production processes. As in the case of the different sizes of firms, offshoring is decreasing in all four sectors.

2.4.2 Offshoring motives and destinations

According to the data, cost reduction is the dominant motive for relocating production activities abroad: 72% of all firms with offshoring activities stated that labour costs had triggered their offshoring decision. Compared to the previous survey, the importance of labour costs decreased slightly (by 4 percentage points) (Figure 2.8).

Market-related motives, such as proximity to customers or market expansion, gained far fewer votes. The least relevant motives for production offshoring were better access to knowledge, and taxes and subsidies in the target country.

Figure 2.8 – Main motives for production relocations



Note: Multiple answers allowed.

Source: European Manufacturing Survey 2006, 2009.

Besides the all-important consideration of labour cost savings, there are usually a host of factors that make locations attractive as destinations for production offshoring. This is reflected in the high number of multiple answers, as shown in Figure 2.8. Besides cutting costs, production offshoring also has the goal of expanding activities and opening up new markets; this is reflected in the proportion of motives related to expansion of markets and proximity to key customers abroad (which has gained importance since the previous survey).

There is also a strong link between motives and choice of destination country for production offshoring. Regression analysis indicates that when companies are striving to reduce labour costs, the EU-12, China and other Asian countries are the preferred target regions. The main difference between Asian countries and the EU-12 is that the labour cost motive is linked to the market expansion motive in the case of Asian countries, but not in the case of the EU-12. The fact that markets in the EU-12 and Eastern Europe can more easily be supplied with exports from the home country might account for the lack of market and customer incentives in these countries.

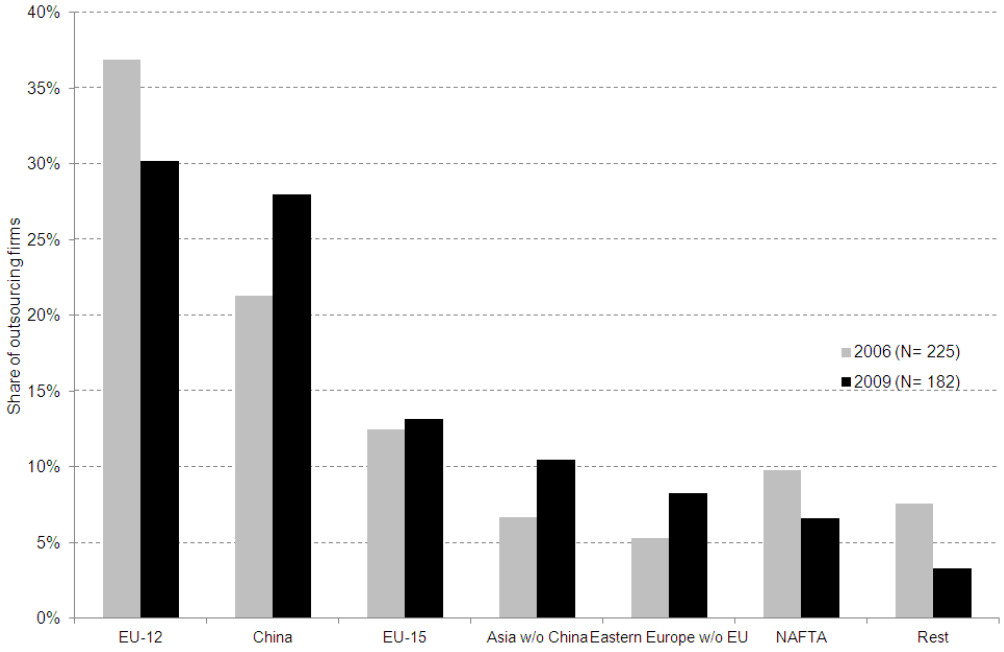
Low transportation costs and access to knowledge, by contrast, are motives related to offshoring to the EU-15. Offshoring to North America is significantly related to the need to be close to important customers.

The EU-12 Member States are the preferred target region for production relocations, accounting for 30% of all valid responses from offshoring companies (Figure 2.9). Compared to the previous period (mid-2004 to mid-2006) their share dropped by 7 percentage points.

China is the second most attractive destination, accounting for 28 % of all valid answers in 2009. In contrast to the EU-12, China has become more attractive than before. In particular small and medium-sized companies intensified their production relocation to China (from 6 % and 15 %, respectively, to 20 % and 33 % of all offshoring firms). It should be noted, however, that the share of firms that moved production offshore to China remained virtually unchanged if one looks at the whole sample rather than just the offshoring firms, because the overall propensity to offshore has declined. Relocations to the EU-15 Member States remained stable, at around 13 % of all offshoring firms. The EU-15 countries are still the third most attractive region for relocation for European manufacturing companies. They are followed by other Asian countries excluding China (10 %) and non-EU Eastern Europe (8 %).

Overall, it can be concluded that *farshoring* to Asian countries has gained in attractiveness for offshoring firms, while *nearshoring* to the EU-12 countries has decreased noticeably. As a result, production relocation between EU Member States (*intra-EU-27*) is decreasing while *extra-EU-27 relocation* activities have gained ground.

Figure 2.9 – Target regions of production offshoring, only offshoring firms



Note: Multiple answers allowed.

Source: European Manufacturing Survey 2006, 2009.

2.4.3 Characteristics of offshoring firms

The empirical evidence presented above indicates that firm size, sector and location of the firm strongly determine offshoring decisions. These determinants have been analysed further using multivariate analysis to gain a better understanding of which firms offshore and which do not.

The analysis shows the relationship between the decision to offshore and each explanatory variable included in the regression analysis, holding all other explanatory variables constant. The dependent variable of the analysis is a dummy variable that is one if the firm offshored production activities to its own or independent firms between 2006 and 2009.

Explanatory variables include first a number of variables that describe firm characteristics, including *firm size*, *revenue per employee* as a measure of productivity, the share of *exports* on turnover or a dummy variable that is one if the firm is a *supplier of intermediary goods*. Based on the literature, larger, more productive firms are assumed have a higher propensity to move their production activities abroad. Moreover, an intermediate supplier may feel compelled to follow customers who move their production activities offshore.

A second set of explanatory variables describes the innovation behaviour of the firm. These variables include *R&D expenditure* as a share of turnover, a dummy variable that is one if the firm has introduced a *product innovation* in the period 2006-2008, and the share of *new products* on turnover. If more productive firms have a higher propensity to offshore, then they may also be more innovation active. Moreover, offshoring of production may lead to a new division of labour within the firm, where the parent company focuses on activities such as R&D, innovation and marketing.

A third set of variables describe the production process of the firm. Two dummy variables indicate whether the firm produces *simple* or *complex products* consisting of many parts. The baseline case for both variables is medium complex products. Two other dummy variables show whether the firm produces *single units* or in *large batches*. Here, the baseline case is small batches. Moreover, three dummies are included that gauge the *degree of standardisation* in product development. It is assumed that firms that produce complex, highly-customised products in single production unit may have less opportunity to offshore because they rely very much on a close interaction with the customer, and are therefore more bound to their location than producers of standardised goods in large batches.

Finally, the regression includes explanatory variables that control for the *sector* and the *location* of the firm to test if the differences in the offshoring propensity across sectors and countries can be explained by the firm characteristics listed above. The regression also tests the assumption that the degree of product market regulation in a country is related to offshoring, i.e. that firms relocate production because of too much regulation. The variable *product market regulation* provided by the OECD has been introduced into the regression. This variable captures various aspects of regulation, such as barriers to trade and investment, state control or barriers to entrepreneurship, in one single number for each country.

A probit regression model is estimated to analyse the linkages between firm characteristics and the manufacturing firm's probability of offshoring production activities. The probit model is given as

$$Y^* = X'\beta + \varepsilon$$

where Y^* can be viewed as an indicator for whether the latent dependent variable Y – the probability of offshoring – is positive

$$Y = 1_{\{Y^*>0\}} = \begin{cases} 1 \text{ if } Y^* > 0 \text{ i.e. } X'\beta + \varepsilon > 0 \\ 0 \qquad\qquad\qquad \text{otherwise} \end{cases}$$

with X' denoting the vector of binary explanatory variables and β being the parameter reflecting the marginal effect of a discrete change in the probability to offshore for the explanatory variables. E is the error term, which is assumed to be of zero mean and with a standard deviation of σ^2.

The results are presented in Table 2.9 which shows the results from the analysis of factors determining outshoring decisions between 2006 and 2009. The first three columns include dummy variables controlling for firms' home countries. The right three colums contains results from controlling for the degree of product market regulation in home countries.

The results confirm a positive relationship between firm size and offshoring, holding all other factors constant. If two firms are the same in all variables employed in the regression except for size, the larger firm will, on average, have a higher propensity to offshore. A similar positive relationship is also found for revenue per employee and offshoring.

The relationship between innovation and offshoring is not clear cut. Offshoring firms, on the one hand, spend slightly less on R&D than non-offshoring firms; on the other hand, they introduce new products onto the market significantly more often.

This result points to the fact that offshoring is not only a passive reaction to rising wage costs, but has to be seen in the wider context of the international expansion of firms. Offshoring firms are also characterised by the development and production of a standard programme of less complex products.

The results clearly show that there is a strong relationship between the firm's sector affiliation and the probability that it will offshore production abroad. Firms that belong to the machinery and equipment, electrical and optical equipment, and transport equipment sectors show a higher propensity to offshore than those in the sector of chemicals and chemical products.

Moreover, the results confirm that not only do sector and firm size explain the propensity to offshore to a larger degree than firms' characteristics, but so does the firm's home country. Being a Dutch or a Swiss firm has a significant positive effect on offshoring, compared to being a German firm. Austrian, Danish, Finnish, Spanish and Slovenian/Croatian firms do not differ significantly from German firms in their propensity to offshore.

The regression also tests the assumption that the degree of product market regulation in a country is related to offshoring, i.e. that firms relocate production because of too much regulation. The analysis does not support this assumption.

Table 2.9 – Probit regression on the probability of being an offshoring firm, 2006–2009

	2006			2009		
Propensity to offshore production	**Coefficient**	**Sig.**	**Std.err.**	**Coefficient**	**Sig.**	**Std.err.**
General						
Size (log function of number of employees)	0.101	***	0.007	0.094	***	0.007
log revenue per employee	0.041	***	0.015	0.050	***	0.016
Export share (% of turnover)	0.001	***	0.000	0.001	***	0.000
Intermediate supplier*	-0.037	*	0.019	-0.035	*	0.020
Innovation						
Share of R&D expenditure (% of turnover)	-0.004	**	0.002	-0.005	***	0.002
Product innovator (new to firm innovation)*	0.053	**	0.021	0.050	**	0.022
Share of product innovations (% of turnover)	-0.001	**	0.001	-0.001	*	0.001
Product complexity (a)						
Simple products*	0.035		0.037	0.040		0.038
Complex products*	-0.046	**	0.020	-0.044	**	0.020
Batch size (b)						
Single unit production*	-0.020		0.022	-0.032		0.022
Large batch*	0.068	**	0.029	0.040		0.029
Product development (c)						
According to customers' specification*	-0.007		0.020	-0.009		0.020
Standard programme*	0.064	**	0.031	0.064	**	0.031
No product development*	-0.069		0.039	-0.088	***	0.038
Sector (d)						
Machinery and equipment*	0.169	***	0.037	0.161	***	0.037
Electrical and optical equipment*	0.224	***	0.039	0.216	***	0.039
Transport equipment*	0.178	***	0.055	0.154	***	0.056
Country (e)						
AT*	0.031		0.037			
CH*	0.064	***	0.025			
NL*	0.142	***	0.046			
DK*	0.088		0.072			
HR & SI*	-0.057		0.038			
FI*	0.033		0.074			
ES*	-0.033		0.046			
Product market regulation				-0.071		0.046
Sample size	2,476			2,359		
Pseudo R^2	0.1502			0.1416		

Note: (*) dF/dx is for discrete change of dummy variable from 0 to 1. Reference groups: [(a)] medium complexity, [(b)] medium batch, [(c)] basic programme with alternative, [(d)] chemicals and chemical products, [(e)] Germany. Difference in means of the independent variables significantly diverge from zero, probability values of 10% (*), 5% (**) or 1% (***).
Source: European Manufacturing Survey 2006, 2009.

2.5. SUMMARY AND POLICY IMPLICATIONS

The study provides an overview of the tendencies observed in the internationalisation of production since 1995 and over the period of the recent crisis. As outlined above, there is no single approach that allows the many facets of this phenomenon to be captured at the various levels of aggregation: from single-firm decisions to overall industry-level patterns and macroeconomic consequences. Therefore, various approaches have been used here to analyse this internationalisation process, in order to highlight some of the main aspects. Based on the recently compiled world input-output tables from the WIOD project, ongoing trends in the vertical specialisation patterns for the EU countries and other major economies have been documented. Generally, one finds that, for the EU, the integration process since 1995 has intensified the internationalisation of production within Europe considerably — and the EU-12 countries play a particular role in this respect. But the rise of China as a major partner is also well documented in this exercise. An important finding is that during the recent crisis there was a tendency towards less integration, which manifested itself in the resurgence of domestic rather than foreign sourcing. The only foreign country that has continued to increase its share in the EU sourcing structures has been China. Although this phenomenon of 'backshoring' might be caused by those industries that have been most affected by the crisis, it might also be indicative of a rupture in the trend towards more offshoring and 'farshoring'. Albeit to varying degrees, the trends seem to be similar for all four sectors that have been studied in more detail.

The economic and financial crisis that broke out in 2008 was accompanied by a great fall in foreign trade volumes. The extent of the trade collapse was greater than the decline in output. Thus international trade can be regarded as one of the great 'victims' of the world crisis. At the same time, it was also one of the channels through which

the crisis was transmitted between countries. It seems that production chains in the first phase of the crisis had an amplifying effect in terms of the decrease in international trade, which is referred to as the 'bullwhip effect'. On the other hand, there is a certain stabilising effect created by value chains, at least in the slightly longer run. This may be caused by the reversal of the bullwhip effect, as well as by the fact that companies inside the value chain helped each other, e.g. by providing trade finance. With regard to the changing role of the internationalisation of production as a result of the crisis, it is obvious that the internationalisation of production is here to stay.

The focus on industry-level data brought about by using trade statistics, or trade statistics combined with detailed input-output tables, might hide aspects of this internationalisation process that can only be seen at the level of firms. The last section investigated offshoring — the relocation of production activities to locations abroad — by European firms. The analyses show that the share of offshoring firms decreased across most countries, sectors and firm sizes between the periods 2004-06 and 2007-09. This may indicate that firms focus on utilising their activities at home in times of (upcoming) economic crisis.

The main target regions for offshoring by European firms are the EU-12, China, the EU-15 and other Asian locations excluding China. Despite a general decrease in the share of offshoring firms, *farshoring* to Asia and China, in particular, has increased. By contrast, *nearshoring* to the EU-12 has become less attractive, though it is still the most important target region. An explanation for this shift may be an increase in labour costs in the EU-12 countries, coupled with their geographical proximity, which allows firms to serve these markets from their home countries.

The dominant motive for production offshoring is the desire to reduce labour costs, followed (at some considerable distance) by proximity to customers and market expansion. Expected labour cost reductions explain offshoring to the EU-12, Asia and China, in particular. However, in contrast to the EU-12, where the offshoring decision is dominated solely by potential labour cost savings, customer and market expansion motives are also significantly related to offshoring activities involving Asia and China.

Characteristics of firms that have offshored production activities include larger firm size and greater revenue per employee, a standard programme of less complex products, and a higher probability of introducing new products to the market. Producers of electrical and optical equipment have a higher propensity to offshore production than do firms in the other three sectors considered. Previous experience of production offshoring goes a long way towards determining production offshoring today. Product market regulation does not seem to be a push factor for firms to offshore production activities abroad.

The increasing use of foreign sourcing for the content of exports in the manufacturing industries illustrates well how globalisation has impacted firms' value chains. The increased pace of globalisation has improved firms' and industries' opportunities to source inputs and intermediates from locations which have comparative advantages in producing these inputs and intermediates which is now better reflected in different parts of firms' value chains. The higher use of foreign content by industries that are more highly dependent on intermediates clearly shows that this is key for competitiveness.

The globalisation of value chains gives rise to some policy challenges due to the new opportunities and challenges which the increased globalisation leads to. Some of these policy challenges are already familiar to some extent and relate to policies aimed at reaping the benefits of openness for trade and FDI.

The growing importance of intermediate goods for exports and competitiveness of firms illustrates that the costs of national borders have grown as trade costs are more important for intra-firm and vertical trade within global value chains (GVCs) compared to traditional trade where intermediates and inputs are produced domestically. Raising barriers to international trade and direct investments can therefore disrupt GVCs for domestic firms that source intermediates from abroad. As pointed out in the Communication 'Trade, Growth and World Affairs' and the associated Staff Working Document 'Trade as a driver of prosperity', openness to trade facilitates local companies' integration in GVCs which makes them more productive. And more than two thirds of EU imports consist of intermediate products which boost EU industry productivity.[41]

Multinational enterprises have been driving the emergence of GVCs through intra-firm trade and FDI flows. In order to reap the benefits of globalisation and GVCs on a broader scale, participation in GVCs, particularly of SMEs, needs to increase. In many cases, SMEs lack the expertise and capacity to engage in international trade

[41] European Commission (2010) "Trade as a driver of prosperity". Commission staff working document accompanying the Commission's Communication on "Trade, Growth and World affairs".

directly; more opportunities for creating or strengthening linkages between local firms and firms that are already engaged in GVCs would be beneficial.

The emergence of GVCs and increased participation of countries also give rise to challenges. As is well established, most of the value is created in the upper and lower part of the value chains where activities such as R&D, branding, design, management, marketing and sales services are located. While emerging countries formulate policies on how to move up the value chain, policies to keep the comparative advantage in high value-added activities are more relevant for the EU. Intangible assets are crucial in this respect. Investments in intangibles are essential for innovation and important for capturing larger shares of value in the value chains. Investments in intangibles enable firms to create superior capabilities which help them acquire unique skills or suppliers of unique factors indispensable to the whole value chain. Firms that possess such unique, idiosyncratic, specific factors in the GVC capture the largest shares of value-added. Innovation is the most important source for capturing value-added and developing or keeping competitive advantages. The oft-cited examples of the Nokia 95 model and the iPhone illustrate that the locational advantages of the home countries for activities in the upper part of the value chains relate to their attractiveness for innovation and the development of intangible assets. Innovation policies are therefore obvious candidates. But consideration should also be given to policies that help localise factors that are essential for activities which capture large shares of value-added.

REFERENCES

ACM, (2006) *Globalization and Offshoring of Software*, a report of the ACM Job Migration Task Force, available at:http://www.acm.org/globalizationreport/pdf/fullfinal.pdf.

Alajääskö, P. (2009), ´International Sourcing in Europe´, Eurostat, *Statistics in Focus, Industry Trade and Services*, No. 4, http://www.eds-destatis.de/de/downloads/sif/sf_09_004.pdf.

Alessandria, G., Kaboski, J.P. and Midrigan, V. (2011), ´US Trade and Inventory Dynamics´, *American Economic Review*, No. 101(3), pp. 303-07.

Altomonte, C., Di Mauro, F., Ottaviano, G., Rungi, A. and Vicard, V. (2011), ´Global Value Chains During the Great Trade Collapse. A Bullwhip Effect?´, European Central Bank, Working Paper Series, No. 1412.

Amiti, M. and Wei, S.J. (2009), ´Service Offshoring, Productivity and Employment: Evidence from the US´, *The World Economy*, Vol. 32, No. 2.

Aurújo, S. (2009), *The great synchronisation: What do high-frequency statistics tell us about the trade collapse*, OECD.

Baldone, S., Sdogati, F. and Tajoli, L. (2001), ´Patterns and determinants of international fragmentation of production: Evidence from outward processing trade between the EU and Central Eastern European countries´, *Review of World Economics*, Vol. 137, No. 1.

Baldwin R. (2009), ´Introduction: The Great Trade Collapse: What caused it and what does it mean?´, in *The great trade collapse: Causes, consequences and prospects*, VoxEU.org ebook, available at: http://www.voxeu.org/index.php?q=node/4297.

Baldwin, R. (2006), *Globalisation: the great unbundling(s), background paper to the project: Globalisation challenges for Europe*, Secretariat of the Economic Council, Finnish Prime Minister's Office, available at: http://appli8.hec.fr/map/files/globali-sationthegreatunbundling%28s%29.pdf.

Bergoeing, R., Kehoe, T.J., Strauss-Kahn, V. and Yi, K.M. (2004), ´Why is Manufacturing Trade Rising Even as Manufacturing Output is Falling?´, *American Economic Review*, Vol. 94, No. 2, pp. 134-138.

Bertoli, S. (2008), *The impact of material offshoring on employment in the Italian manufacturing industries: the relevance of intersectoral effects*, Centro Studi Luca d'Agliano Development Studies, Working Papers, No. 244, http://ssrn.com/abstract=1361789.

Bhagwati, J., Panagariya, A. and Srinivasan, T.N. (2004), ´The Muddles over Outsourcing´, *The Journal of Economic Perspectives*, Vol. 18, No. 4.

Blinder, A.S. (2007), *How Many U.S. Jobs Might Be Offshorable?*, CEPS Working Paper, No. 142, Princeton, NJ: Princeton University, Center for Economic Policy Studies.

Carson, S.E. (2009), *Boeing and Airbus face mass aircraft deferrals and cancellations*, http://www.centreforaviation.com/analysis/boeing-and-airbus-face-mass-aircraft-deferrals-and-cancellations-4837, access: 9.2.2012.

De Backer, K. and Yamano, N. (2011), *International comparative Evidence on Global Value Chains,* OECD Directorate for Science technology and Industry, in Sydor, (2011), pp. 103-126.

European Commission (2010), *An Integrated Industrial Policy for the Globalisation Era. Putting Competitiveness and Sustainability at Centre Stage*, Communication COM(2010)614, 28.10.2010, Brussels.

European Commission (2010), *Trade, Growth and World Affairs*, Communication COM(2010)612, Brussels.

European Commission (2010), ´Trade as a driver of prosperity´, Commission staff working document accompanying the Communication from the Commission *Trade, Growth and World affairs*.

Feenstra, R.C. (2010), ´Offshoring in the global economy. Microeconomic structure and macroeconomic implications´, Cambridge, MA: *MIT Press.*

Feenstra, R.C. and Hanson, G. (1996), ´Globalization, Outsourcing, and Wage Inequality´, *American Economic Review*, Vol. 86, No. 2.

Forrester, J. (1961), *Industrial Dynamics*, *MIT Press*, Cambridge, MA.

Geishecker, I., (2008), ´The Impact of International Outsourcing on Individual Employment Security: A Micro-Level Analysis´, *Labour Economics*, Vol. 15, No. 3.

Görg, H., Greenaway, D. and Kneller, R. (2008), ´The economic impact of offshoring´, *GEP Research Report*, Leverhulme Centre for Research on Globalisation and Economic Policy, University of Nottingham.

Grossman, G. and Rossi-Hansberg, E. (2008), ´Trading tasks. A simple theory of offshoring´, *American Economic Review*, Vol. 98, No. 5.

Haddad, M., Harrison, A. and Hausman, C. (2010), ´Decomposing the great trade collapse: Products, prices and quantities in the 2008-2009 crisis´, NBER Working Paper 16253.

Hummels, D., Ishii, J., and Yi, K.M. (2001), ´The Nature and Growth of Vertical Specialization in World Trade´, *Journal of International Economics*, Vol. 54 No. 1.

Jabbour, L. (2010), ´Offshoring and Firm Performance: Evidence from French Manufacturing Industry´, *The World Economy*, Vol. 33, No. 3.

Jacoby, W. (2010), ´Managing globalization by managing Central and Eastern Europe: the EU's backyard as threat and opportunity´, *Journal of European Public Policy,* Vol. 17, No. 3.

Jones, R.W. and Kierzkowski, H. (1990), ´The role of services in production and international trade: A theoretical framework´, in Jones, R., and Krueger, A., (eds.), *The political economy of international trade,* Festschrift in honor of Robert Baldwin. Oxford, Basil Blackwell.

Kaminski, B. and Ng, F. (2001), ´Trade and Production Fragmentation. Central European Economies in European Union Networks of Production and Marketing´, World Bank Policy Research Working Paper, No. 2611. Washington, World Bank.

Kirkegaard J.F. (2005), ´Outsourcing and offshoring: Pushing the European model over the hill, rather than off the cliff!´, *IIE Working Paper Series*, WP05-1, Institute for International Economics.

Leibl, P., Morefield, R. and Pfeiffer, R. (2011), ´A study of the effects of backshoring in the EU´, *Proceedings of the 13th International Conference of American Society of Business and Behavioural Sciences*, available at: http://asbbs.org/files/2010/ASBBS_%20Pro-ceedings_13th_Intl_Meeting.pdf.

Levchenko, A.A. and Lewis, L.T. (2009), ´The collapse of international trade during the 2008-2009 crisis: In search of the smoking gun´, Working Papers 592, Research Seminar in International Economics, University of Michigan.

Neureiter, M. and Nunnenkamp, P. (2009.a), ´Outsourcing motives, location choice and labour market implications: an empirical analysis for European countries´, *Kiel Working Papers*, No. 1541, Kiel, Kiel Institute for the World Economy.

Neureiter, M. and Nunnenkamp, P. (2009.b), ´Modes of International Sourcing and the Competitiveness of Firms: An Analysis of European Survey Data´, *Kiel Working Papers*, No. 1558, October 2009. Kiel, Kiel Institute for the World Economy.

Ng, F. and Yeats, A. (1999), ´Production Sharing in East Asia. Who Does What for Whom and Why?´, *World Bank Policy Research Working Paper*, No. 2197, Washington, World Bank.

OECD (2004), *Information Technology Outlook*, Paris, OECD.

Olsen, K.B., (2006), ´Productivity impacts of offshoring and outsourcing: A review´, OECD Directorate for Science, *Technology and Industry STI Working Paper*, No.1, Paris, OECD, available at: http://www.oecd.org/dataoecd/16/29/36231337.pdf.

Stehrer, R., Foster, N., and deVries, G. (2012a), ´Value added and factors in trade. A comprehensive approach´, WIOD Working Paper, No. 7.

Stehrer, R., Biege, S., Borowiecki, M., Dachs, B., Francois, J., Hanzl, D., Hauknes, J., Jäger, A., Knell, M., Lay, G., Pindyuk, O. and Schartinger, D. (2012b), ´Convergence of Knowledge-Intensive Sectors and the EU's External Competitiveness', study for DG Enterprise carried out within Framework Service Contract No. ENTR/2009/033, Background Study for the *European Competitiveness Report 2011.*

Sturgeon, T.J., and Gereffi, G. (2009), ´Measuring success in the global economy: international trade, industrial upgrading, and business function outsourcing in global value chains´, *Transnational Corporations*, Vol. 18, No. 2.

Timmer, M., Erumban, A.A., Francois, J., Genty, A., Gouma, R., Los, B., Neuwahl, F., Pindyuk, O., Poeschl, J., Rueda-Cantuche, J.M., Stehrer, R., Streicher, G., Temurshoev, U., Villanueva, A. and d. Vries, G.J (2012), *The World Input-Output Database (WIOD): Contents, sources and methods,* WIOD Background document available at www.wiod.org.

UNCTAD (2004), ´The shift towards services´, *World Investment Report*, Geneva, UNCTAD.

Wagner, J. (2011), ´Offshoring and firm performance: self-selection, effects on performance or both?´, *Review of World Economics*, Vol. 147, No. 2.

Yeats, A. (1997), ´Just How Big Is Global Production Sharing?´, *World Bank Policy Research Paper*, No. 1871, Washington.

Yi, K.M. (2009), ´The collapse of global trade: the role of vertical specialization´, ´The collapse of global trade, murky protectionism, and the crisis´, *Recommendations for the G20*, Baldwin and Evenett (eds), CEPR.

ANNEX 1. THE WORLD INPUT-OUTPUT DATABASE (WIOD)

BOX 2.1 – THE WORLD INPUT-OUTPUT DATABASE (WIOD)[42]

The data used are taken from the World Input-Output Database (WIOD), which became available in April 2012 (see www.wiod.org) and was compiled within the EU Framework programme. These data provide international supply and use and input-output tables for a set of 41 countries (the EU-27, Australia, Brazil, Canada, China, India, Indonesia, Japan, Korea, Mexico, Russia, Taiwan, Turkey, the US and the Rest of World) over the period 1995–2009. It was compiled on the basis of national accounts, national supply and use tables and detailed trade data on goods and services, combining information for 59 products and 35 industries. Corresponding data at the industry level allow the splitting up of value-added into capital and labour income. For detailed information see Timmer et al. (2012).

This results in a world input-output database for 41 (including the Rest of World) countries and 35 industries, i.e. the intermediates demand block is of the dimension 1 435x1 435, plus additional rows on value-added and columns on final demand categories. The outline of such a world input-output table is presented below. Each country listed vertically sources intermediates from its own industries and from other countries' industries. Together with value-added from this country, the level of gross output is obtained. Furthermore, each country also demands products from its own economy and the other economies for final use, such as consumption and gross fixed capital formation. The horizontal view shows what each country's industries provide to industries in its own country and the other countries, and as final demand for domestic and foreign consumers. Gross output produced in one country equals the value of demand for each country's industries.

Outline of world input-output table (industry by industry)

	Intermediate use			**Final use**			
	Country A	**Country B**	**Country C**	**Country A**	**Country B**	**Country C**	
Country A	A sources from A	B sources from A	C sources from A	A demands in A	B demands in A	C demands in A	GO in A
Country B	A sources from B	B sources from B	C sources from B	A demands in B	B demands in B	C demands in B	GO in B
Country C	A sources from C	B sources from C	C sources from C	A demands in C	B demands in C	C demands in C	GO in C
Value added	VA in A	VA in B	VA in C				
Gross output	GO in A	GO in B	GO in C				

[42] The WIOD project was funded by the FP7 SSH research programme.

ANNEX 2. THE EUROPEAN MANUFACTURING SURVEY

The European Manufacturing Survey (EMS) investigates technological and non-technological innovation in European industry. It focuses on fields such as technical modernisation of value-adding processes, the introduction of innovative organisational concepts, including international offshoring and outsourcing of production and R&D activities, and new business models for complementing the product portfolio with innovative services. The questions on these indicators have been agreed upon in the EMS consortium and are surveyed in all the participating countries. Additionally, some countries ask questions on specific topics. The underlying idea of the question design is to have a common core of questions asked consistently over several survey rounds; to modify other common questions in a survey round in order to correspond to actual trends, problems and topics; and to provide space for some country- or project-specific topics.

In most countries, EMS is carried out as a paper-based survey at company level. In order to prepare for multinational analyses, the national data undergo a joint harmonisation procedure.

The latest survey – EMS 2009 – was carried out in 13 countries. Information on the utilisation of innovative organisation and technology concepts in the generation of products and services, as well as performance indicators such as productivity, flexibility and quality was collected for more than 3,500 companies from the manufacturing sector in these countries.

The dataset employed in this report was compiled using those country surveys that included questions on the companies' production relocation behaviour, conducted in nine European countries. It includes the Austrian, Croatian, German, Dutch, Slovenian, Spanish and Swiss datasets collected in 2009 and 2006. The Danish and Finnish datasets are only available for the 2009 round, as the respective partners joined the EMS network after 2006. While most partners sent out their questionnaires by mail, the Finnish and Danish data were collected using an online questionnaire. Those asked to fill in the questionnaires were the production managers or CEOs of the manufacturing firms contacted.

This report focuses on actual trends and developments in production relocation activities of European manufacturing companies in the following industrial sectors: chemicals/chemical products (NACE 24), machinery and equipment (NACE 29), electrical and optical equipment (NACE 30–33) and transport equipment (NACE 34–35).

Table A.2.1 below provides an overview of the sample, broken down by sector, firm size and country distribution for the EMS surveys 2006 and 2009.

Table A.2.1 – Sample of surveyed firms, by firm size, country and sector, 2006 and 2009

Firm size	2006		2009	
	N	**%**	**N**	**%**
Up to 49	435	29.96	476	33.36
50 to 249	669	46.07	663	46.46
250 and more	348	23.97	288	20.18
Sector	N	%	N	%
Chemicals/chemical products [(a)]	170	11.71	180	12.61
Machinery & equipment [(b)]	617	42.49	628	44.01
Electrical & optical equipment [(c)]	537	36.98	507	35.53
Transport equipment [(d)]	128	8.82	112	7.85
Country	N	%	N	%
Germany	847	58.33	635	44.5
Austria	89	6.13	102	7.15
Switzerland	299	20.59	303	21.23
Netherlands	89	6.13	116	8.13
Denmark			143	10.02
Croatia	40	2.75	24	1.68
Finland			42	2.94
Spain	56	3.86	32	2.24
Slovenia	32	2.2	30	2.1
Total	1452		1427	

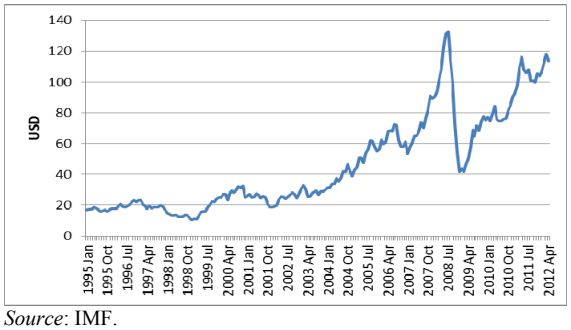
Note: (a) NACE 24, (b) NACE 29, (c) NACE 30–33, (d) NACE 34–35.

Source: European Manufacturing Survey 2006, 2009.

CHAPTER 3. ENERGY CONTENT IN EXPORTS AND ECO-INNOVATION

The prices of energy commodities, particularly oil, have risen sharply in the last decade (see Figure 3.1). Some of the causes are structural, such as globalisation and the increasing demand from developing countries, limited fossil-fuel resources and an overall increase in exploration costs, and these tend to lead to permanent energy-price increases. Cyclical factors such as the considerable rigidity of energy demand in the short term; the failure to fully anticipate its fast growth, as shown by preceding low levels of exploration investment and spare capacity; or concerns related to geopolitical events were often the major causes behind some of the recurrent energy price hikes and volatility observed. In addition there has been a significant increase in financial investment flows into energy commodity derivative markets. While the debate on the relative importance of the multiple factors influencing energy prices is still open, it is clear that energy commodity markets have become more closely linked to financial markets.

Figure 3.1 – Crude oil spot prices (USD/barrel)



Source: IMF.

Rising energy price and volatility levels have a series of potential effects on businesses, production costs, economic activity or external accounts and competitiveness. These effects will be larger for countries or sectors that are less energy-efficient, more specialised in energy-intensive products or more energy-dependent (e.g. countries more heavily dependent on imported fossil fuels).

This chapter studies the energy content in exports and energy-efficiency trends over the past 15 years in the context of key economic developments such as the globalisation of industrial activities, investments in energy-efficient technologies and eco-innovation. Their impact on competitiveness is analysed at country, sector and firm level. Section 3.2 analyses the developments and the improvements in overall energy productivity and investments in more energy-efficient technologies at an international level. Section 3.3 analyses the interplay between the trends in the energy content in exports and globalisation, their impact on competitiveness and the prominent role played by industry and services. This is a novel integrated analysis (mapping) of energy use per sector at domestic and global levels based on the World Input Output Database (WIOD) made available recently. Section 3.4 analyses the evidence for the adoption and development of eco-innovations by EU firms and how this translates into performance and competitiveness, focusing on energy-efficiency process technologies and products. Section 3.5 draws conclusions.

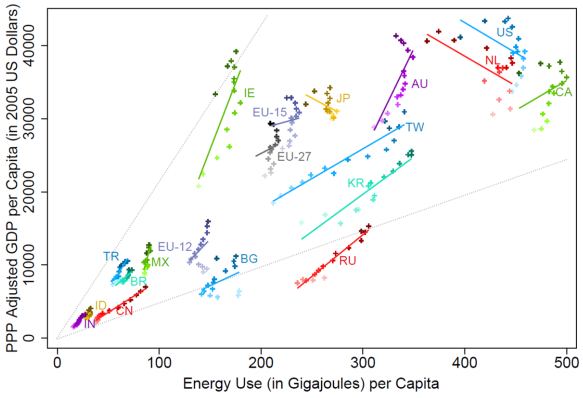
3.1. ENERGY EFFICIENCY FROM AN ECONOMIC PERSPECTIVE

This section provides a short analysis of the global trends in energy efficiency in the last 15 years using the World Input Output Database (WIOD). A cross-country comparison of energy-efficiency performance makes it possible to identify and introduce such related key economic developments as the internationalisation of production chains or investments in energy-efficient technologies, underpinning the more detailed analyses (at country, sector and firm level) that follow in the other sections.

The WIOD accounts for approximately 85 percent of the world's production. The world input-output data is reported for 41 countries (the EU-27 countries, 13 other major world economies and the rest of the world) and 35 sectors (NACE rev. 1) over the period 1995-2009 (see Box 2.2 in Chapter 2 of this report). Most importantly for this chapter, the economic data is linked to environmental accounts and energy use. The WIOD database considers the use-side of energy and reports 'gross energy use' covering the transformation of primary energy into other forms of energy like electricity and heat, as well as the final use of energy. Energy is reported in terajoules of crude-oil inputs. As a general rule, throughout this chapter the other economic variables used to compute energy-efficiency indicators and ratios are first transformed into constant prices.

Figure 3.2 shows the patterns of energy consumption and economic output (per capita) for the European Union and its most important competitors (as well as separately for a selection of Member States: Bulgaria, Ireland and the Netherlands). Countries' per capita GDP are plotted against the amount of energy per capita that was used to produce per capita GDP (PPP adjusted GDP was considered to be closer to the real level of economic activity and output). The figure also shows energy-efficiency improvements over time. Country-level observations for 1995 are indicated by light colours. The more recent an observation is, the darker it is plotted.

Figure 3.2 – GDP and Energy Use per Capita (1995 – 2009)



Note: Bulgaria (BG), Ireland (IE), United States (US), Japan (JP), China (CN), (South) Korea (KR), Taiwan (TW), Canada (CA), Australia (AU), Turkey (TR), Brazil (BR), India (IN), Mexico (MX), Indonesia (ID), and Russia (RU).

Source: WIOD.

A measure of energy productivity (a crude measure of energy efficiency) is indicated by the slope of grey dotted lines. The steeper the line the higher the energy productivity, meaning that less energy per capita is used to produce a unit of GDP per capita. In 2009, energy productivity was highest in Ireland and lowest in Russia (comparing the two grey dotted lines at their 2009 values, using one gigajoule of energy one person in Ireland is able to produce goods and services with a value of USD 215, 4 times more than in Russia — USD 49 — using the same amount of energy). It has to be noted that using purchasing power parities rates (instead of exchange rates) increases the value of GDP — and therefore measured energy productivity — in countries with a low cost of living. Overall PPP adjustment narrows the gap in measured energy productivity between countries and regions, but leaves the trends unchanged.

Energy efficiency improved overall in the period 1995-2009 in advanced economies (the decline in measured energy productivity in 2008 and 2009 in some countries can to a large extent be explained by cyclical low capacity utilisation associated with the economic crisis). The European Union and Japan reinforced their lead in terms of energy productivity. EU-12 countries as a whole significantly narrowed their gap in energy efficiency vis-à-vis the EU-15 (Bulgaria is one of the EU Member States with the lowest energy-productivity levels). Conversely, in countries like China, India, Taiwan and Korea energy-efficiency improvements from 1995 until 2009 are much less perceptible.

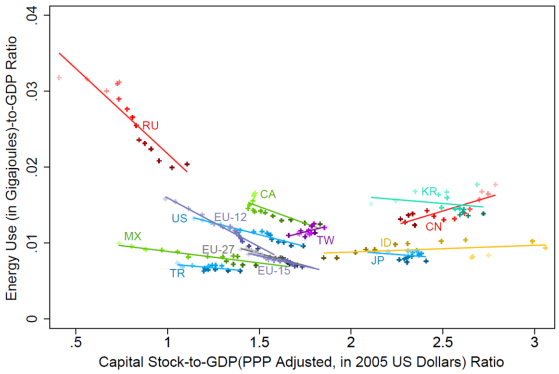
Energy is used in practically all production processes and the importance of energy efficiency as a competitiveness factor is growing over time with globalisation. The globalisation of industrial activities tends overall to exert pressure to improve energy efficiency and speed-up the convergence of energy productivity in industry across countries. As result, significant economic changes and differentiated impacts on the competitiveness of different countries and sectors are to be expected. Section 3 analyses the changes in the energy content in exports in the context of the increasing global trade in intermediates and the internationalisation of production networks.

Rising energy prices and volatility levels were major underlying drivers for the changes observed in energy use and the overall improvement in energy productivity. Permanent increases in energy prices and volatility levels lead to significant economic changes, in particular in terms of energy-saving efforts and investments in energy-efficient technologies. The search for energy savings includes choosing products and services with less energy content and more energy-efficient production technologies. A prominent example is the development and use of more energy-efficient consumer durables and capital goods. Typically, they are the result of investment decisions comparing higher initial capital costs with expected future savings in energy operating costs. This example also provides a straightforward illustration of the well-known limitations in energy-efficiency the improvements in the short run (due, for example, to the long lifetimes of the capital equipment) versus a higher degree of responsiveness in the medium and long run[43].

[43] See e.g. Berndt and Wood (1975, 1979), Griffin and Gregory (1976), Pindyck (1979), Rosenberg (1994), Atkeson and Kehoe (1999) or Gillingham et al. (2009).

The WIOD data is now linked to country-level data from the Penn World Tables 7.0.[44] Figure 3.3 plots energy use against the countries' physical capital stock (both energy use and the physical capital stock are scaled by the GDP). The y-axis reports the countries' energy intensity, meaning the quantity of energy (in gigajoules) needed to produce 1 US dollar (at 2005 prices) of GDP. The x-axis indicates capital intensity, i.e. the dollar value of the capital stock of a country that was needed to produce 1 US dollar of GDP. Only a selection of countries is presented for the sake of illustration (Australia, India, and Brazil are no longer included in the figure due to visual overlap). Again, country-level observations for 1995 are indicated by light colours. The more recent an observation is, the darker it is plotted.

Figure 3.3 – Capital Stock and Energy Use per GDP (1995 – 2009)



Source: WIOD, Penn World Tables 7.0.

China has reduced both energy use and capital use to produce one dollar of GDP over time. In other countries (including also the European Union), a shift towards less energy intensive and more capital-intensive production tends to be observed. This overall trend of the substitution of energy by capital reflects the choice at aggregate level for more energy-efficient technologies embodied in capital goods following the overall increase in the international price of energy observed in the period up to 2008 (see Figure 3.1).

The aggregate analysis just made applies similarly at the sectoral, firm or household levels. Permanent increases in energy prices are one of the factors exerting strong pressure for the adoption of more energy-efficient technologies, the replacement of older capital equipment and the attraction of new entrants (Linn, 2008), as well as inducing the development of energy-efficiency eco-innovations over the medium and long term. Popp (2002) identified increasing prices of energy in the oil crisis as the significant driver of energy-saving inventions (energy-related patent applications appear to respond with a lag). Newell et al. (1999) provide evidence of price-induced eco-innovation in new air conditioners. Jaffe and Stavins (1995) find noticeable impacts on the adoption of energy-efficient technology for buildings. Energy efficiency and eco-innovation can be promoted through a broad range of public policies and instruments such as regulations and standards, eco-design, eco-labels, energy taxes and subsidies. Evidence on energy efficiency and eco-innovations adoption and its impact on the competitiveness of EU firms are analysed in section 3.5 (using firm-level data from the European Community Innovation Survey).

3.2. ENERGY CONTENT IN EXPORTS AND GLOBALISATION

Increasing global competition and integration of production chains (involving more and more economic activities and tasks and covering new countries and geographical areas) are developments with far-reaching social, political and economic consequences. Global competition and off-shoring have an enormous potential and offer new opportunities in terms of the efficient exploitation of existing technologies and resources. The development and adoption of eco-innovations tend also to be fostered by global competition[45]. As a result, greater energy-efficiency improvements can be expected within and across firms, sectors and countries, helping to achieve environmental and climate change goals world-wide.

However, the quest for economic efficiency does not necessarily translate into energy efficiency and related environmental efficiency. Market failures (in energy or other markets) or regulatory failures may stand in the way and impair the simultaneous achievement of eco-efficiency, in particular on a

[44] The Penn World Table data offer additional information on gross domestic product (GDP, in 2005 US dollars and purchasing power parity (PPP) adjusted) as well as the share of GDP that is saved. The capital stock is constructed using the perpetual inventory method (see Caselli 2005). A country's capital stock in period t is $K(t) = (1 - \delta) \cdot K(t-1) + I(t)$, where I(t) is investment (savings) and δ is the depreciation rate that is assumed to equal 10 percent for each country and year. The starting value of the capital stock is constructed as $K(0) = I(0) \cdot (1 + g)/(g + \delta)$, where g is the average growth rate of investment in the first 5 years. A cross check with the Extended Penn World Tables, where capital data is reported, although only until 2003, indicates a correlation between the calculated and the real capital stock of 99.71 per cent.

[45] Brunnermeier and Cohen (2003) find that international competition is an important determinant of environmental innovations, see also Section 5 and ECR 2010, Chapter 3.

world-wide basis. For example, various stages of production may be offshored to less energy-efficient countries or firms as a result of distorting taxes or subsidies on energy products. Existing plants in pollution-intensive industries can be relocated to regions with less stringent or unenforced regulations. Some evidence for this is presented by Henderson (1996) (see also List, Millimet, Fredriksson and McHone (2003); a survey of this strand of the literature is offered by Brunnermeier and Levinson (2004)).

A fully-fledged analysis of these complex issues is beyond the scope of this chapter. This section merely investigates the relationship between the internationalisation of production and changes in the energy content in exports, focusing on the EU, US and Japan. The main interest is in analysing (mapping) the energy use for exports in terms of its sources: domestic intermediates versus foreign intermediates (focusing on the energy content of exports — via embodied energy in intermediate imports). The role and different impacts on manufacturing and service exports are also analysed. The contribution of improved technical efficiency in the manufacturing sector to overall energy efficiency and competitiveness is also briefly analysed using a standard decomposition method.

3.2.1. Energy content in total exports

Input-output tables and in particular the WIOD database (which, as mentioned, contains detailed information on international and inter-industry transactions, for N=35 industries and C=41 economies – including the rest of the world – from 1995 to 2009) make it possible to trace the source and the energy content of goods and services produced in vertically-integrated industries and cross-border production networks. This provides an integrated global framework for the analysis of energy use that does not suffer from the limitations of standard sectoral or purely domestic input output data which do not take the interlinkages between sectors/countries into account.

Suppose there was interest to trace the energy inputs (per sector and country) and to calculate the energy content of a German car exported to China. The energy (e.g. electricity) used directly in the car-manufacturer's plant would be one element. To that must be added the series of (indirect) energy consumptions embodied in the car components purchased by the manufacturer (e.g. the electricity used in the mining industry in Australia or in the production of the intermediates purchased from the electronics industry in Germany or other countries). The inverse Leontief matrix (from the input-output tables) can be used to calculate the total energy inputs (direct and indirect, in all rounds of production of the car and car components).

With data on energy use by industry, the Leontief inverse matrix can be pre-multiplied by the energy coefficients vector (i.e. energy used per unit of output) and post-multiplied by the vector of exports. This then allows a separation of the energy directly and indirectly used by a partner country to produce another country's exports and its domestic energy use. The calculation of energy-input coefficients (i.e. energy use per unit of gross output) was performed using deflated gross output series. Gross output was deflated to constant 1995 prices, using industry-level price indices for each country.

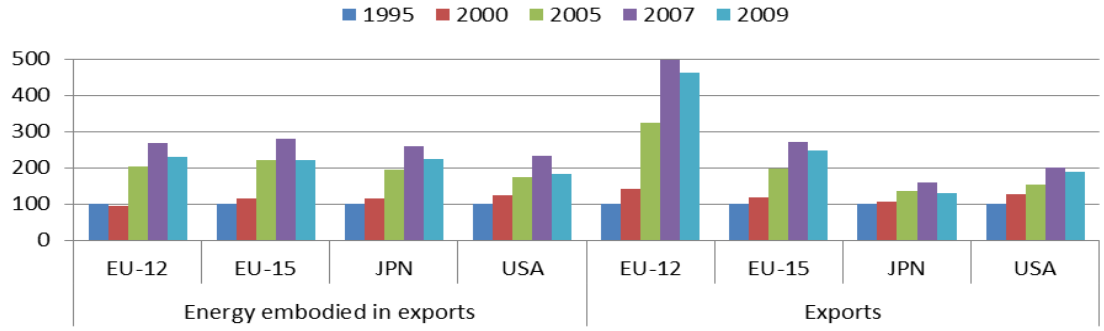
The energy embodied in country r exports (measured in terajoule, TJ) is given by

$$e'(I-A)^{-1}x$$

where e denotes the NCx1 vector of energy use per unit of gross output (measured in constant prices, the prime denotes transposition), $(I-A)^{-1}$ is the inverse Leontief matrix and x the NCx1 vector with country r exports (see Box 2.1 in Chapter 2 of this report).

The left-hand panel in figure 3.4 shows an index of the energy embodied in exports for EU-15, EU-12, Japan and the US, over the period 1995-2009. Total energy inputs in exports increased globally in the four economies in the pre-crisis period (between roughly 130% in the US and 180% in the EU-15 up to 2007). In 2008-2009 the energy embodied in exports declined significantly and globally as a result of the economic crisis and the collapse in worldwide trade. The impact of the crisis and the sudden reversal of the long term upward trends in global trade can be seen in the right-hand panel in Figure 3.4 (presenting the underlying trade trends in terms of the index for total exports, for each of the four economies over the whole period 1995-2009).

Figure 3.4 – Indexes (1995=100): total energy embodied in exports (left panel) and total exports (right panel), 1995–2009



Source: WIOD.

The growth of total exports was higher in the EU overall (in particular the EU-12) than in Japan and in the US over the period analysed. The significant increase in total exports in the EU-12 economies as a whole is to a large extent due to their relatively high and increasing degree of vertical specialisation (e.g. in their role as providers of intermediates namely to EU-15, as documented in section 2.3.2 of the second chapter in this report, see e.g. Figure 2.1). This fact is corroborated by the much less than proportional growth rate in the energy embodied in exports (observed in the left-hand panel of Figure 3.4) for the EU-12.

A slight opposite trend occurs in Japan, for which the increase in energy inputs was slightly higher than the growth in the underlying total exports. In part, this may be due to the specialisation of the Japanese economy and eventually to its relatively high degree of vertical specialisation and its integration links with the Chinese economy (see, for example, Table 3.1 below or Figure 2.2. in Chapter 2 of this report). For the other two advanced economies (the EU-15 and the US), the underlying growth in total exports has been accompanied by a (broadly) a more proportional variation in the energy embodied.

This can be observed in Figure 3.5, presenting the energy embodied per unit of total exports for the four economies over the same period. In the left-hand panel, the marked decline in the total energy inputs per unit of exports in the EU-12 (and only to a much smaller extent in the EU-15) contrasts with the increase in the energy content in Japanese exports and the relative stagnation observed in the US for the whole period. The EU-15 and Japan lead in terms of the lowest energy content in exports but the catching-up achieved by the EU-12 over the period is noticeable.

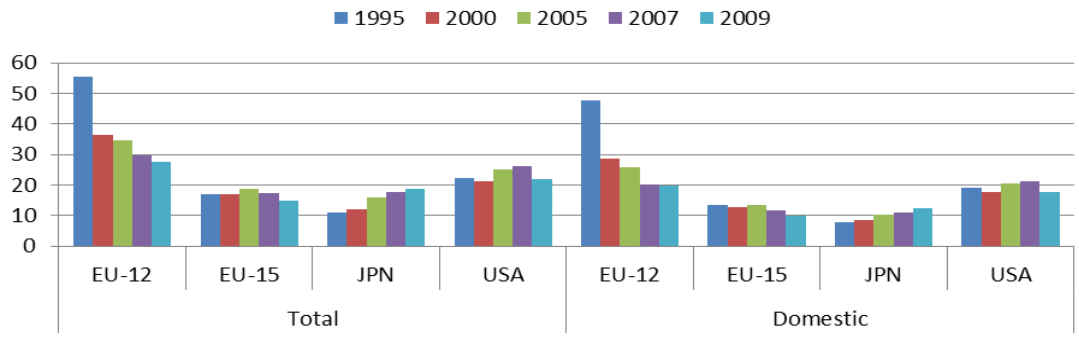
The right-hand panel in Figure 3.5 depicts the energy embodied per unit of exports that is sourced domestically in each of the four economies (i.e. the sum of the energy incorporated by each of the 35 domestic sectors in all the various implicit rounds, stages of production and embedded economic activities in the achievement of the total exports of goods, services, raw materials and intermediates).[46].

[46] The energy embodied in exports that is sourced domestically is given by

$$(e^r)'(I-A)^{-1}x$$

where e^r is the vector of domestic energy use per unit of gross output (i.e. all elements in the NCx1 vector e are replaced by zero, except for the country r, - N=35 sector-, elements, see Box 2.1 in Chapter 2 of this report).

Figure 3.5 – Energy embodied (TJ) per unit of exports (USD million), 1995–2009



Source: WIOD.

The energy embodied per unit of exports that is sourced domestically is dominant in all four economies (particularly in the US, given the similarity in size of the respective columns (bars) in the two panels in Figure 3.5). Over time, the domestic energy embodied in exports and the overall energy content tend to move in parallel to a large extent but some differences can be noticed. For the EU-15 and EU-12, for instance, the observed drop in the domestic component of the energy content in exports is more pronounced than the decline in the total energy embodied, reflecting the rising importance of foreign sources in the energy embodied in exports. As a result, the EU-15 caught up Japan in 2007 (and outperformed it in 2009) in terms of the lowest domestic energy content in exports.

One of the effects of the increasing cross-border integration of production networks can be seen in the rising importance of foreign economies as a source of the energy inputs embodied in exports. Figure 3.6 presents the share of foreign energy inputs embodied in exports[47]. The energy content in exports sourced from foreign countries rose continuously in all four economies up to 2007, but at a slower pace in Japan and the US. In the US, the domestic component is more important, representing more than 80% of the overall energy content in exports, partly reflecting the USA's lower dependence in terms of imported fossil fuels compared to the other three economies overall (in 2009 the domestic energy shares were 72%, 66% and 67% in the EU-12, EU-15 and Japan, respectively).

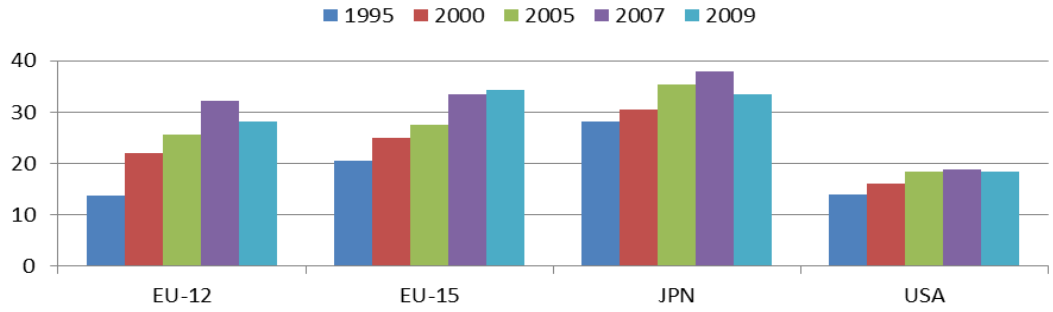
This is unlike the pattern observed in Figure 2.1 (Chapter 2 of this report) in which the EU-12 had a higher level of import content in exports relative to the EU-15, Japan and the US (the reasons are discussed in Chapter 2, namely the openness of the EU-12 — being a group of small and medium-sized countries — and their vertical-integration links in particular with the EU-15). This contrasts with broadly identical levels of foreign-energy content in exports for the EU-15 and EU-12 (and Japan in the later years) observed in Figure 3.6. Another distinctive feature is apparent in Table 3.1. It concerns the greater weight overall of energy-rich economies (such as some countries in BRII and ROW) in terms of foreign-energy content relative to import content in exports (see also subsection 3.3.3 and Figure 3.16 below).

Table 3.1 presents a detailed breakdown of the sourcing structure of embodied energy inputs in exports (the domestic component is highlighted in grey). The changes over time and the geographical patterns follow expectations for each of the four economies. In the EU-12, the considerable reduction (by almost 20 percentage points in the period 1995-2007) in the domestic share of energy embodied in exports is mirrored in the large increases in the weight of traditional trade and energy supplier partners (like the EU-15, BRII — Brazil, Russia, India and Indonesia — and the Rest Of the World — ROW) and China (and smaller increases in the shares of other trade partners). In the period 1995-2007, all EU-12 trade partners in Table 3.1 steadily increased their shares of the energy embodied in EU-12 exports (except Mexico and the US in 2005).

[47] The difference between total and domestic energy embodied in exports corresponds to energy sourced from other countries (e.g. energy embodied in intermediate imports) and therefore the share of foreign energy embodied in exports is calculated as

$$\frac{(e-e^r)'(I-A)^{-1}x}{(e)'(I-A)^{-1}x}$$

Figure 3.6 – Share of foreign energy embodied in exports, (percentage 1995–2009)



Source: WIOD.

Table 3.1 – Geographic (source) structure of energy embodied in exports (1995–2009, share in percentage, domestic source highlighted in grey)

	EU-12					EU-15				
	1995	**2000**	**2005**	**2007**	**2009**	**1995**	**2000**	**2005**	**2007**	**2009**
BRII	5.0	6.6	6.8	8.4	6.4	3.7	4.0	6.0	7.4	6.8
Canada	0.1	0.2	0.3	0.4	0.3	0.7	0.8	0.7	0.8	0.7
China	0.3	1.1	2.9	4.7	6.1	1,6	2.2	3.4	4.8	6.5
EU-12	86,2	78.0	74.4	67.7	71.7	2.4	2.2	2.5	2.7	2.8
EU-15	4.5	6.9	7.8	8.8	7.1	79.4	75.0	72.4	66.5	65.8
Japan	0.1	0.3	0.4	0.5	0.4	0.4	0.6	0.5	0.6	0.6
S. Korea	0.1	0.3	0.5	0.8	0.8	0.3	0.6	0.6	0.8	0.8
Mexico	0.0	0.1	0.1	0.1	0.1	0.2	0.3	0.3	0.3	0.3
USA	0.5	1.3	1.0	1.3	1.1	2.3	3.1	2.6	2.9	2.9
ROW	3.2	5.3	5.8	7.3	6.0	9.0	11.3	11.0	13.3	12.8

	Japan					USA				
	1995	**2000**	**2005**	**2007**	**2009**	**1995**	**2000**	**2005**	**2007**	**2009**
BRII	4.4	4.7	5.2	6.1	4.7	1.4	1.8	2.4	2.4	2.1
Canada	0.9	0.7	0.5	0.5	0.4	2.3	2.6	2.7	2.5	2.1
China	3.1	4.0	7.6	7.9	8.5	1.6	1.9	3.4	3.7	4.7
EU-12	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.3	0.2	0.2
EU-15	2.1	2.0	2.1	1.8	1.3	1.7	1.9	2.2	2.0	1.6
Japan	71.9	69.5	64.7	62.1	66.6	0.6	0.6	0.5	0.5	0.4
S. Korea	2.4	3.2	2.8	2.4	1.7	0.5	0.6	0.6	0.7	0.6
Mexico	0.1	0.2	0.1	0.2	0.1	0.6	0.8	1.0	1.0	1.2
USA	2.9	3.3	2.6	2.5	1.6	86.0	83.9	81.5	81.2	81.5
ROW	11.9	12.2	14.1	16.3	14.9	5.1	5.6	5.5	5.7	5.6

Source: WIOD. Note: BRII denotes Brazil, Russia, India and Indonesia, ROW-Rest of the world.

The domestic proportion of the energy content in EU-15 exports decreased steadily over the whole period (from 4/5 in 1995 to 2/3 in 2009) reflecting the increasing weights of the BRII economies, the ROW and China. In 2009, China's share of energy embodied in EU-15 exports was already more than twice the — relatively stable — share accounted for by traditional trade partners like the EU-12 or the US. The other trade partners listed in the table have smaller shares that increased slightly overall or tended to remain relatively stable.

The increased importance of China as a source of energy content in exports globally is particularly

striking in the case of Japan (accounting for more than 8% of the energy content in total exports in 2009). The increase in China's share, and to a smaller extent that of the ROW and the BRII economies, almost compensates for the reduction in the domestic share in the energy content in Japanese exports in the period 1995-2007. The shares of other important Japanese trading partners like South Korea and the US remained fairly stable or decreased only slightly in the period 1995-2007.

The US maintained a relatively higher domestic share of the energy content in exports and relatively lower shares for typical energy-sourcing countries within the BRII and the ROW, partly reflecting the US's lower dependence in terms of imported fossil fuels compared to overall the EU-15, EU-12 and Japan. China has comparatively a smaller share of the energy embodied in US exports and Canada has a more prominent weight in the US (relative to the EU-15, EU-12 and Japan).

The recent crisis together with its impact on global trade, in particular for industries with more developed cross-border production networks, led to a halt and in some cases a reversal of the previous trends. Overall, the domestic content of energy embodied in exports started rising at the expenses of the foreign content for the majority of trade partners. The exception is China, which continued to increase its share for the four economies analysed, squeezing the shares of other foreign economies. In fact, China is the single economy whose share increased more over the whole period for all the four economies analysed (China's share increased by 5 percentage points or more for Japan, the EU-12 and EU-15 and by 3 percentage points in the US in the period 1995-2009).

These developments are to a great extent the result of the globalisation of production and underlying vertical-specialisation trends observed in terms of the import content of exports in the second chapter of this report (see, for example, Table 2.2). The analysis suggests that, along with increasing globalisation, the EU economies (as a whole) have been able to export more and at the same have reduced the energy embodied in their exports, in particular the part that is sourced domestically. Overall, the EU economies have been leading (relative to Japan and the US) in the reduction of the energy content per unit of exports and in the global trends towards the increasing weight of foreign-energy inputs in the total energy embodied in exports. Services and manufacturing exports have played a central role in this process. This is the subject of the analysis in the next subsection.

3.2.2. Energy content in manufacturing and service exports

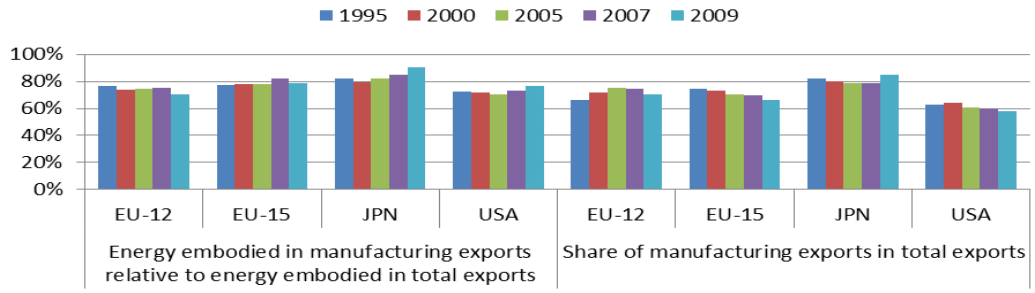
Manufacturing transforms primary energy inputs into final energy products and uses energy in the transformation of materials into products; many manufacturing sectors are at the forefront of the internationalisation of production networks.

Figure 3.7 highlights the importance of manufacturing in terms of exports and how this is translated into the energy embodied in exports for the four economies being analysed. The right-hand panel shows that manufacturing exports accounted in the years 2007-2009 for around 80% of total exports in Japan, 70% in the European economies and 60% in the US. The share of manufacturing in total exports has been falling in all economies, except for the EU-12 (reflecting the vigorous increase in manufacturing exports; to a great extent, this is the result of the increasing vertical integration of the EU-12 documented in Chapter 2 of this report). A number of manufacturing industries (e.g. producing durable goods) were severely hit during the most recent crisis and the share of manufacturing in total exports dropped in all economies in 2007-2009 except for Japan, for which the exports of services declined more than manufacturing exports during the crisis, see Figure 3.8 below.

Manufacturing activities involve transforming a range of material inputs into products, so manufacturing exports generally tend to have a higher energy content than total exports. The share of energy embodied in manufacturing relative to total exports (in the left-hand panel in Figure 3.7) is higher overall than the weight of manufacturing in total exports. This is true for all four economies, except for the EU-12 in 2009 and Japan in the years 1995, 2005, cases in which the shares in the left-hand and right-hand panels in Figure 3.7 are roughly identical.

Moreover, the energy embodied in manufacturing exports as a share of the energy embodied in total exports remained broadly stable (or even increased slightly in some sub-periods and for the whole period 1995-2009) while at the same time the share of manufacturing exports fell overall. The exception was the EU-12, for which manufacturing as a whole outperformed the overall reduction of energy content in total exports.

Figure 3.7 – Energy embodied in manufacturing exports relative to total energy embodied in total exports (left panel) and share of manufacturing exports in total exports (right panel), 1995–2009

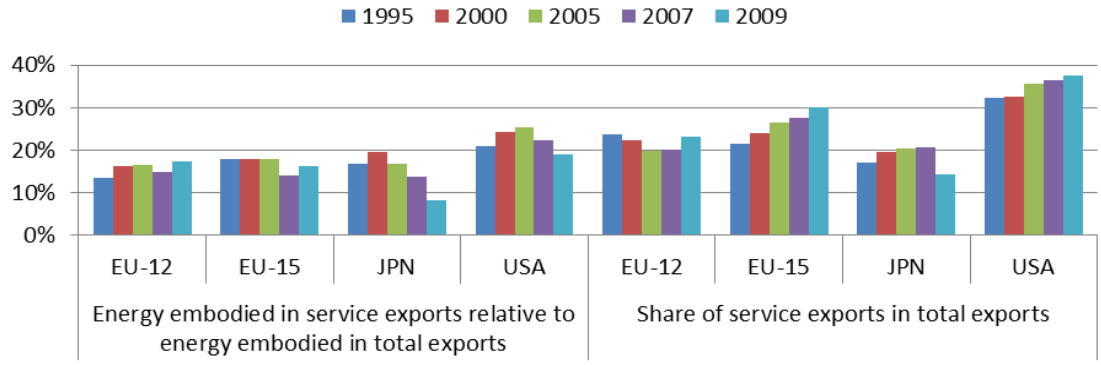


Source: WIOD.

Figure 3.8 illustrates the growing importance of service exports and their overall lower energy content relative to manufacturing exports. The right-hand panel shows that the share of services in total exports has been growing for all economies in the last 15 years, except in the EU-12 (for which manufacturing remained the dominant driver of export growth). Altogether, manufacturing and services accounted for more than the 95% of total exports for all four economies (the highest share is reached in Japan, 99% of total exports, see Table 3.4).

The growth of service exports was particular strong in the European economies (+320% in the EU-12 and +250% in the EU-15 in the period 1995-2007). In the EU-15, the growth of manufacturing exports was much lower (around +150% in the period 1995-2007) and as a result the share of services in total exports rose from 20% in 1995 to close to 30%. In 2007, the share of services accounted for more than 1/3 of total exports in the US and for around 20% in the EU-12 and Japan. Japan has a much lower share than the US and the EU-15 in services such as financial intermediation and Renting and Machinery and Equipment and other business services (including ICT and R&D-related services). During the recent crisis, exports dropped considerably in a number of service sectors (including more cyclical-related sectors such as water transport and wholesale trade and commission trade, NACE codes 61 and 51, respectively), leading to the observed fall in the share of services in total exports in Japan.

Figure 3.8 – Energy embodied in service exports relative to total energy embodied in total exports (left panel) and share of service exports in total exports (right panel), 1995–2009



Source: WIOD. Note: Service includes the sectors NACE rev. 1 codes 50 to P.

Not surprisingly, Figure 3.8 shows that service exports as a whole tend to have a relatively lower energy content (the share of energy embodied in service exports relative to total exports (left-hand panel) is lower overall than the weight of services in total exports (right-hand panel)). Moreover, energy embodied in service exports relative to total exports decreased (or remained broadly stable in the case of EU-12 and US) while the share of service exports increased overall (except in the crisis period 2007-2009 in the case of Japan and for the EU-12, where growth in manufacturing exports dominated the whole period).

Table 3.2 presents energy embodied per unit of exports (panel A) and the share of the energy inputs that is sourced from foreign countries (panel B) for manufacturing, services and total exports (in the

latter case, a convenient recast of the data in Figures 3.4 and 3.6 above).

Panel B shows a steady rise in the share of foreign-energy inputs in the total energy embodied in exports (both manufacturing and services up to 2007). Partly reflecting a higher degree of cross-border production linkages (see Chapter 2 of this report, Figure 2.2), manufacturing has a higher share of foreign energy content relative to services (except for the EU-12 in 1995). However, the gap between the share of foreign energy in manufacturing and services narrowed, in particular in the EU-15. The input-output linkages between services and manufacturing explain why the differences between the two sectors are much smaller in terms of foreign-energy content than in import content. Services source many of their more energy-intensive inputs from manufacturing, some of which are in turn directly and indirectly sourced from foreign countries.

Japan leads over the period 1995-2007 in terms of the highest content of foreign energy inputs in exports. The US has overall a larger share of domestic-energy inputs in exports, particularly in services.

Figure 3.9 plots the changes (in the period 1995-2007) against the level of the energy content in exports in 2007 (highlighting the main trends in the data presented in panel A of Table 3.2). Manufacturing is depicted by the larger bubbles. The EU-15 and Japan lead in terms of having the lowest energy content in services and manufacturing exports but the energy content in manufacturing exports increased in the period 1995-2007, particularly in Japan. The EU-15 kept the energy content in total exports broadly constant in the period up to 2007 mainly thanks to a reduction in the energy embodied in service exports (together with their greater and increasing weight in total exports relative to Japan, see also Figure 3.8).

Table 3.2 – Energy embodied (TJ) per unit of exports (USD million) (left panel) and share of foreign energy embodied in exports (right panel) 1995–2009

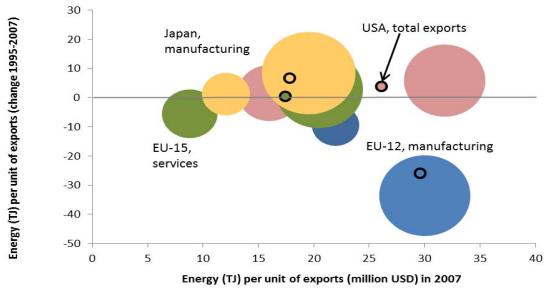
	(A) Energy inputs per unit of exports					(B) Share of foreign energy inputs				
	1995	2000	2005	2007	2009	1995	2000	2005	2007	2009
					Manufacturing (NACE D)					
EU-12	63.6	38.0	34.8	30.0	27.3	14%	23%	29%	36%	33%
EU-15	17.6	18.2	20.8	20.5	17.8	23%	27%	29%	34%	35%
Japan	11.1	12.1	16.7	19.5	20.1	29%	31%	36%	38%	34%
USA	25.9	23.8	29.0	31.8	28.6	16%	19%	21%	20%	20%
					Services (NACE 50 to P)					
EU-12	31.4	26.7	29.1	22.0	20.8	16%	22%	19%	26%	22%
EU-15	14.3	12.7	12.6	8.8	8.1	13%	19%	22%	32%	33%
Japan	10.9	12.1	13.1	12.1	10.8	26%	30%	34%	35%	30%
USA	14.4	15.8	17.9	16.0	11.0	8%	9%	12%	14%	15%
	.Total exports (NACE A to P)									
EU-12	55.5	36.6	34.8	29.6	27.6	14%	22%	26%	32%	28%
EU-15	17.0	16.9	18.8	17.4	14.9	21%	25%	28%	33%	34%
Japan	11.0	12.1	15.9	17.8	18.8	28%	30%	35%	38%	33%
USA	22.2	21.3	25.2	26.1	21.8	14%	16%	19%	19%	19%

Source: WIOD.

Following its integration in cross-border production networks and strengthening of its vertical specialisation, the EU-12 achieved a noticeable reduction and catching-up in the energy content of The energy content in the US increased both for manufacturing and service exports in the period 1995-2007 (in a broadly similar trend to Japan's). manufacturing exports. The EU-12 reached the same energy content in manufacturing exports as the US in 2007. The reduction in the energy content in service exports was comparatively much smaller. The higher energy content in US exports vis-à-vis the EU-15 and Japan is less pronounced in services. Combined with a larger share of service exports in

the US, this mitigates the gap in energy embodied per unit of US total exports.

Figure 3.9 – Energy content in exports (for manufacturing, services and total exports): change 1995-2007 versus level in 2007

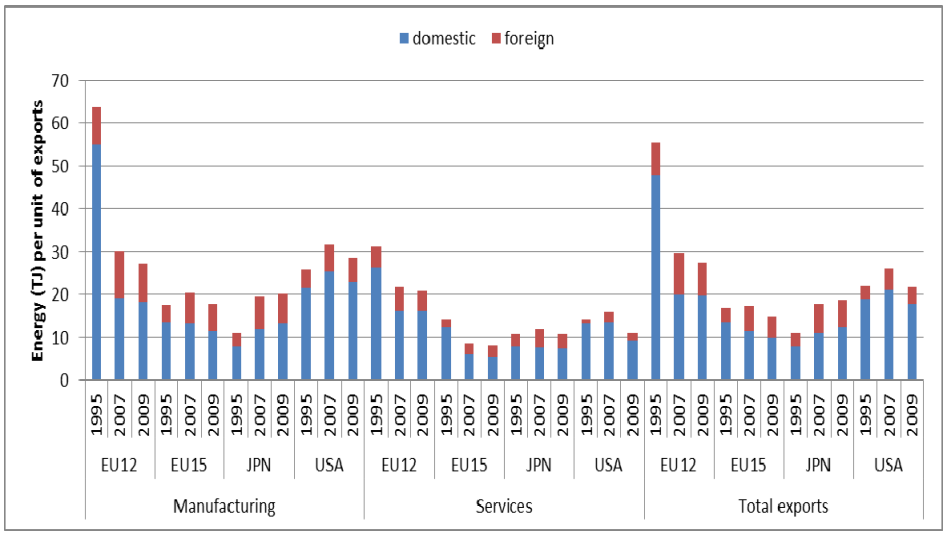


Source: WIOD. Note: Manufacturing is depicted by the larger bubbles. The size of the bubbles reflects the weight of manufacturing and services in total exports in 2007. The points enclosed in the small black circles of uniform size represent total exports.

Figure 3.10 presents the breakdown of energy inputs per unit of exports by domestic and foreign countries' sources. The amount of foreign-energy inputs per unit of exports increased overall in all four economies for both manufacturing and services in the period 1995-2007. In the period 1995-2007, (as already observed in Figure 3.5 above), the domestic energy content in total exports decreased in the European economies and increased in Japan and to a lesser extent in the US. For the EU-12, this is due to a significant drop in the energy incorporated domestically in manufacturing exports and to a much lesser extent in service exports. In contrast, in the EU-15 this is mainly the result of the considerable drop in the domestic- energy content of service exports. As from 2007, the EU-15 also clearly leads in terms of the lowest domestic-energy inputs per unit of service exports. Regarding manufacturing exports, the EU-15's domestic-energy content remained constant and the increase in total energy embodied was due to the increase in foreign-energy inputs. For Japan and the US, the increase in the domestic energy content in total exports was primarily due to the rise in the (corresponding domestic) energy inputs in manufacturing.

During the crisis period 2007-2009, following the slump in global trade, the previous upward trend in the share of foreign energy inputs in total energy embodied in manufacturing and service exports ended or in some cases temporarily reversed. Panel B in Table 5.2 above showed that in the period 2007-2009 the share of foreign-energy inputs in total energy embodied in exports stabilised in the EU-15 and USA and decreased in Japan and the EU-12. This may be due in part to the fact that manufacturing exports, which were more severely hit overall during the crisis, account for a larger share of total exports in Japan and in the EU-12.

Figure 3.10 – Energy (TJ, domestic and foreign) content in (manufacturing, services and total) exports (Million USD, 1995, 2007)



Source: WIOD.

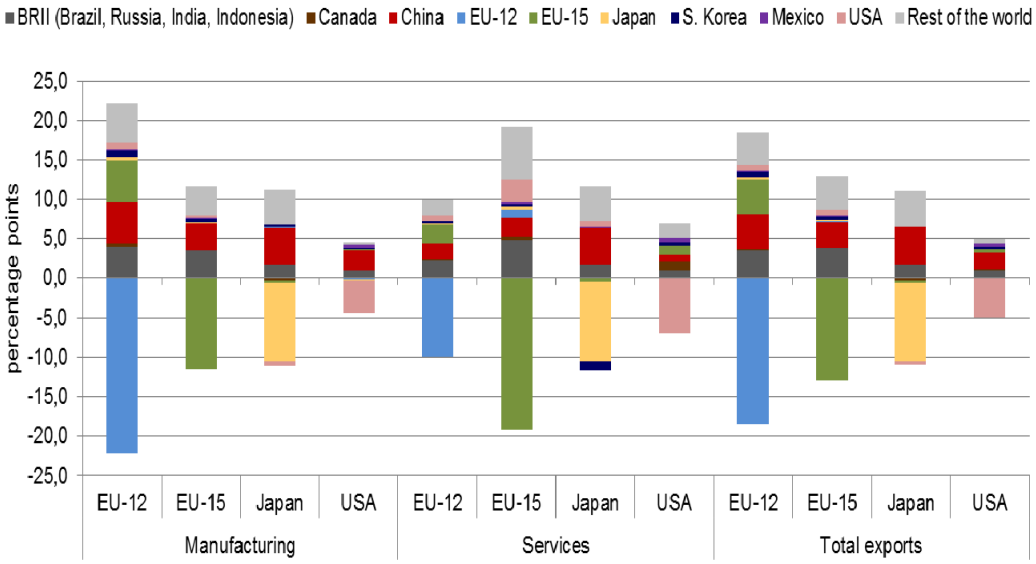
Figures 3.9 and 3.10 show for the period 1995-2007 an overall increase in the energy content in manufacturing (except in the EU-12) and to a lower extent in service exports (except for the EU-12 and EU-15). These figures also suggest that this could in part be related to the increasing globalisation of production and the increasing weight of foreign-energy inputs. Panel B in Table 3.2 points in the same direction by showing a steady rise in the share of foreign-energy inputs in the total energy embodied in exports (both in manufacturing and services up to 2007). Subsection 3.2.3 below presents a short exploratory analysis of the country and sectoral trends in the energy content in exports in relation to globalisation of production and trade.

Figure 3.11 further illustrates the geographic patterns implicit in the changes in the structure of the energy inputs embodied in exports over the period 1995-2007. The figure presents the changes in the shares of energy inputs embodied in manufacturing, services and total exports for each of the four economies (e.g. the share of domestic-energy inputs in total energy embodied in the EU-15 exports of services decreased by 19% in the period 1995-2007, while the share of energy inputs that EU-15 exporters sourced directly and indirectly from the BRII countries increased by 5% in the same period).

Figure 3.11 shows a large shift overall from domestic to foreign energy inputs embodied in exports in the period 1995-2007. Interestingly, the figure also reveals for this period a higher (or at least comparable in the case of Japan) shift towards foreign-energy inputs in service exports relative to manufacturing exports. The exception is the EU-12, whose share of domestic-energy inputs in manufacturing exports declined (significantly by 22 %) by more than twice the contraction observed in the share of domestic-energy inputs in service exports. A major and almost equivalent drop (19%) was observed in the share of domestic-energy inputs in EU-15 exports of services. This, together with the relative weights of the manufacturing and services in total exports in the EU-12 and EU-15, explains why the European economies had the largest falls in the share of domestic-energy inputs in total exports. The US had a much lower reduction in the share of domestic-energy inputs in exports (around 4% in manufacturing and 6% in services).

The reciprocal increase in the share of foreign-energy inputs embodied in exports was not distributed equally across all trade partners. However, almost all of them increased their shares of total energy inputs embodied in the exports in the period 1995-2007. The very few exceptions concern Japan. There were marginal decreases in the shares of S. Korea and EU-15 energy inputs in Japanese service exports or in the share of US, Canadian and EU-15 energy inputs in Japanese manufacturing exports. This means that in the case of Japan domestic energy inputs, but also (to a minor extent) those from some foreign countries, were shifted to other economies (e.g. China and the RoW).

Figure 3.11 – Changes in the share of energy inputs embodied in exports in the period 1995–2007 (in p.p.)



Source: WIOD.

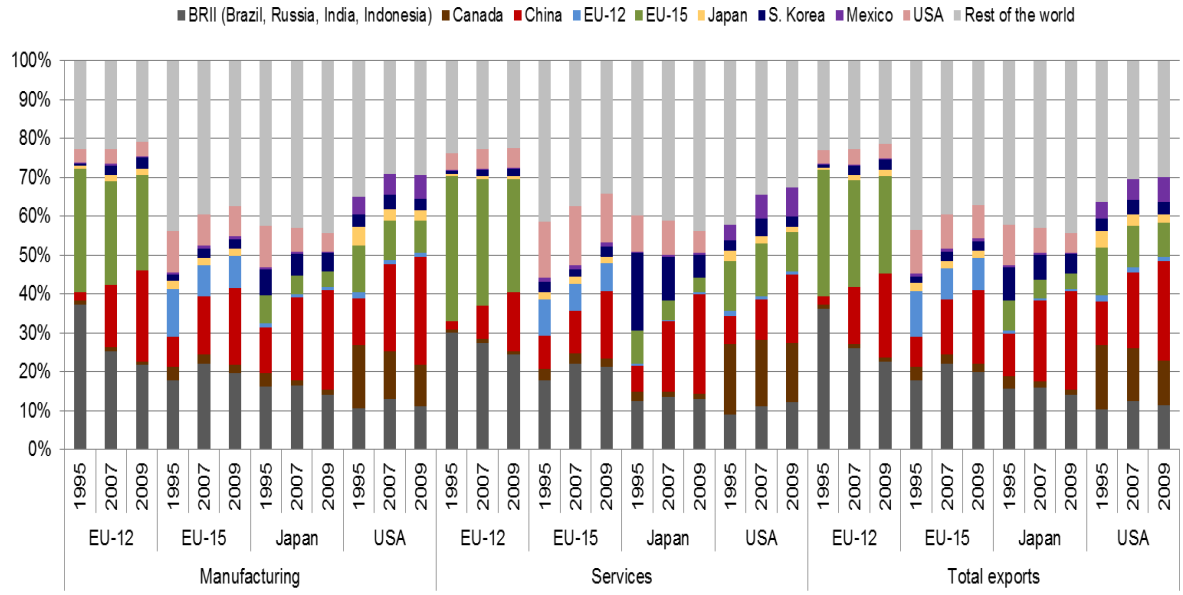
Figure 3.12 below summarises the main changes in the structure of (shares per trade partner in) foreign-energy inputs embodied in exports. A joint reading of Figures 3.11 and 3.12 shows that in the period 1995-2007 a significant part of the energy inputs embodied in exports were diverted from domestic to foreign countries, in particular to China.

Figure 3.12 shows that this is particularly noticeable in manufacturing, where off-shoring trends in the period 1995-2007 led to virtually a doubling of the share (8 times higher in the case of EU-12) of Chinese energy inputs in the foreign-energy inputs in manufacturing exports. The increase in the weight of China as source of foreign-energy inputs led to an overall contraction in the shares of other trade partners. Overall, the shares of the RoW or the BRII contracted as well as the share of energy inputs embodied in bilateral manufacturing trade between the EU-12, EU-15, Japan and the US.

Compared to manufacturing, the rise in the weight of China as source of foreign-energy inputs embodied in service exports was less pronounced, except for Japan. For Japan in the period 1995-2007, the share of Chinese energy inputs in the foreign-energy inputs in Japanese service exports also more than doubled, while the corresponding shares of S. Korea and EU-15 were roughly halved. In the EU-15, despite the significant decline in the relative weight of domestic-energy inputs in service exports (remember Figure 3.11), the relative increase in Chinese energy inputs was less pronounced and the US and the EU-12 kept their shares broadly stable. Similarly, in the US in the period 1995-2007, the shares of Canadian and EU-15 energy inputs in US service exports remained fairly stable while the increase in the corresponding share of China was much smaller compared to manufacturing.

Regarding the recent crisis period, Figure 3.15 shows that China continued to increase its share of foreign-energy inputs in exports both for manufacturing and services, now at the expense of the other trade partners in general. Over the whole period (1995-2009), it more than doubled its share of the foreign-energy inputs embodied in both manufacturing and service exports of the EU-15, Japan and the US (the corresponding increase was much higher in the case of the EU-12).

Figure 3.12 – Shares (per trade partner) in foreign-energy inputs embodied in exports, 1995, 2007, 2009



Source: WIOD.

The changes in the sourcing structure of foreign-energy inputs embodied in exports reflect many factors such as differences in energy-efficiency trends across countries and sectors, together with global-trade and vertical-specialisation developments. For instance, Figure 3.12 shows a relatively high share of the EU-15 in the foreign-energy inputs embodied in EU-12 exports (for manufacturing, services and total exports). This is to a great extent a reflection of the strong links and importance of the EU-15 (e.g. as providers of intermediate inputs) in the import content of EU-12 exports (documented in Chapter 2). Subsection 3.2.4 below analyses in more detail the relations between imports and foreign-energy content in exports and some of their implications for competitiveness across countries and sectors.

3.2.3. Globalisation and the energy content in exports worldwide

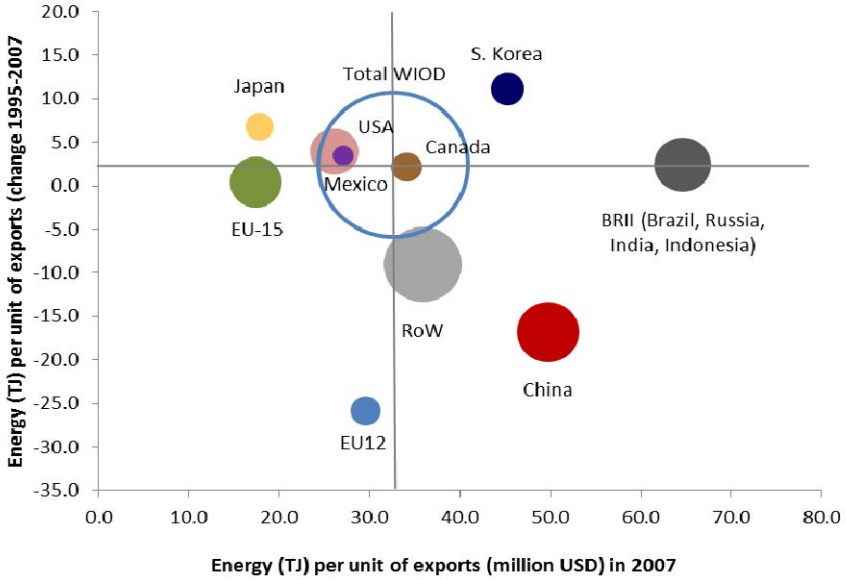
This section explores to what extent globalisation and increasing vertical specialisation have been followed by changes (and eventually some convergence) in the energy content in exports at the world level. World exports are proxied by the whole WIOD exports. The different developments and contributions of manufacturing and service exports are also briefly analysed, focusing on the long term changes in the period 1995-2007.

Figure 3.13 plots the changes (in the period 1995-2007) against the level of the energy content in total exports in 2007. The size of the bubbles reflects the proportion that the energy embodied in each of the ten economies' total exports makes up of the total energy embodied in (the whole ten economies') WIOD total exports. The world is proxied by total WIOD and is represented by the largest circle (with vertical and horizontal lines crossing at its centre).

The figure shows an increase (of 8%, see Table 3.3) in the energy use per unit of worldwide exports in the period 1995-2007. This was a period of sustained growth in global trade and intensified vertical specialisation and appears to have led to significant reductions and some convergence in the energy content in exports for economies such as the EU-12, China and the RoW.

.

Figure 3.13 – Energy content in total exports: change 1995-2007 versus level in 2007



Source: WIOD. Note: The size of the bubbles reflects the weight that the energy embodied in the each economy's total exports has in the total energy embodied in all WIOD total exports in 2007. Total WIOD is represented by the largest circle.

China achieved partial convergence by reducing the energy content in its exports by ¼ in the period 1995-2007 (see also Table 3.3 below). However, this reduction was much smaller than the increase (it almost tripled) in China's share in total WIOD exports in the same period. This explains to a large extent the observed increase in energy inputs per unit of worldwide exports in the period 1995-2007.[48] It has to be noted that domestic-energy inputs account for a relatively high share (85% in 2007) of the energy content in Chinese exports. Even if the share of foreign-energy inputs embodied in Chinese total exports has almost doubled (it increased from 8% to 15%) in the period 1995-2007, this is still a relatively low value. In fact, this is the second-lowest value after the BRII economies and less than half of the weight of foreign-energy inputs in exports in the majority of the other economies (except for the US, Canada and the RoW, that are less dependent on energy imports, see the last three columns in Table 3.3).

The increasing contribution and role of energy embodied in Chinese exports can also be seen by comparing the shares in total WIOD energy embodied with the shares in total exports in Table 3.3. Despite some improvement, in 2007 China still had the second-highest ratio (after the BRII economies) between the share of energy embodied and the share in total WIOD exports (e.g. in 2007 China and the US already had comparable shares of total WIOD exports – 11% and 13% respectively – while the share in terms of energy embodied is considerably higher in China – 17%, as against 10% in the US).

BRII economies as a whole also contributed (but to a lower extent than China) to the observed increase in energy inputs per unit of total WIOD exports in the period 1995-2007. This is due to the marginal increase in the BRII economies' share of total WIOD exports, combined with their overall high (unchanged) level of energy content in exports. The high level of energy content in exports may in part reflect the relatively abundant energy resources in some of the BRII economies.

The convergence (and significant reduction) in the energy content in exports of the RoW economies was roughly proportional to the increase in their share of total WIOD exports which led to a neutral (slight reduction) effect on the energy inputs per unit of worldwide exports.

[48] Energy inputs per unit of total WIOD exports can be recorded as the sum of energy inputs per unit of exports of each economy weighted by the respective shares in total WIOD exports. A simple analysis consists in decomposing the changes in the weighted sum to obtain the changes in each of the elements of the weighted sum (as a result of the changes in the two variables for each country: energy inputs per unit of exports and shares in total WIOD exports). A more elaborate analysis would for instance be to use an index or structural decomposition analysis (see, for example, subsection 3.3.6; this approach is not followed here).

Table 3.3 – Energy embodied (TJ) per unit of exports (USD million) and share of trade, energy and foreign energy embodied in manufacturing, service and total exports: 1995, 1997, 2009

	Energy (TJ) per unit of exports (Million USD)			Share in total WIOD exports			Share in total WIOD energy embodied			Share of foreign energy inputs		
	1995	2007	2009	1995	2007	2009	1995	2007	2009	1995	2007	2009
MANUFACTURING (NACE D)												
BRII	74.9	82.4	77.3	5%	6%	5%	11%	13%	12%	7%	7%	7%
Canada	32.8	37.6	34.8	6%	4%	3%	6%	4%	3%	22%	26%	24%
China	68.1	51.2	46.1	5%	15%	21%	10%	21%	28%	8%	15%	17%
EU-12	63.6	30.0	27.3	3%	5%	5%	5%	4%	4%	14%	36%	33%
EU-15	17.6	20.5	17.8	27%	24%	23%	14%	14%	12%	23%	34%	35%
Japan	11.1	19.5	20.1	14%	8%	7%	5%	4%	4%	29%	38%	34%
S. Korea	33.4	48.8	50.0	4%	5%	5%	4%	6%	7%	30%	31%	32%
Mexico	26.4	30.5	32.8	2%	2%	2%	2%	2%	2%	29%	36%	32%
USA	25.9	31.8	28.6	17%	12%	11%	14%	10%	9%	16%	20%	20%
RoW	53.8	37.6	37.3	18%	20%	17%	30%	21%	19%	12%	33%	31%
WIOD	32.6	35.8	34.6	100%	100%	100%	100%	100%	100%	-	-	-
SERVICES (NACE 50 to P)												
BRII	37.8	37.9	37.4	6%	9%	8%	13%	19%	16%	6%	6%	6%
Canada	20.6	16.5	15.7	3%	2%	2%	3%	2%	2%	19%	21%	19%
China	55.9	39.2	36.9	2%	7%	14%	7%	16%	30%	8%	15%	16%
EU-12	31.4	22.0	20.8	3%	4%	4%	5%	5%	5%	14%	32%	28%
EU-15	14.3	8.8	8.1	26%	29%	29%	19%	15%	13%	21%	33%	34%
Japan	10.9	12.1	10.8	10%	6%	4%	6%	4%	2%	28%	38%	33%
S. Korea	38.5	26.6	30.3	3%	3%	2%	7%	4%	4%	27%	31%	32%
Mexico	16.2	17.1	17.1	2%	2%	1%	2%	2%	1%	25%	31%	28%
USA	14.4	16.0	11.0	30%	21%	21%	22%	19%	13%	14%	19%	19%
RoW	22.8	14.8	15.7	14%	17%	15%	17%	15%	13%	11%	22%	20%
WIOD	19.2	17.5	17.6	100%	100%	100%	100%	100%	100%	-	-	-
TOTAL EXPORTS (NACE A to P)												
BRII	62.2	64.7	61.0	6%	7%	7%	12%	14%	13%	6%	6%	6%
Canada	32.0	34.1	31.4	5%	4%	3%	6%	4%	3%	19%	21%	19%
China	66.6	49.7	44.5	4%	11%	17%	9%	17%	24%	8%	15%	16%
EU-12	55.5	29.6	27.6	3%	4%	4%	5%	4%	4%	14%	32%	28%
EU-15	17.0	17.4	14.9	25%	23%	22%	14%	12%	10%	21%	33%	34%
Japan	11.0	17.8	18.8	12%	6%	6%	4%	4%	3%	28%	38%	33%
S. Korea	34.2	45.3	46.9	4%	4%	4%	4%	5%	5%	27%	31%	32%
Mexico	23.6	27.1	29.5	2%	2%	2%	2%	2%	2%	25%	31%	28%
USA	22.2	26.1	21.8	19%	13%	13%	14%	10%	9%	14%	19%	19%
RoW	45.0	35.9	36.5	21%	25%	22%	31%	27%	26%	11%	22%	20%
WIOD	30.3	32.7	31.7	100%	100%	100%	100%	100%	100%	-	-	-

Source: WIOD.

The EU-12 in particular (but also the EU-15) outperformed overall in the reduction on energy content in exports. The EU-12 achieved full convergence with the total WIOD level in the period 1995-2007. The increase in the energy inputs per unit of exports in South Korea and Japan may partly reflect the particular and intense vertical-specialisation links of these two economies with China.

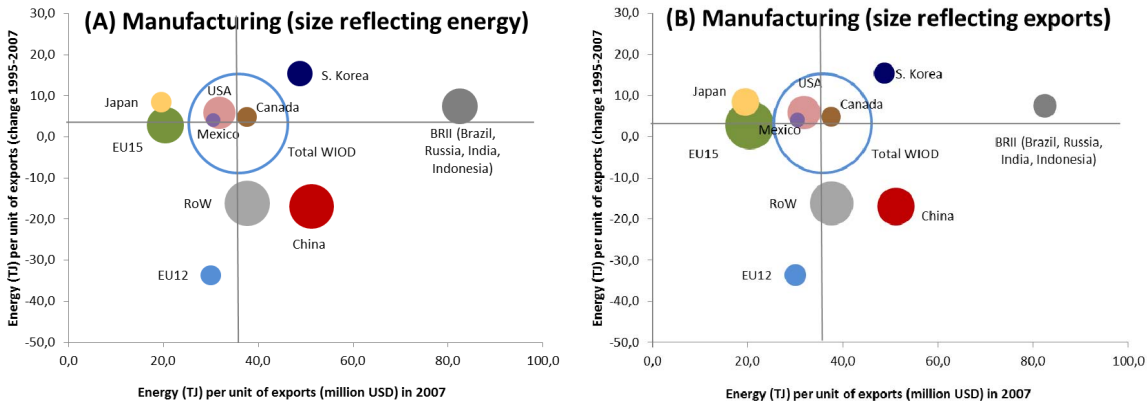
Figure 3.14 plots the changes (in the period 1995-2007) against the level of the energy content in manufacturing exports in 2007. The two panels are equal except for the size of the bubbles. In panel A (on the left), the size of the bubbles reflects for each economy the weight that the energy embodied in its manufacturing exports has in the energy embodied in total WIOD manufacturing exports. On the right in panel B, the size of the circles reflects the share of manufacturing exports in total WIOD manufacturing exports in 2007. Total WIOD is represented by the largest circle in both panels.

Manufacturing exports are dominant overall in total exports (see Table 3.4 below) and appear to explain to a large extent the observed increase in energy embodied in exports at world level in the period 1995-2007. Figure 3.12 shows (see also Table 3.3) an increase of 10% in the energy use per unit of world-wide manufacturing exports, which is slightly higher than the (8%) rise in energy use per unit of total exports depicted in Figure 3.11 and Table 3.3 above.

The rise in energy content in total WIOD manufacturing exports appears to be primarily driven by the increasing vertical-specialisation links with China. The energy content in Chinese manufacturing exports declined by ¼ in the period 1995-2007 while its share in total WIOD manufacturing exports tripled in the same period (see Table 3.3). To a lesser extent, the BRII economies as a whole and S. Korea also contributed to the rise in the energy use per unit of total WIOD manufacturing exports. This can be seen by the position and size of bubbles in Figure 3.14. For China, BRII and S. Korea, the bubbles in panel B (reflecting export shares) are smaller relative to panel A (in which they reflect the shares in energy embodied in exports).

The EU-12 more than halved their energy inputs per unit of manufacturing exports (starting from roughly the same level as China in 1995). The ROW economies also reduced significantly (by 30%) the energy content in exports and moved closer to the total WIOD average in the period 1995-2007.

Figure 3.14 – Energy content in manufacturing exports: change 1995-2007 versus level in 2007



Note: In panel A (on the left) the size of the bubbles reflects the weight that energy embodied in the manufacturing exports of each economy has in the total energy embodied in the whole WIOD manufacturing exports in 2007. On the right in panel B the size of the bubbles reflects the share of manufacturing exports in total WIOD manufacturing exports in 2007. Total WIOD is represented by the largest circle.

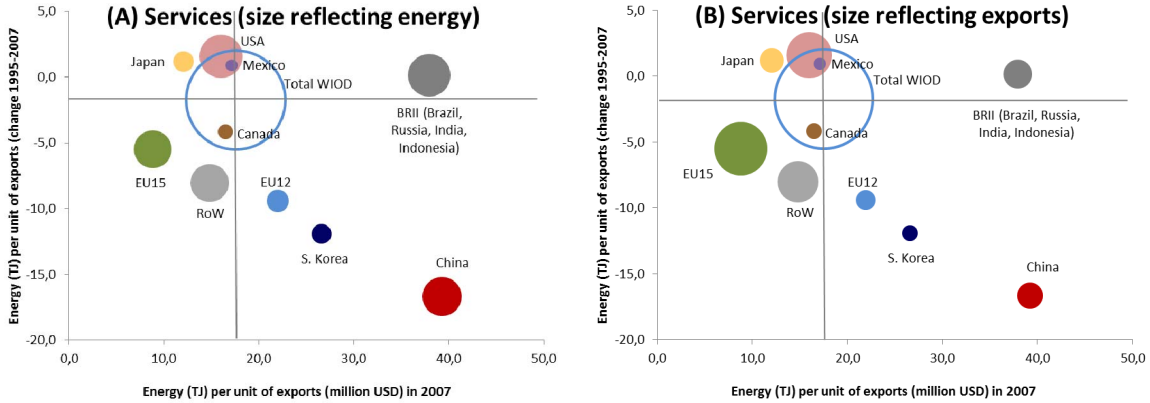
Source: WIOD.

Figure 3.15 presents similar plots of the changes (in the period 1995-2007) against the level of the energy content in service exports in 2007. Unlike manufacturing, the energy inputs embodied in service exports declined by 9% in the period 1995-2007. The energy content in service exports is converging in the majority of countries, except for the BRII economies, as with manufacturing. Despite a significant improvement, in China the energy content in service exports in 2007 was similar to the level in the BRII economies.

Services and manufacturing have different weights in the various economies. Moreover, for some economies exports from other sectors such as agriculture, forestry or mining are also significant

(e.g. in the RoW, BRII economies and Canada, exports other than manufacturing and services accounted for between 1/5 and 1/3 of the total exports in 2007, see Table 3.4).

Figure 3.15 – Energy content in service exports: change 1995-2007 versus level in 2007



Source: WIOD. Note: On the left panel (A) the size of the bubbles reflects the weight that energy embodied in the service exports (NACE 50 to P) of each economy has in the total energy embodied in the whole WIOD service exports in 2007. On the right panel the size of the bubbles reflects the share of service exports in total WIOD service exports in 2007. Total WIOD is represented by the largest circle.

Table 3.4 – Shares of manufacturing, services and other exports in total exports, 1995, 1997, 2009

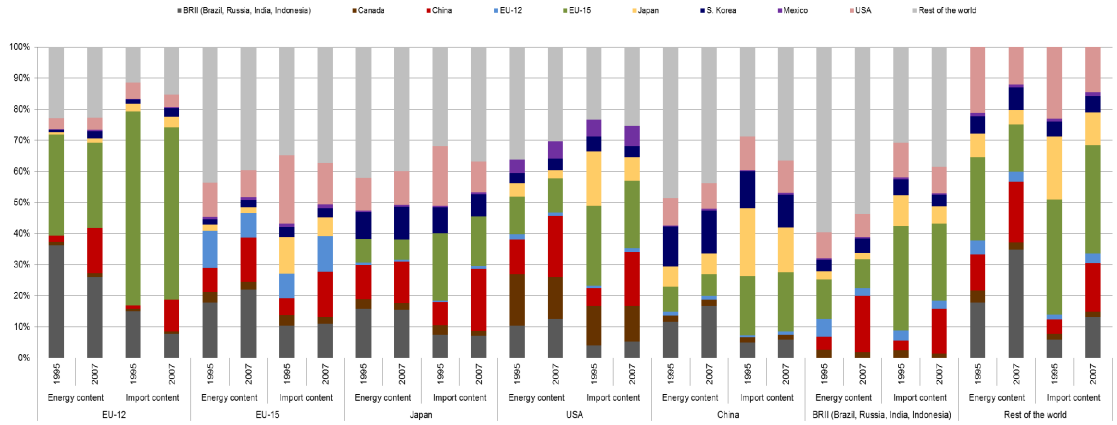
	MANUFACTURING (NACE D)			SERVICES (NACE 50 to P)			OTHER (NACE A to C, E,F)		
	1995	2007	2009	1995	2007	2009	1995	2007	2009
BRII	58%	51%	50%	23%	26%	26%	19%	23%	24%
Canada	75%	65%	59%	12%	14%	17%	13%	22%	25%
China	81%	84%	79%	12%	14%	19%	7%	2%	2%
EU-12	66%	75%	71%	24%	20%	23%	10%	5%	6%
EU-15	75%	70%	67%	21%	28%	30%	4%	3%	3%
Japan	83%	79%	85%	17%	21%	14%	0%	0%	1%
S. Korea	81%	84%	84%	18%	16%	16%	1%	0%	0%
Mexico	68%	69%	72%	21%	15%	14%	12%	16%	14%
USA	63%	60%	58%	32%	36%	38%	5%	4%	4%
RoW	60%	52%	50%	14%	15%	15%	25%	32%	35%
WIOD	70%	66%	64%	21%	22%	23%	10%	12%	12%

Source:WIOD.

3.2.4. Foreign-energy inputs vs import content in exports

Figure 3.16 presents the shares (per trade partner) of foreign-energy inputs and import content in exports (the latter studied in Chapter 2 of this report) side-by-side. As expected, the figure depicts a significant overall similarity between the two structures but also some important differences. Firstly, energy-rich economies (such as some countries in BRII and ROW) have a higher weight in terms of foreign-energy inputs relative to import contents in total exports. This general pattern is also found for manufacturing and service exports. The direction of the changes (in the period 1995-2007) in the shares of foreign energy sourced from these (BRII and ROW) countries tend to follow the direction of the changes in import content in exports. However, the relationship is not one-to-one: the ratio between the shares in foreign energy and import content in exports is rising overall for the BRII and declining for the RoW (see Table 3.5 below), perhaps reflecting many factors such as energy-efficiency trends, preferential trade and energy supply relations between different countries, etc.

Figure 3.16 – Shares (per trade partner) in foreign energy inputs vs import content in EU-12, EU-15, Japan, US, China, BRII and RoW total exports, 1995, 2007



Source: WIOD.

Secondly, advanced economies (in particular the EU-15, Japan and to a lesser extent the US) tend to have higher shares of import content relative to foreign-energy content in exports. Both shares decreased overall for the EU-15, Japan and the US in the period 1995-2007. Thirdly, and unlike these advanced economies, China significantly increased its overall share of both foreign-energy inputs and import content in exports over the same period. However, China's share of foreign-energy inputs is higher (or broadly as great in some cases in 2007) than the share of import content in exports. Fourthly, regarding China's exports, the increase in energy use was reflected in a significant increase in the energy content share of the BRII in the period 1995-2007, mostly at the expense of the RoW economies. These movements do not have an immediate parallel in the import-content structure of Chinese exports. In fact, partly reflecting the increased use of non-energy raw material inputs, the import-content share of the RoW economies increased over this period, mostly at the expense of Japan and to a much lesser extent of the other economies (in 2007, the EU-15 as a whole had the second-largest import-content share in Chinese exports, after the ROW). The figures for manufacturing and service exports show similar patterns and were omitted.

Table 3.5 presents the ratio between the shares in foreign-energy inputs and import content in manufacturing, service and total exports (panels A, B, C respectively) for all ten economies. The ratio provides a measure of relative energy intensity in total foreign inputs. It can similarly be seen as the share of energy in total (energy and non-energy) inputs sourced from a given trade partner relative to the corresponding average share for all trade partners of a given country. Therefore it indicates (in relative terms, per trade partner) how energy intensive the import contents are in the exports of a given country. A value lower than one indicates that a given trade partner has a lower than average weight of energy inputs relative to all foreign inputs embodied in the exports of a given country. In order to facilitate reading, values lower or equal to one (and higher than ½) are highlighted in yellow. Values lower or equal to ½ are highlighted in green.

The import content of exports is growing with the globalisation of production and vertical specialisation and this ratio provides a summary of the relative energy intensities and vulnerabilities to increases in the relative price of energy. It permits analysis of relative performances across countries and sectors as a consequence, for instance, of specialisation or energy-efficiency trends. For instance, the two columns for China indicate (for the years 1995 and 2007) the ratio between foreign-energy inputs and import contents in Chinese (manufacturing, service and total) exports. In 2007, the Japanese share of total foreign-energy inputs embodied in Chinese exports was only half of the Japanese share in the import content of Chinese exports. For the EU-15, the corresponding figure was even smaller. Incidentally, in this particular case the ratios for Chinese total exports and manufacturing exports are identical (in terms of the figures presented, rounded to one decimal place). For Chinese service exports in 2007, the lead of the EU-15 in terms of the lowest relative weight of energy inputs is even more pronounced.

The diagonal is empty because only foreign-energy inputs and import content in exports are being compared. The last two columns (labelled WIOD) present the ratio between the shares in foreign-energy inputs and import content in total WIOD exports (for manufacturing, service and total exports). Standard deviations are presented in the last three rows for manufacturing, service and total exports.

The EU-15 and Japan have the lowest relative weight of energy inputs in the total foreign inputs incorporated in exports (globally and overall across countries and sectors, manufacturing and services). Among the economies with a high overall dependency on energy imports, the EU-15 as a whole and Japan are therefore those economies that in principle will suffer lower external competitiveness losses as a result of an increase in the relative price of energy. One distinction is that the EU-15 slightly reduced overall the relative weight of energy inputs in total inputs across countries and sectors in the period 1995-2007 (one exception was the increase from 1.4 to 1.7 in the relative weight of EU-15 energy inputs embodied in US service exports).

By contrast, for Japan the relative weight of energy inputs in the total inputs it embodies in exports increased overall in the same period. The EU-15 and Japan are among the countries having the lowest dispersion in the relative weights of energy inputs, reflecting a relatively diversified sourcing among their trade partners of the energy inputs embodied in their exports.

In the US, the relative weight of energy inputs is higher (twice the relative weight in the EU-15 and Japan in 2007 in WIOD exports) and, as with Japan, also increased overall in the period. Despite this increase, the relative weight of US energy inputs is overall below (or in some cases close to) the average. The standard deviation of the relative weight of energy inputs embodied in US exports decreased, particularly in manufacturing exports.

The EU-12 as a whole achieved the greatest reduction in the relative weight of energy inputs embodied in exports (halving or more than halving the ratio for all WIOD service, manufacturing and total exports) in the period 1995-2007. In 2007, the relative weight of EU-12 energy inputs embodied in exports was already below the average for total WIOD and for many of the single-country exports. The standard deviation of the relative weights of foreign inputs embodied in EU-12 exports increased, in particular for manufacturing, as result of the increase in the relative weight of the energy inputs sourced from the BRII in the period 1995-2007.

China and the RoW economies have also significantly reduced the relative weight of their energy inputs embodied in the exports of the other countries. However, unlike the EU-12 the relative weight of Chinese and RoW energy inputs in general remain above the average of relative weight of foreign energy inputs embodied in the exports of most of the countries in 2007. Exceptions include the considerable convergence of China towards the average of the relative weights in energy inputs embodied in EU-15 and Japanese manufacturing and total exports.

Some of the BRII countries are energy-rich and this may in part explain why energy has a relatively high weight in the BRII inputs embodied in exports of the other economies. The relative weight of BRII energy inputs in manufacturing and service exports has increased in the period 1995-2007.

Table 3.5 (panel C) indicates a constant or reduced variability of the relative weight of energy in the total foreign inputs embodied in the total exports of countries and total WIOD exports in the period 1995-2007 (the exception is the EU-12). This appears to be result of the convergence that occurred across countries in terms of the weight of energy inputs embodied in manufacturing exports (as indicated by overall lower – except for the EU-12 – standard deviations in 2007 in panel A of Table 3.5).

Table 3.5 – Ratio between the shares in foreign energy inputs and import content in manufacturing, service and total exports in 1995 and 2007

	BRII		Canada		China		EU-12		EU-15		Japan		Korea		Mexico		USA		RoW		WIOD	
	1995	2007	1995	2007	1995	2007	1995	2007	1995	2007	1995	2007	1995	2007	1995	2007	1995	2007	1995	2007	1995	2007
A) Manufacturing exports																						
BRII			3.4	2.7	2.3	2.9	2.4	3.0	1.7	2.0	2.2	2.3	2.5	2.7	3.6	2.7	2.7	2.5	3.1	2.6	2.5	2.6
Canada	1.2	1.3			1.3	1.4	1.4	1.6	1.1	1.1	1.0	0.9	1.3	1.1	1.7	1.1	1.3	1.1	2.0	1.4	1.3	1.2
China	1.4	1.3	2.8	1.5			1.9	1.5	1.4	1.0	1.6	1.0	1.5	1.2	2.7	1.4	2.1	1.2	2.5	1.2	2.0	1.2
EU-12	1.8	1.0	2.8	1.2	2.5	1.0			1.5	0.7	1.8	0.7	2.0	0.7	3.2	1.0	2.3	1.0	3.1	1.1	2.2	0.9
EU-15	0.4	0.4	0.6	0.5	0.4	0.4	0.5	0.5			0.3	0.3	0.4	0.3	0.6	0.5	0.5	0.5	0.7	0.4	0.5	0.4
Japan	0.3	0.4	0.3	0.3	0.3	0.5	0.3	0.4	0.2	0.3			0.3	0.4	0.3	0.4	0.3	0.4	0.4	0.4	0.3	0.4
Korea	0.7	1.2	1.0	0.9	1.0	1.3	0.6	0.9	0.5	0.7	0.9	0.9			0,8	0.8	0.6	1.0	1.1	1.3	0.8	1.1
Mexico	0.9	1.0	0.8	0.7	1.1	0.8	1.2	1.1	0.6	0.7	0.7	0.6	1.0	0.7			0.8	0.8	1.2	0.8	0.8	0.8
USA	0.8	0.8	0.9	0.8	0.8	0.8	0.7	1.0	0.5	0.6	0.5	0.6	0.7	0.6	0.9	0.9			0.9	0.8	0.7	0.8
RoW	1.9	1.4	2.2	1.6	1.7	1.2	2.0	1.5	1.2	1.1	1.3	1.2	1.8	1.3	2.0	1.1	1.5	1.2			1.8	1.3
St dev	0.6	0.4	1.2	0.7	0.8	0.7	0.8	0.9	0.5	0.5	0.6	0.6	0.7	0.7	1.2	0.7	0.9	0.6	1.0	0.7	0.8	0.6
B) Service exports																						
BRII			2.7	2.1	1.9	2.4	2.5	2.8	1.7	2.1	1.7	2.4	1.9	2.7	2.5	2.0	2.7	2.2	3.2	3.2	2.2	2.5
Canada	0.8	1.1			0.9	1.1	1.2	1.1	1.0	1.0	0.7	0.9	0.9	1.2	1.3	0.8	1.5	1.6	2.1	1,	1.3	1.5
China	1.0	1.2	2.0	1.1			1.6	1.2	1.2	1.0	1.1	1.1	0.8	1.3	2.1	0.9	1.6	0.8	2.6	1.3	1.5	1.1
EU-12	1.3	0.8	1.6	1.0	1.7	0.8			1.4	0.7	1.0	0.6	0.8	0.6	2.1	0.7	1.2	0.7	2.9	1.0	1.6	0.8
EU-15	0.3	0.3	0.5	0.6	0.4	0.3	0.6	0.6			0.4	0.3	0.3	0.3	0.4	0.7	0.4	0.7	0.8	0.5	0.5	0.4
Japan	0.2	0.3	0.3	0.5	0.3	0.5	0.2	0.3	0.2	0.3			0.4	0.4	0.3	0.4	0.2	0.4	0.4	0,5	0.3	0.4
Korea	0.7	1.5	1.1	1.0	1.7	1.9	0.4	0.8	0.7	0.7	1.4	0.9			0.7	0.9	0.8	1.7	1.4	1.8	1.3	1.4
Mexico	0.7	1.0	0.8	0.9	0.9	0.7	1.1	1.0	0.8	0.9	1.0	1.0	1.1	1.1			0.9	1.2	1.3	1.0	0.9	1.2
USA	0.6	0.9	1.0	1.0	0.7	0.7	0.6	0.9	0.5	0.7	0.6	0.9	0.6	0.9	1.1	1.2			1.0	1.0	0.7	0.8
RoW	2.2	1.5	1.6	1.2	1.8	1.3	2.0	1.3	1.4	1.1	1.3	1.1	1.7	1.4	1.7	1.0	1.5	1.0			1.9	1.2
St dev	0.6	0.4	0.8	0.5	0.7	0.7	0.8	0.7	0.5	0.5	0.4	0.6	0.5	0.7	0.8	0.4	0.7	0.6	1.0	0.8	0.6	0.6
C) Total exports																						
BRII			3.4	2.7	2.3	2.8	2.4	3.4	1.7	2.0	2.1	2.3	2.4	2.7	3.5	2.6	2.7	2.4	3.1	2.6	2.5	2.5
Canada	1.1	1.2			1.3	1.4	1.3	1.5	1.0	1.1	1.0	0.9	1.2	1.1	1.6	1.1	1.3	1.2	2.0	1.4	1.3	1.2
China	1.3	1.3	2.8	1.4			1.8	1.4	1.4	1.0	1.5	1.0	1.4	1.2	2.6	1.3	2,0	1.1	2.5	1.2	1.9	1.2
EU-12	1.7	0.9	2.7	1.2	2.4	1.0			1.5	0.7	0.7	0.7	1.9	0.7	3.0	1.0	2.1	0.9	3.0	1.1	2.2	0.9
EU-15	0.4	0.4	0.6	0.5	0.4	0.4	0.5	0.5			0.4	0,3	0.4	0.3	0.6	0.5	0.5	0.5	0.7	0.4	0.5	0.4
Japan	0,3	0.4	0.3	0.4	0.3	0.5	0.3	0.4	0.2	0.3			0.3	0,4	0.3	0.4	0.3	0.4	0.4	0.4	0.3	0.4
Korea	0.7	1.3	1.0	0.9	1.1	1.3	0.5	0.8	0.5	0.7	1.0	0.9			0.8	0.8	0.6	1.1	1.1	1.3	0.9	1.1
Mexico	0.9	1.0	0.8	0.7	1.0	0.8	1.2	1.1	0.7	0.7	0.7	0.6	1.0	0.7			0.8	0.9	1.2	0.8	0.8	0.8
USA	0.7	0.9	0.9	0.8	0.8	0.8	0.7	1.0	0.5	0.7	0.5	0.7	0.7	0.7	0.9	1.0			0.9	0.8	0.7	0.8
RoW	1.9	1.4	2.2	1.6	1.7	1.2	2.0	1.5	1.3	1.1	1.3	1.2	1.8	1.3	2.0	1.1	1.5	1.2			1.8	1.3
St dev	0.6	0.4	1.1	0.7	0.7	0.7	0.8	0.9	0.5	0.5	0.6	0.6	0.7	0.7	1.1	0.6	0.8	0.6	1.0	0.7	0.8	0.6

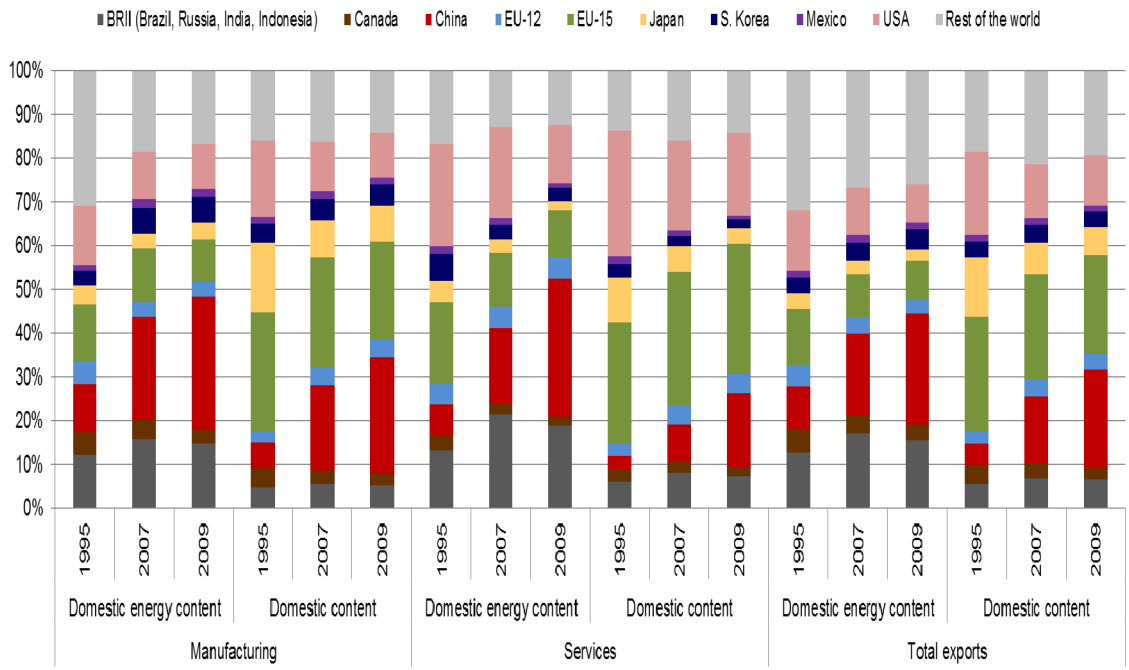
Note: values lower or equal to one and higher than ½ are highlighted in yellow. Values lower or equal to ½ are highlighted in green.

Source: WIOD.

3.2.5 Domestic-energy inputs vs domestic inputs in exports

Figure 3.17 presents the country shares in total (the across-countries sum of) domestic energy inputs in exports side-by-side with the shares in total (the sum of) domestic inputs in exports (the latter studied in Chapter 2 of this report).

Figure 3.17 – Shares in domestic energy inputs vs. domestic content in (manufacturing, service and total) exports, 1995, 2007 and 2009



Source: WIOD.

Figures 3.16 and 3.17 depict broadly similar patterns. The BRII economies as a whole have relatively high energy intensities in total domestic inputs embodied in exports. By contrast, in the EU-15, Japan and (to a lesser extent) the US, the share in domestic content in exports is higher than the share in domestic-energy inputs in exports. However, both shares are decreasing over time, in particular in the US and Japan (including during the crisis period 2007-2009). They are giving way to the larger shares of China in both domestic-energy inputs and domestic content in exports (as in the case described above of the foreign-energy inputs and import content in exports), reflecting the Chinese exports boom in the period.

Table 3.6 presents the ratio between the shares in domestic energy inputs and domestic content (in manufacturing, service and total) exports. Similarly, the ratio provides a measure of energy intensity relative to total domestic inputs embodied in exports. Again, a value lower than one indicates that a given country has a lower than average weight of energy inputs relative to all domestic inputs embodied in exports (which for economies that are dependent on energy imports may represent relatively lower potential competitiveness losses arising from an increase in the relative price of energy).

Table 3.6 – Ratio between the shares in domestic energy inputs and domestic content in manufacturing, service and total exports in 1995, 2007 and 2009

	Manufacturing			Services			Total exports		
	1995	2007	2009	1995	2007	2009	1995	2007	2009
BRII	2.6	2.9	2.8	2.2	2.6	2.5	2.4	2.5	2.4
Canada	1.2	1.3	1.2	1.2	1.0	1.0	1.2	1.3	1.2
China	1.9	1.2	1.1	2.5	2.0	1.9	1.9	1.2	1.1
EU-12	2.2	0.9	0.8	1.5	1.2	1.2	1.9	0.9	0.9
EU-15	0.5	0.5	0.4	0.7	0.4	0.4	0.5	0.4	0.4
Japan	0.3	0.4	0.5	0.5	0.6	0.5	0.3	0.4	0.4
Korea	0.8	1.2	1.3	2.0	1.3	1.5	0.9	1.2	1.2
Mexico	0.8	1.0	1.1	1.0	1.3	1.3	0.8	0.9	1.1
USA	0.8	1.0	1.0	0.8	1.0	0.7	0.7	0.9	0.8
RoW	1.9	1.1	1.2	1.2	0.8	0.9	1.7	1.3	1.3
St dev	0.8	0.7	0.6	0.7	0.7	0.7	0.7	0.6	0.6

Note: values lower or equal to one and higher than ½ are highlighted in yellow. Values lower or equal to ½ are highlighted in green.

Source: WIOD.

The EU-15 and Japan also have the lowest relative energy intensity in terms of domestic inputs embodied in (total, manufacturing and service) exports. The energy intensity ratio decreased by almost ½ for the EU-15 in the period 1995-2007, eliminating the gap with manufacturing and broadly converging to the Japanese energy-intensity levels (that increased slightly over the period). The US also has a higher energy intensity when it comes to domestic inputs in exports (that, as in Japan, increased slightly in the period 1995-2007), but that still remains below the average overall (for manufacturing, service and total exports). For these economies, the energy intensity levels in the domestic and foreign content in exports (the latter presented in Table 3.5) are broadly similar.

The EU-12 significantly reduced energy intensity in domestic inputs in manufacturing exports but achieved only a much smaller reduction in relation to service exports. The weight of energy inputs in domestic inputs embodied in service exports remained above one over the whole period and the gap vis-à-vis the EU-15 was not reduced. This may be one of the factors undermining the competitiveness of service exports in the EU-12 and may partly explain its lower growth when compared to manufacturing exports in the period (see Figure 3.9 and Table 3.3 for the evolution of the EU-12 market shares in each sector relative to total WIOD exports). The contrast is evident not only with the substantial reduction in the weight of energy inputs in the domestic content in manufacturing exports, but also with the roughly similarly reduction observed in Table 3.5 above in terms of the relative weight of the EU-12 energy inputs embodied in both manufacturing and service exports of the other economies.

Similarly, China has considerably reduced the energy intensity of the domestic content in manufacturing exports but to a much lesser extent in service exports. This contrasts with the RoW, where the weight of energy in the domestic content in exports declined both in manufacturing and services.

The standard deviations at the bottom of Table 3.6 point to some convergence in the energy intensity of domestic inputs embodied in manufacturing but not in service exports. This may be partly explained by an overall greater competition, larger weight of tradable goods and more developed vertical specialisation within manufacturing. Table 3.5 indicated some convergence in the energy intensity of foreign energy inputs in the import content of both manufacturing and service exports. This is a further indication of the importance of internationalisation and the development of cross-border production networks for the reduction and convergence of energy-intensity levels across countries. The next subsection, focusing on manufacturing, analyses whether part of the reduction of the energy intensity of the inputs embodied in exports is due to improvements in energy efficiency.

3.2.6 Measuring energy efficiency in the manufacturing sector

There has been a substantial improvement in industrial competitiveness due to investment in more energy-efficient technology and innovative products and processes. This subsection analyses how to measure energy-efficiency changes that are genuinely the result of technology improvements in EU manufacturing and to what extent they have contributed to improved competitiveness.

Energy efficiency is analysed by breaking down the changes in energy use to a number of causative factors, focusing on manufacturing in the European Union and on its major competitors.

Table 3.7 presents energy intensity in the EU-27 in the years 1995, 2007 and 2009. Manufacturing activities involve transforming different material inputs into products and tend to use relatively more energy in terms of gross output volumes but not in relation to value added. Manufacturing sectors contributed significantly to the overall improvement in energy productivity in the period 1995-2009. The improvement was particularly noticeable in energy intensive sectors such as Coke, Refined Petroleum and Nuclear Fuel, Basic Metals and Fabricated Metal or Chemicals, but also in some less energy-intensive sectors. The few exceptions, such as Wood and Products of Wood and Cork, seem to be more a result of a cyclical increase in measured energy intensity that may be due to the crisis and to low capacity utilisation.

Table 3.7 Energy intensity in TJ per Unit of Output (O) and Value Added (VA) (EU-27 in 1995 prices and US Dollars)

NACE Rev. 1.1	Description	Energy Intensity						Change	
		1995		2007		2009		1995-2009	
		O	VA	O	VA	O	VA	O	VA
TOTAL	ALL SECTORS	5.94	31.63	4.48	22.90	4.37	23.98	-26%	-24%
D	MANUFACTURING (Total)	10.28	11.85	6.96	9.60	7.12	9.19	-31%	-22%
15t16	Food , Beverages and Tobacco	1.97	7.84	1.48	6.15	1.47	6.33	-25%	-19%
17t18	Textiles and Textile	2.13	6.31	1.49	4.66	1.35	4.19	-36%	-34%
19	Leather, Leather and Footwear	1.24	4.31	0.81	3.06	0.77	2.79	-38%	-35%
20	Wood and Products of Wood and Cork	2.79	8.21	2.84	9.41	3.42	11.31	23%	38%
21t22	Pulp, Paper, Printing and Publishing	3.69	9.73	3.64	10.43	3.64	10.37	-1%	7%
23	Coke, Refined Petroleum and Nuclear Fuel	195.71	1231.89	128.76	1199.02	95.33	967.93	-51%	-21%
24	Chemicals and Chemical	13.60	39.97	9.29	28.25	8.95	27.11	-34%	-32%
25	Rubber and Plastics	1.62	4.40	1.47	4.36	1.41	4.23	-13%	-4%
26	Other Non-Metallic Mineral	9.45	23.20	7.63	20.22	7.85	20.61	-17%	-11%
27t28	Basic Metals and Fabricated Metal	7.83	22.46	5.24	16.38	4.70	15.11	-40%	-33%
29	Machinery, Nec	0.95	2.54	0.57	1.73	0.61	1.82	-36%	-28%
30t33	Electrical and Optical Equipment	0.68	1.92	0.33	0.87	0.31	0.84	-54%	-56%
34t35	Transport Equipment	0.77	2.83	0.43	1.90	0.47	2.13	-38%	-25%
36t37	Manufacturing Nec; Recycling	1.11	3.09	1.02	3.31	1.22	3.83	10%	24%

Source: WIOD.

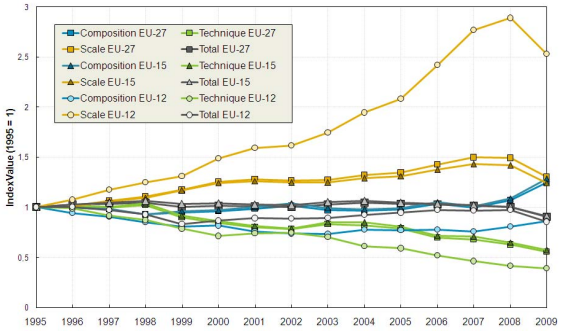
The analysis of the changes in energy use and the improvements in energy efficiency are carried out through a standard index decomposition method (the Log-Mean Divisia Index, see Annex 1). The change in total energy use in manufacturing sectors is decomposed into three factors: i) scale; ii) composition and, most importantly, iii) 'technical effect'. The scale factor accounts for the change in

energy use that is due to a change in economic activity (overall level of production[49]). The composition factor isolates the effect of sub-sectoral/structural changes within manufacturing. Finally, the technical effect shows how energy use would have changed if the total level of production (scale) and the industry structure (composition) had remained unchanged over time.

Figure 3.18 presents the results of the decomposition for the EU, EU-15 and EU-12. The grey lines in the figure show the development of total energy use in manufacturing in the EU-27, EU-15, and EU-12. In general, the EU-15 aggregate accounts for a very high share of the EU-27's overall economic activity and energy use in manufacturing sectors (that is the reason why the lines corresponding to these two aggregates appear superimposed). The yellow lines (for the scale effect, controlling for a fixed technology and sector composition) indicate a significant increase in total energy use up to 2008 (in particular in the EU-12, almost a 200% increase from 1995 to 2008). However, this effect was more than compensated for by the improvement in energy efficiency (accounted for by the green lines). The better performance of EU-12 (vis-à-vis the EU-15) indicates a genuine improvement in energy efficiency in manufacturing and an important contribution to the overall performance and catching-up (from their low initial efficiency levels as observed above in Figure 3.2). Finally, the blue lines indicate negligible composition effects for the EU-15. For the EU-12, the composition effect indicates a shift towards less energy-intensive manufacturing subsectors.

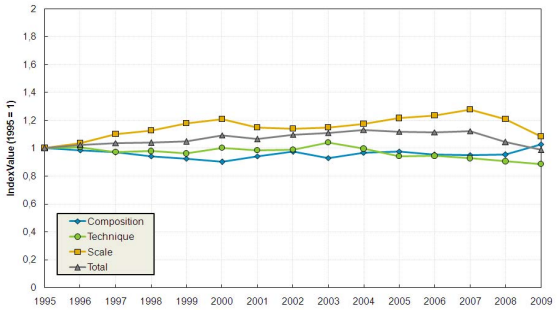
Figure 3.19 shows that the manufacturing sector in the US has improved its energy efficiency and contributed to the overall improvement in energy-use in that country. However, the technical effect is much smaller than the one observed in the European Union. The scale effect is positive but also smaller compared to the EU (largely a result of the higher growth in manufacturing output in the EU in the period 1995-2007, as afterwards the drop in activity was roughly similar in both areas).

Figure 3.18 – Index Decomposition Analysis of Total Energy Use in Manufacturing Sectors Using the Log Mean Divisia Index: *EU-27, EU-15, and EU-12*



Source:WIOD.

Figure 3.19 - Index Decomposition Analysis of Total Energy Use in Manufacturing Sectors Using the Log Mean Divisia Index: *United States*

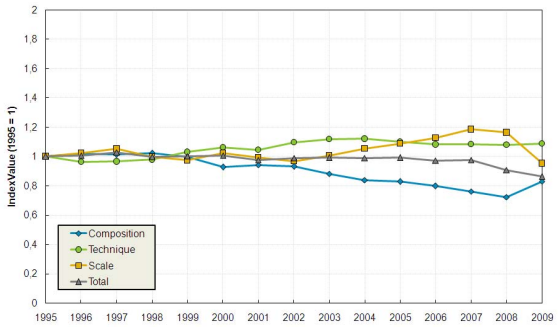


Source: WIOD.

Japan, one of world leaders in energy efficiency in manufacturing (see European Competitiveness Report 2011, Chapter 5), has not achieved an improvement of the kind seen in the EU and the US in this period (in fact, the technical effect even displays a slight upward trend in the period from 1998-2009, see Figure 3.20). The scale effect is relatively flat and the slight reduction in total energy use observed in the later period in the figure is due to a shift towards less energy-intensive manufacturing sectors.

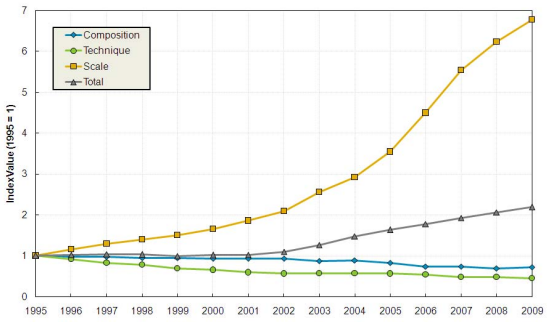
[49] The level of production is measured by the gross output of the various manufacturing sectors.

Figure 3.20 - Index Decomposition Analysis of Total Energy Use in Manufacturing Sectors Using the Log Mean Divisia Index: *Japan*



Source: WIOD.

Figure 3.21 - Index Decomposition Analysis of Total Energy Use in Manufacturing Sectors Using the Log Mean Divisia Index: *China*

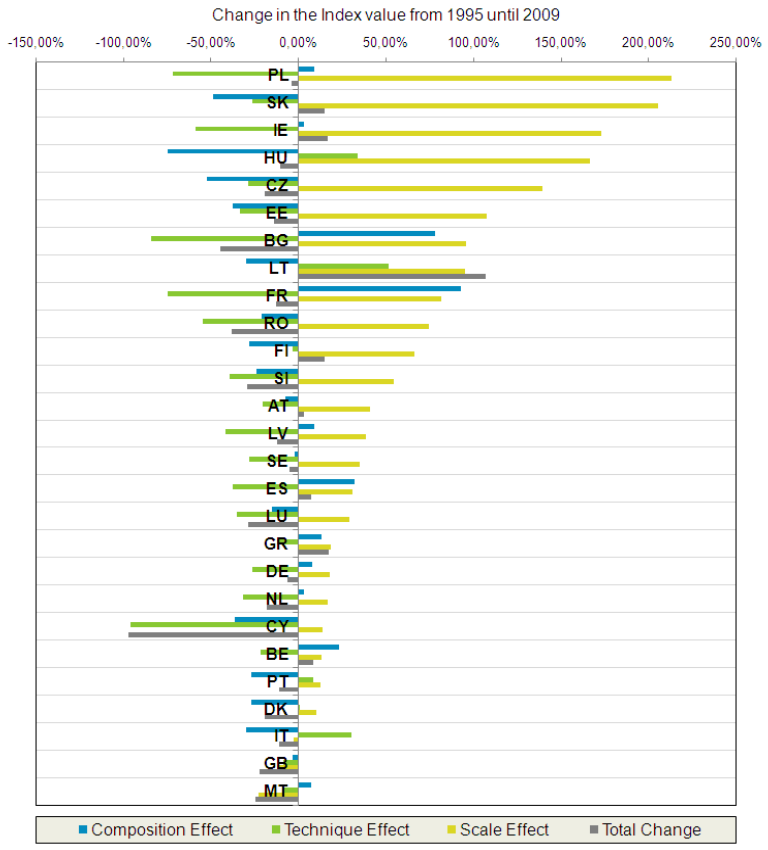


Source: WIOD.

Figure 3.21 shows that for China the increase in economic activity in the manufacturing sector was the dominant factor (it would have accounted for an overwhelming 600% increase in energy use had other factors remained unchanged in the period 1995-2009). At the same time, there was a significant improvement in energy efficiency and a progressive shift towards less intensive manufacturing sectors. As a result, total energy use of the Chinese manufacturing sector more than doubled from 1995 until 2009.

So far, the analysis suggests that EU manufacturing sectors had a relatively good performance overall in improving energy efficiency and contributed to the leading position and eco-performance of the European Union as a whole. Figure 3.22 reports the changes in total energy use and the three decomposition factors per Member State in the period 1995-2009.

Figure 3.22 - Decomposition Analysis of Total Energy Use in Manufacturing Sectors



Source: WIOD.

Overall total energy use in the manufacturing sectors decreased from 1995 until 2009 in most of the Member States (there are only a few exceptions, e.g. Lithuania). Those countries with a high scale effect (Ireland and a subset of the EU-12 countries) are at the same time those countries that overall achieved the greatest improvement in energy efficiency (technical effect). However, all Member States (except five, Lithuania, Hungary, Italy, Portugal and Denmark) have improved energy efficiency in manufacturing. There was a shift towards less energy-intensive sectors in the EU-12 countries with only a few exceptions (in particular Bulgaria). The composition effect is heterogeneous across EU-15 countries (e.g. there is no discernible shift towards less energy-intensive sectors as observed in Figure 3.20 above for Japan).

3.3. ECO-INNOVATION ADOPTION AND THE COMPETITIVENESS OF EU FIRMS

This section analyses the evidence for the adoption and development of eco-innovations by EU firms, focusing on energy-efficient process technologies and products. It is of particular interest to study how the adoption of energy efficiency translates into the performance and competitiveness of European firms.

This section is organised as follows: i) it starts by presenting some background and a short literature review; ii) the second part studies the reasons why firms introduce energy-efficient technologies; iii) the third part analyses whether firms that introduce new products on the market that allow their customers to save energy have a higher success rate in terms of commercialisation of their product innovations, compared to conventional product innovators. The section ends with a brief analysis of the competitive position of EU firms in the growing cross-border investments in clean, more energy-efficient and other technologies related to the development of environmental goods and services. This assessment paves the way for the in-depth analysis that follows in Chapter 4 on general FDI flows and their impact on competitiveness.

3.3.1. Background and literature review

Eco-innovation is any form of innovation resulting in or aiming at significant and demonstrable progress towards the goal of sustainable development, through reducing impacts on the environment, enhancing resilience to environmental pressures, or achieving a more efficient and responsible use of natural resources (European Commission (2011)). It can be understood as the first introduction of a pollution-abatement technology or resource-saving technology (energy or material inputs) by a firm. It is required that the respective technology only to be novel to the introducing firm and, of course, does not distinguish between technology invented by the firm itself and the adoption of well-known abatement technology that had already been invented by others (see Rennings (2000) for a more detailed discussion).

The choice to invent or to adopt a new process technology is determined by several factors (such as input prices or regulations), but eco-innovation has also associated a positive environmental externality. While for conventional technical change the innovator is rewarded with private benefits, the eco-innovator in general also creates social benefits and has to bear the costs of introducing technical change alone. For energy-efficiency technology, there are usually both private returns (e.g. lower energy and maintenance costs, etc.) and social benefits (such as reductions in CO2 emissions).

This chapter restricted the scope of the empirical analysis to energy-saving technologies and the words ‘eco-innovation’, ‘invention’, ‘innovation’ and ‘adoption’ - of an existing technology that is new to the firm - have been used interchangeably.

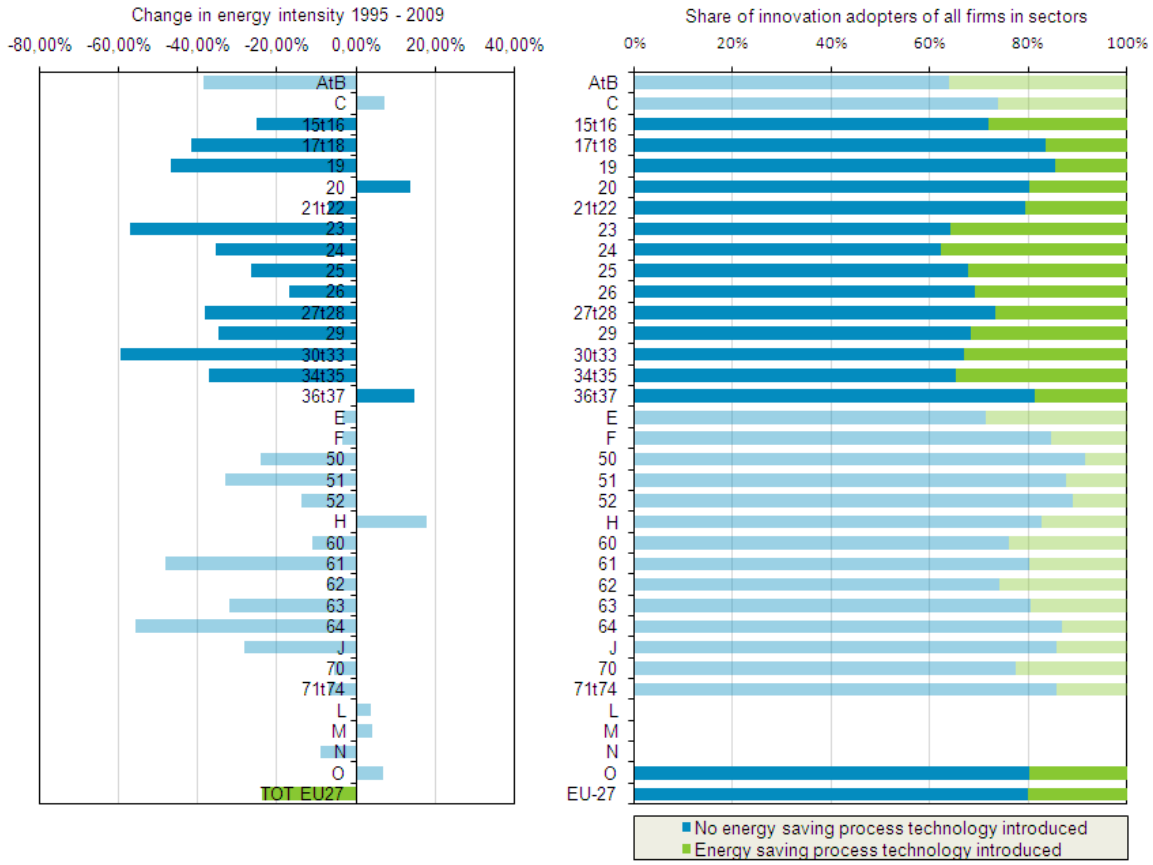
The Community Innovation Survey 2008 (CIS 2008) reports information for more than 76500 firms across 18 EU Member States on whether they adopted energy-saving technologies (amongst other eco-innovations) between 2006 and 2008[50]. The countries included are Bulgaria, Cyprus, the Czech Republic, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Lithuania, Latvia, Malta, The Netherlands, Portugal, Romania, Slovakia, and Sweden.

A first look at both the CIS micro-data and WIOD sectoral data (see Figure 3.23) reveals that manufacturing – as a whole and in particular energy-intensive sectors – achieved a relatively greater reduction in their energy intensity and that this corresponds to higher eco-innovation activities observed in the firm-level data for the same sectors.

[50] The CIS 2008 reports information about eco-innovation for 22 Members States. However, microdata is not available for four of them (Belgium, Luxembourg, Austria and Poland). CIS reports the firms’ responses to the question “During the three years 2006 to 2008, did your enterprise introduce a product (good or service), process, organisational or marketing innovation with any of the following environmental benefits: […]’.

The left-hand side of Figure 3.23 presents the change in energy intensity from 1995 until 2009, based on WIOD. The share of firms in the CIS micro-data that introduced energy-saving process technologies between 2006 and 2008 is presented in the right-hand-side (RHS) figure.

Figure 3.23 - Change in Energy Intensity 1995 - 2009 by Sectors in 18 EU Member States (LHS) and Energy-efficiency Innovation Activities of Firms by Sectors in 18 EU Member States (RHS)



Source: WIOD, CIS 2008.

The arguments and brief discussion in section 3.2 had already suggested — at a macroeconomic level — that increases in the price of energy were one of the major drivers for energy saving eco-innovations. An interesting follow-up would be to study whether firms that use energy rather intensively are more affected by increasing energy prices and have a higher level of induced energy-saving eco-innovation activities (bearing in mind that existing capital goods can limit the opportunity space for the adoption of energy-efficiency technology, etc.). Unfortunately, the CIS data offers no information on either energy prices or on how much energy is consumed by firms.

There exist a large number of studies indicating that, apart from prices, regulation is another important driver for the adoption of eco-innovation in general. The price-induced innovation argument can be 'translated' to environmental regulation that induces technical change.[51] Early empirical evidence that regulation triggers eco-innovations is given by Lanjouw and Mody (1996). They associate international patenting behaviour regarding environmentally related technologies with pollution-abatement spending in different countries. Jaffe and Palmer (1997) take the R&D process into account as well as the outcomes of inventive processes (measured with patent applications) and do not find a statistically significant effect of pollution-control expenditures on patenting activities. In contrast to this study, Brunnermeier and Cohen (2003) find a link

[51] It can be argued that what environmental regulation does is to drive a wedge between the market price of polluting inputs and their shadow price (so that they become 'loosely speaking' relatively more expensive). In this sense, environmental regulation would have the same consequences as a price increase for the polluting input factors (such as fossil energy sources), making the concept of induced technical change applicable to green innovations.

between pollution-abatement spending and successful patent applications related to environmental technologies. Popp et al. (2010) contains a detailed and comprehensive survey of this literature.

In contrast to the literature on the drivers of eco-innovation adoption, a much less clear-cut prediction is provided regarding eco-innovation's impact on competitiveness. The large body of research on the competitiveness impact of eco-innovation adoption in general is mostly focused on the role played by regulation (e.g. the very early literature begins in the 1980s after the United States and other highly industrialised countries had started to regulate local water and air pollutants; for instance, sulphur dioxide (SO_2)).

Christiansen and Haveman (1981) associate an 8–12% slowdown in U.S. productivity between 1965 and 1979 with environmental regulations. Other studies, like Gollop and Roberts (1983) or Greenstone (2002), also find that regulation has negative effects on economic performance. Jaffe et al. (1995), in a comprehensive survey, conclude that overall there was relatively little evidence to support the hypothesis that environmental regulations have had a large adverse effect on competitiveness. Several sectoral studies on how firms' productivity is affected by environmental regulation appear to reach similar mixed and inconclusive results: Berman and Bui (2001) find that for U.S. oil refineries, regulation is associated with a 'substantial' investment in pollution-abatement capital and productivity growth in the more stringently regulated regions; conversely, Gray and Shadbegian (2003) find the opposite is the case for pulp and paper plants, again in the U.S.; however, Boyd and McClelland (1999), based on a new (regression-free) methodology, find some evidence for productivity-decreasing effects of abatement technology in the paper industry; Aiken et al. (2009) does not find negative effects of pollution abatement on the productivity of several sectors in the U.S., Germany, Japan, and the Netherlands. In a more recent contribution, Rexhäuser and Rammer (2011) use German CIS data — distinguishing between regulation and non-regulation-induced eco-innovations (these further broken down into pollution-preventing ones and those that reduce energy and material use) — finding productivity-enhancing effects at firm level but only for energy and material-saving technology adoption.

3.3.2. Adoption of energy-saving technologies

The choice to introduce energy-efficiency technology is expected to be driven by environmental regulation and increasing prices for energy in the first place. For regulation, the CIS data offers firms' responses to the question whether energy-saving process technology was introduced to meet regulatory requirements or whether it was introduced because regulation was expected to come into force in the future. For energy prices, however, the CIS data unfortunately offers no information.

Examples of other potential determinants of eco-innovations reported in the CIS data are whether the innovation was introduced in response to demand by customers, due to voluntary environmental agreements by the firm or due to public subsidies for environmental technology. There are also such indicator variables as whether the firm has introduced any other process innovation or new products, exports to European countries or to world markets (which can be seen as a proxy for exposure to international competition).

Given the discrete nature of a firm's decision whether or not to introduce environmental process technology, a discrete choice (probit) model estimates the probability of introducing energy-saving process technology, controlling for firm-specific characteristics (such as firm size and sector affiliation) and, of course, the determinants for having introduced eco-innovations the firms reported (see Annex 2).

In line with previous research, the analysis supports the view that environmental regulation is a key driver of eco-innovations (the adoption of energy-saving process innovations in this case). For more than 46 000 firms across 16 European countries[52], the model estimates that those firms that reported they had introduced eco-innovations due to environmental regulation have (on average) an 11.70 percentage points higher probability of adopting energy-efficiency technology than those firms that did not introduce such innovations due to regulation (see Annex 2). The mere expectation of further regulation increases by 9.56 percentage points the probability of adopting energy-saving technology. However, the results differ across countries. The effect of regulation is found to be greater in Romania (25.9 percentage points), Slovakia (24.8 percentage points), and Bulgaria (24 percentage points). In contrast, the effect is very low but still significant in Italy (4.7 percentage points).

Other important determinants are voluntary environmental agreements by firms and the adoption of other process innovation. Firms that reported voluntary environmental agreements as the

[52] Sweden and Finland were omitted due to missing data.

reason for eco-innovation adoption have (on average) a 17.0 percentage points higher probability of adopting energy-saving innovation compared to firms where this was not the case. The effect of having introduced another process innovation boosts by 13.2 percentage points the probability of adopting an energy-saving innovation; a possible interpretation for this is that energy-saving process technology is to some degree adopted together with conventional process technology. The effect that introducing new products has on the probability of adopting energy-saving innovation is also positive but smaller (+5.3 percentage points).

Firms exporting to other European countries or to world markets have higher probabilities of adopting energy-saving innovations but in no case is this statistically significant. Interestingly, the two export dummy variables were statistically significant in a different model specification, not controlling for the introduction of new products and other process innovations. This result suggests there might be an indirect link between the internationalisation of EU firms and the adoption of energy-efficiency innovation — meaning that (exporting) internationalised firms tend to be more innovative (introducing new products or adopting conventional process technology), this being associated with the adoption of energy-saving innovations. Anticipating the results in the next section, an example would be a firm that introduces a new product embodying energy-saving features.

3.3.3 Market success of energy-efficiency product innovators

The existing literature largely focuses on the adoption of energy-efficiency-improving technologies (especially if regulation-induced) and the impacts on measured productivity at firm, sector or aggregate level. Unfortunately, the CIS data does not make it easy to study the impact of eco-innovation on productivity measures such as total factor productivity. With CIS it is possible only to study the impact on rather rough productivity measures, such as turnover or turnover per worker. Moreover, the non-availability of important factors such as capital use or energy further complicates matters. The non-availability of capital data is problematic since capital is expected to be correlated with the adoption of energy-efficiency technology. Firms that have a higher capital endowment also need more energy inputs to operate capital goods and therefore (if energy prices are high) may find a need to replace capital goods by more energy-efficient ones. In summary, in a standard regression the effect of energy-efficiency-technology adoption could therefore be biased.
Rennings and Rexhäuser (2012) made several attempts to circumvent these problems (e.g. by proxying capital by lagged firm turnover). The regressions performed seem to suggest that energy-saving process innovation adoption has only minor, if any, effects on the growth rates of turnover or turnover per worker.

This section takes another approach to studying the impact of energy-efficiency innovation activities on the performance and competitiveness of EU firms. A major — and largely neglected — aspect of competitiveness and eco-innovations is whether 'green' product innovations lead to a better competitive position of the innovators. In what follows, the competitiveness of product innovators will be studied using firms' innovation success which is measured, as is commonly done, by the share of new products in firms' total sales.

Innovation success is measured as the sum of the turnover share of market novelties in total sales plus the share of new products introduced into the market that are new only to the firm (reported in percentage points in CIS). The CIS data also offers information on whether the product innovations of firms allow their customers to save energy. For instance, the data shows (as expected) that manufacturing firms lead in the introduction of product innovations that allow their customers to save energy but that other firms also have important energy-saving innovation activities. Around 15 000 firms (more than 9 250 in manufacturing) across 17 EU countries[53] reported having introduced newly developed products on the market between 2006 and 2008. New products account for around 28 % of the firm's total sales on average (both for the whole 15 000 and for manufacturing firms only). However, 41 % of the manufacturing firms reported energy-saving product innovations, against 38 % in the whole sample of product innovators (see Annex 3).

The central question addressed here is then the extent to which the introduction of energy-efficient products by firms is valued by the market and whether this translates into greater firm success compared to conventional product innovators.

One of the major determinants of innovation success is to what extent a firm is engaged in innovative activities. A firm that invests more in R&D will in principle have a higher share of new products in total sales. Moreover, firms that are continuously engaged in R&D activities may also be more innovative as well as those that cooperate with other firms, customers or research institutes.

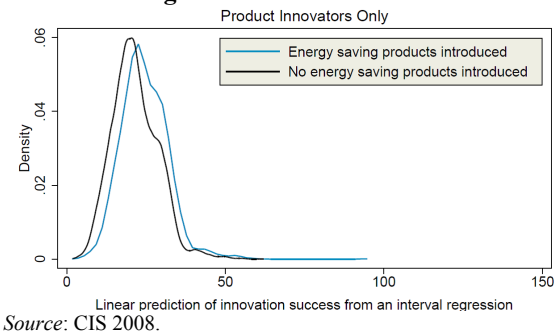
[53] Sweden is not included due to missing data.

Firms owned by domestic groups or belonging to foreign multinationals may also have access to external knowledge. The economic literature also offers evidence of the effect of other variables. For instance, innovative outputs tends to increase with firm size, but that this relationship follows a less than proportionate rate (see for instance Scherer (1965) or Acs and Audretsch (1988)). These are the main variables serving as controls in the regression analysis (see Annex 3).

In surveys, firms often report rather 'round' numbers if they are asked to state a percentage number, for instance because they simply do not know the exact number. This was also observed in the CIS data on innovation success. The dependent variable in the regression was therefore transformed into a categorical variable recording innovation success in 10 equally distributed intervals. A sensitivity check has shown that this rearrangement has only a very small impact on the results. The analysis reported here is restricted to European firms in the CIS that stated they had introduced newly developed products on the market (as a large number of non-innovator firms report missing values for several control variables).

The regression analysis provides evidence that innovators that introduce new products into the market, allowing their customers to save energy, are more successful innovators. Compared to firms which introduce only conventional product innovations into the market, eco-product innovators have on average a 2 percentage points higher share of product innovations in total turnover. At aggregate level, the mean share of turnover that is earned by selling new products would rise from approximately 28 to 30 per cent. This may seem to be a small percentage at first glance but individually the effect can be higher (see Figure 3.24) and mostly importantly may represent a significant competitive advantage. Eco-product innovators in manufacturing sectors enjoy a 2.6 percentage point increase in innovation success compared to conventional product innovators. For manufacturing firms, this effect is illustrated graphically below.

Figure 3.24 – Innovation Success in Manufacturing Sectors



Source: CIS 2008.

The figure predicts the likelihood of a certain level of innovation success being recorded and compares firms that introduced energy saving product innovations with those that did not, controlling for any other differences in innovation success. The interpretation of these density plots is as follows: For 'green' product innovators, the likelihood of levels of innovation success from zero up to, say, 25 per cent being recorded is smaller compared to conventional innovators. Conversely, the likelihood of eco-product innovators being recorded at levels above 25 per cent, but most importantly between 25 and 40 per cent, is higher for 'green' innovators compared to non-green innovators.

Overall, there seems to be evidence that product innovators introducing energy-saving products on the market enjoy higher sales generated by product innovation compared to conventional product innovators. This, of course, may also reflect an important competitive advantage.

3.3.4. The internationalisation and competitive position of EU firms in 'green FDI'

Energy efficiency and related environmental goals are global challenges presenting many business opportunities for EU firms. This subsection uses the fDi markets database to analyse the internationalisation and competitive position of EU firms and some EU leading industries in the area of environmental goods and services. The analysis focuses on cross-border greenfield investments in an environmental-technologies cluster related to the provision of environmental goods and services (Golub et al. 2011). The assignment of greenfield FDI to the environmental cluster is done at the project level. For example, particular FDI projects within the machinery industry are included if they relate to environmental goods (e.g. if the project consists of new production facility for water-treatment systems). Another example is the electronics industry where projects related to solar modules from part of the environmental technology cluster. This classification entails a very large

overlap with Eurostat's definition of Environmental Goods and Services Industries. In particular, it includes both the main environmental-protection industries, i.e. waste and wastewater treatment, and the resource-management industries, i.e. alternative-energy generation (Eurostat, 2009). In addition, the definition also includes several investments related to what Eurostat calls 'connected' products such as wind turbines.

Table 3.8 presents the amounts (in million USD) of green FDI projects undertaken by EU MNEs across four main sectors of environmental technology in the period 2007-2011 and compares them with the activities of major competitors (MNEs from the US, China and Japan). Renewable energy is clearly the dominant industry in terms of the amount of green FDI (374 000 million USD worldwide over the period 2007-2011, accounting for 4/5 of all green FDI projects). In terms of the common industry classification, the renewable-energy industry would be part of the electricity, gas and water supply sector – NACE E according to NACE Rev1.). Other important industries for green investment projects are also found within manufacturing, namely the electronic-components industry (48 000 million USD worldwide, a share of 10 % of the total green FDI), the engines and turbines industry (with a 4 % share of the total worldwide green FDI). Industrial machinery accounts for a smaller share (around 1 %) of the worldwide green FDI but includes a considerable number of cross-border FDI projects (around 250 projects worldwide in the period 2007-2011 — not reported in Table 3.8, comparable to the number of green FDI projects in the engine and turbine industry over the same period).

The prominence of these industries stems from the fact that companies in these sectors build the equipment needed for alternative forms of power generation (FDI projects include plants producing wind engines and turbines or the electronic components of solar panels). The remaining green FDI is attributed to several sectors (e.g. Metals, Chemicals, Business Service), each with much lower individual shares.

Table 3.8 - Position of EU companies in green cross-border investment projects relative to the US, Japan and China (2007-2011, million USD)

		EU total	intra-EU	extra-EU	US	Japan	China	RoW	WORLD
Alternative/Renewable Energy	inv.	236820	*116053*	*120767*	47873	20145	11001	58211	374049
	share	(63.3)	*31.0*	*(32.3)*	(12.8)	(5.4)	(2.9)	(15.6)	79%
Electronic Components	inv.	22811	*6191*	*16620*	9824	2896	2449	9962	47943
	share	(47.6)	*(12.9)*	*(34.7)*	(20.5)	(6.)	(5.1)	(20.8)	10%
Engines & Turbines	inv.	12719	*1931*	*10788*	1109	932	3580	1868	20208
	share	(62.9)	*(9.6)*	*(53.4)*	(5.5)	(4.6)	(17.7)	(9.2)	4%
Industrial Machinery, Equipment & Tools	inv.	2448	*392*	*2056*	911	1101	28	420	4908
	share	(49.9)	*8.0*	*(41.9)*	(18.6)	(22.4)	(.6)	(8.6)	1%
Others	inv.	14251	*5229*	*9022*	2720	2796	653	**5942**	26362
	share	(54.1)	*(19.8)*	*(34.2)*	(10.3)	(10.6)	(2.5)	**(22.5)**	6%
Overall Total	**inv.**	**289048**	*129796*	*159252*	**62438**	**27870**	**17711**	**76402**	**473469**
	share	**(61.0)**	*(27.4)*	*(33.6)*	**(13.2)**	**(5.9)**	**(3.7)**	**(16.1)**	

Note: EU is EU-27. Industry classification of fDi markets database.
Source: fDi markets database.

Overall, leading EU manufacturing and services firms in green industries are highly internationalised and seem to be well positioned in global competition. For the environmental-technologies cluster as a whole, EU companies accounted for almost 2/3 of green FDI by MNEs worldwide in the period 2007-2011 (when Intra-EU FDI is also included). Around 55 % of the EU's green FDI correspond to extra-EU investments, 160 000 million USD in the period 2007-2011. This is almost 3 times the amount of outward green FDI by US MNEs over the same period.

Among the green industries shown in Table 3.8, EU companies are best positioned in Alternative/Renewable Energy and in the engines and turbines industry (with a share of close to 2/3 of the green FDI worldwide in both sectors). EU companies lead international investment activities in these industries and wind-turbine manufacturing firms in countries such as Denmark, Germany and Spain play a leading role. The emergence of Chinese wind-turbine manufacturers (with about 18 % of FDI worldwide) is reflected by the fact that four of the ten leading companies (in terms of installed capacity) are from China and some of

them have already internationalised their operations via cross-border projects.

In the other two main sectors for green FDI, EU companies have a somewhat lower share, but EU MNEs are still global frontrunners. For instance, within the broader electronics industry EU companies managed to occupy a niche and develop a competitive edge in photovoltaic components, at least when judged by their international investment activity. At the same time, it should be stressed that according to sales figures European (as well as US) companies are facing intense competition from Chinese solar-panel producers. China enacted its renewable energies law in 2006, aimed at reducing energy dependence and CO_2 emissions but also at developing domestic production capacities and internationally active firms.

EU outward green FDI is preponderant in all sectors except for Alternative/Renewable Energy, in which Extra-EU and Intra-EU investments are roughly equal, showing the importance of the European single market for this sector. Outside the EU, the main host country for cross-border investments by EU firms in environmental technologies is the United States which accounts for a quarter of total projects (the prominent role of the US as destination is also found in general for FDI by EU multinationals, see Chapter 4 of this report). In second and third position come two other large markets, namely India (6.3 % of projects) and China (4.6 % of projects).

Table 3.9 presents worldwide green FDI in the period 2003-2011 per major host economy (in percentage). The EU attracted more than a third of all green investments globally over the period 2003-2011. This makes the EU the major host economy for green cross-border investments, ahead of the US (12 %), China and India. However, the EU as a whole appears to have lost some of its attractiveness for green FDI in the last 4 years (the share of green FDI located in the EU declined to below 40 %, compared to the exceptionally high pre-crisis level of 55 % in 2007). Similar trends are observed in overall FDI, the subject of a thorough analysis in Chapter 4.

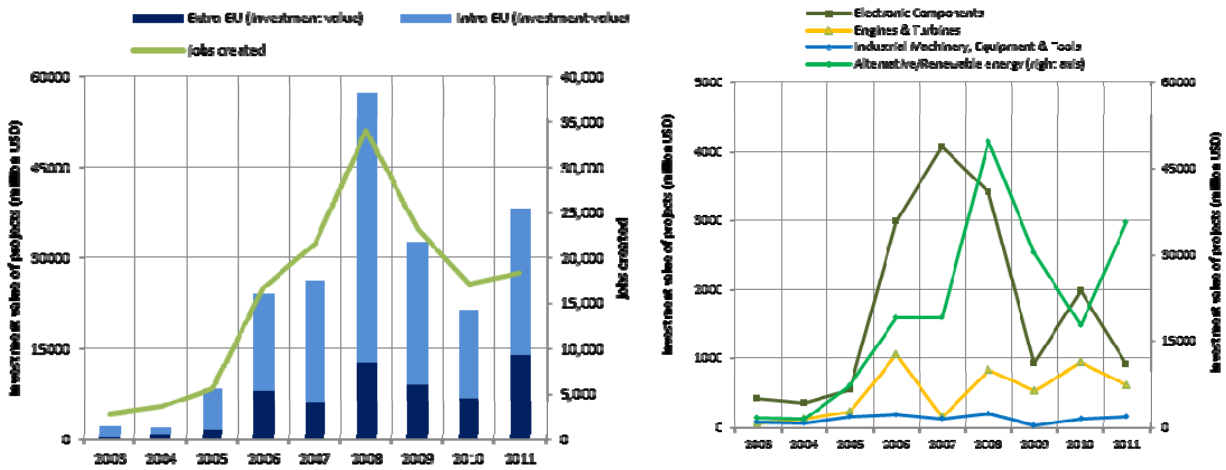
Table 3.9 - Major host economies for green cross-border investments, 2003-2011, shares of global green FDI (in percentage)

Destination Country	2003	2004	2005	2006	2007	2008	2009	2010	2011	average 2003-2011
EU-27	21.7	34.4	36.8	44.1	54.5	44.1	37.0	37.9	39.0	40.8
UK	2.3	11.5	4.7	4.3	7.1	5.8	8.7	7.2	8.6	7.0
Germany	1.6	2.5	5.2	3.5	3.9	5.3	4.8	6.3	6.9	5.1
Spain	0.8	4.1	6.1	4.6	7.3	5.7	3.9	4.3	2.5	4.5
France	3.1	0.0	4.2	7.3	7.1	9.0	3.0	1.4	2.2	4.5
Italy	1.6	0.0	1.9	0.8	4.1	3.3	4.6	4.3	3.0	3.3
United States	4.7	4.1	2.4	5.7	8.8	12.4	16.3	16.8	15.1	12.2
China	6.2	11.5	4.2	5.7	8.2	8.2	7.6	8.5	5.3	7.3
India	3.1	3.3	2.8	7.6	2.1	4.5	4.0	4.0	6.1	4.5
Canada	1.6	3.3	3.8	2.2	0.4	1.7	2.4	5.7	4.8	3.1
Brazil	15.5	0.0	1.9	2.7	1.7	1.6	0.7	3.3	4.0	2.7
Other Countries	47.3	43.4	48.1	32.2	24.2	27.5	31.9	23.9	25.7	29.5
Overall Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: fDi markets database.

Figure 3.25 shows the trends in cross-border investments in green technologies in the EU market (including both intra-EU and extra-EU projects), over time covering the period from 2003 to 2011. In this period, about two thirds of the green FDI correspond to intra-EU investments (a pattern found for EU inward FDI in general, see Chapter 4 of this report). This pattern is also observed across the main four industries for green FDI projects (presented in the right-hand panel of the figure), except for the electronic components industry, for which the extra-EU investments are predominant.

Figure 3.25 - Green cross-border investment undertaken in the EU-27 (left panel) and green cross-border investment in the EU market in leading green technologies industries (right panel), 2003-2011

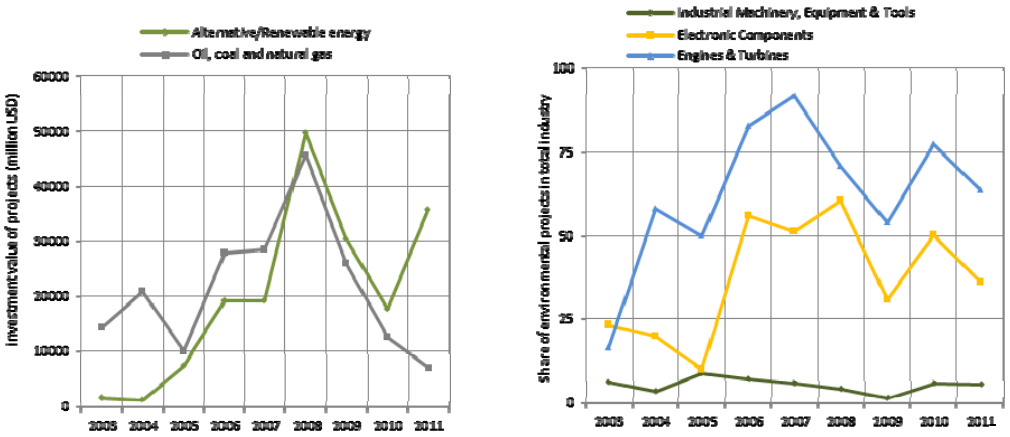


Source: fDi markets database.

The significant decline in green FDI in the EU in 2009 and 2010 (Figure 3.25, left panel) was mainly due to a sharp drop in investment and projects in the renewable-energies industry (Figure 3.25, right panel, right axis). The renewable-energies industry was also driving the recovery observed in green FDI in the EU in 2011. The number of jobs created by new cross-border projects in environmental-technology industries closely follows the trend in investments, though the number of jobs created remained below the 2007 level in 2011.

Despite the recent overall reduction in environmental-technology investment activities in the EU market, there is overall a clear increase in the importance of green technologies in the main industries analysed. Figure 3.26 (left panel) shows that renewable energy FDI has been outperforming cross-border FDI in projects related to oil, coal and natural gas in the EU. The share of renewable energy projects in total energy projects (renewable and conventional) surpassed 70 % in 2011.

Figure 3.26 - Greening of cross-border investment in the EU-27, selected industries, 2003-2011



Source: fDi markets database.

Within the other major green-technology industries, the share of environmental-technology projects in total EU cross-border investment projects also increased substantially, with the exception of the industrial-machinery industry. In the engines and turbines industry, the share of environmental-technology projects more than tripled from 25 % in 2003 to more than 75 % in 2010 (Figure 3.25, right panel). The trend is similarly positive in the electronic-components industry.

3.4. POLICY IMPLICATIONS

This chapter studied energy content in exports and energy-efficiency trends over the last 15 years. Their impact on competitiveness was analysed at country, sector and firm level in the context of key economic developments such as the globalisation of industrial activities and investments and improvements in technology and eco-innovation.

The developments in energy efficiency were first studied at an international level. Overall energy-efficiency improvements were observed in almost all countries over the period 1995-2009. In Europe, the EU-12 economies improved significantly their initial low levels of energy efficiency and the European Union as a whole reinforced its lead in terms of overall energy efficiency. The analysis highlighted the role of the substitution of energy for capital —in the sense of a more energy-efficient technology embodied in capital goods — that was observed over time in almost all countries.

Increasing global competition and cross-border integration of production chains are developments with far-reaching social, political and economic consequences. The overall increase in the relative price of energy is one of its many side effects, often seen as partly due to the increasing energy demand from developing countries. The rise in the price of energy and volatility levels have significant and highly differentiated impacts on the competitiveness of countries, sectors, firms or households.

The analysis in section 3.2 showed that for EU countries (as a whole) globalisation appears to also represent additional channels for minimising the negative competitiveness effects of the energy-price increases. Overall, EU countries have been able to export more and at the same reduce significantly the energy embodied in their exports, in particular the proportion of energy that is sourced domestically.

The analysis covered EU-12, EU-15, US and Japan and showed that energy use per unit of exports declined in European (particularly in EU-12) countries over time in the period 1995-2009. This contrasts with the increase in the energy embodied in one unit of exports observed in Japan, and to a smaller extent in the US, over the same period.

As expected, the share of energy content in exports sourced from foreign countries (i.e. energy embodied in intermediate imports) has been rising everywhere. The WIOD database shows that EU countries have been leading in this — globalisation induced — upward trend and already have a higher share of foreign-sourced energy embodied in exports compared with Japan, a country that also has a high external dependency on fossil fuels. The importance of emerging economies such as Brazil, Russia and in particular China as sources of the energy embodied in the exports of the advanced economies analysed has been growing over time.

As a result, the domestic-energy content in total exports decreased in the European economies. For the EU-12, this is due mainly to a significant drop in the energy incorporated domestically in manufacturing exports. In the EU-15, the most important contribution came from the drop in the domestic-energy content in service exports.

Along with globalisation of production and increasing vertical specialisation, the European economies have overall reduced in relative terms their vulnerability to potential external-competitiveness losses as a result of an increase in the relative price of energy. The relative weight of energy in their inputs into the foreign content of the generality of their trade partners' exports decreased overall in the period 1995-2009. The EU-15 as a whole, together with Japan, have the lowest relative weight of energy inputs in the total foreign inputs incorporated in exports globally. The EU-12 as a whole achieved the greatest reduction in the relative weight of energy inputs in the foreign content of its trade partners in WIOD.

Manufacturing is at the crossroads of globalisation and energy efficiency. Manufacturing transforms primary energy inputs into final energy products, uses energy in the transformation of materials into products, and many of its sectors and firms are at the forefront of the internationalisation of production chains and lead in eco-innovation activities and investments.
An index-decomposition analysis has shown that manufacturing in the European Union moderately increased gross output while at the same time maintaining energy use fairly constant due to continuous technical improvement in the period 1995-2009. Structural changes were negligible in this period for the EU as a whole.

Japan, like the EU a world leader in energy efficiency in manufacturing, did not improve technical efficiency in this period (the observed slight reduction in energy use is due to a shift to less energy-intensive manufacturing sectors, as output has remained fairly constant over the period analysed). US manufacturing increased output and improved technical efficiency, but in both cases less

than in the EU.

Manufacturing output increased and technical efficiency improved in the very large majority of the EU-27 Member States but there are significant variations in performance. The highest increases in manufacturing output were observed in the EU-12 countries and Ireland, and these were also the countries that tended to achieve the greatest improvements in technical efficiency. With only a few exceptions, there was a shift towards less energy-intensive sectors in the EU-12 Member States.

Section 3.4 analysed data (from the Community Innovation Survey) showing that EU firms that introduce new products with energy-saving features tend to be more successful innovators, particularly in the case of manufacturing firms. Controlling for other determinants of innovation success in the market, these eco-innovators sell more new products (in terms of the firm's total sales) than conventional innovators, which may represent an important competitive advantage.

The analysis has also shown that, overall, EU firms are leading in the growing phenomenon of internationalisation and in cross-border 'eco-investment' in clean and more energy-efficient technologies and products and services, exploiting many business opportunities offered by the global environmental and societal goals and challenges ahead. For instance, EU firms accounted for almost 2/3 of the FDI by MNEs worldwide in the important area of renewable energy in the period 2007-2011. They are also global frontrunners in many other eco-technologies (such as Engines & Turbines) associated with the provision of environmental goods and services. However, international competition is increasing, including from MNEs of emerging economies.

REFERENCES

Acs, Z. J. and Audretsch, D.B. (1988), ´Innovation in Large and Small Firms: An Empirical Analysis´, *The American Economic Review* 78(4), pp. 678-690.

Aiken, D. V., Färe, R., Grosskopf, S. and Pasurka Jr. C.A. (2009): ´Pollution Abatement and Productivity Growth: Evidence from Germany, Japan, the Netherlands, and the United States´, in: *Environmental & Resource Economics* 44(1), pp. 11-28.

Ang, B. W. and Zhang, F.Q. (2000), ´A Survey of Index Decomposition Analysis in Energy and Environmental Studies´, Energy 25(12), pp. 1149-1176.

Atkeson, A. and Kehoe, P.J. (1999), ´Models of Energy Use: Putty-Putty Versus Putty-Clay´, *American Economic Review* 89(4), pp. 1028–1043.

Becker, R. and Henderson, V. (2000), ´Effects of Air Quality Regulation on Polluting Industries´, *Journal of Political Economy* 108(2), pp. 379–421.

Berman, E. and Bui, L. T. M. (2001), ´Environmental Regulation and Productivity: Evidence From Oil Refineries´, *The Review of Economics and Statistics* 83(3), pp. 498–510.

Berndt, E. R. and Wood, D. O. (1975), ´Technology, Prices, and the Derived Demand for Energy´, *The Review of Economics and Statistics* 57(3), pp. 259-268.

Berndt, E. R. and Wood, D. O. (1979), ´Engineering and Econometric Interpretations of Energy-Capital Complementarity´, *The American Economic Review* 69(3), pp. 342-354.

Boyd, G. A. and McClelland, J. D. (1999), ´The Impact of Environmental Constraints on Productivity Improvement in Integrated Paper Plants´, *Journal of Environmental Economics and Management* 38(2), pp. 121–142.

Brunnermeier, S. B. and Cohen, M. A. (2003), ´Determinants of Environmental Innovation in US Manufacturing Industries´, *Journal of Environmental Economics an Management* 45(2), pp. 278-293.

Brunnermeier, S. B. and Levinson, A. (2004), ´Examining Evidence on Environmental Regulations and Industry Location´, *The Journal of Environment & Development* 13(6), pp. 6–41.

Caselli, F. (2005), ´Accounting for Cross-Country Income Differences´, in Phillipe Aghion and Steven Durlauf, eds., *Handbook of Economic Growth*, (Amsterdam: North-Holland Press), 2005.

Christiansen, G. B. and Haveman, R. H. (1981), ´The Contribution of Environmental Regulation to the Slowdown in Productivity Growth´, *Journal of Environmen-tal Economics and Management* 8(4), pp. 381–390.

Copeland, B. R. and Taylor, M. S. (2004), ´Trade, Growth, and the Environment´, *Journal of Economic Literature* 42(1), pp. 7–71.

Ederington, J., Levinson, A. and Minier, J. (2005), ´Footloose and Pollution-Free´, *The Review of Economics and Statistics* 87(1), pp. 92–99.

European Central Bank (2010), Energy Markets and the Euro Area Macroeconomy, Strutuctural Issues Report, June 2010.

European Commission (2011), Innovation for a sustainable future – The eco-innovation action plan (ECO-AP), COM(2011) 899 final.

Eurostat (2009), ´The environmental goods and services sector. A data collection handbook´, Eurostat methodologies and working papers, http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-RA-09-012/EN/KS-RA-09-012-EN.PDF.

Gilligham, K., R. G. Newell and K. Palmer (2009), ´Energy Efficiency Economics and Policy´, *Annual Review of Resource Economics*, 1, 597-619.

Gollop, F. M. and Roberts, M. J. (1983), ´Environmental Regulations and Productivity Growth: The Case of Fossil-fueled Electric Power Generation´, *Journal of Political Economy* 91(4), pp. 654–674.

Golub, S.S., Kauffmann, C. and Yeres, P. (2011), ´Defining and Measuring Green FDI: An exploratory Review of Existing Work and Evidence´, OECD Working Paper on International Investment, 2, June 2011.

Gray, W. B. (1987), ´The Cost of Regulation: OSHA, EPA and the Productivity Slowdown´, *The American Economic Review* 77(5), pp. 998–1006.

Gray, W.B. and Shadbegian, R.J. (2003): ´Plant Vintage, Technology, and Environmental Regulation´, *Journal of Environmental Economics and Management*, 46(3), pp. 384-402.

Greenstone, M. (2002), ´The Impacts of Environmental Regulations on Industrial Activity: Evidence from the 1970 and 1977 Clean Air Act Amendments and the Census Manufacturers´, *Journal of Political Economy* 110(6), pp. 1175–1218.

Griffin, J. M. and Gregory, P. R. (1976), ´An Intercountry Translog Model of Energy Substitution Responses´, *The American Economic Review* 66(5), pp. 845-857.

Henderson, J. V. (1996), ´Effects of Air Quality Regulation´, *The American Economic Review* 86(4), pp. 789–813.

Hicks, J. R. (1932), ´The Theory of Wages´, London, Macmillan.

Horbach, J. (2008), ´Determinants of Environmental Innovation—New Evidence from German Panel Data Sources´, Research Policy 37(1), pp. 163–173.

Jaffe, A. B. and Palmer, K. (1997), ´ Environmental Regulation and Innovation: A Panel Data Study´, *The Review of Economics and Statistics* 79(4), pp. 610-619.

Jaffe, A. B. and Stavins, R. N. (1995), ´Dynamic Incentives of Environmental Regulations: The Effect of Alternative Policy Instruments on Technology Diffusion´, *Journal of Environmental Economics and Management* 29(3), pp. 43-63.

Jaffe, A. B., Peterson, S. R., Portney, P. R. and Stavins, R. N. (1995), ´Environmental Regulation and the Competitiveness of U.S. Manufacturing: What Does the Evidence Tell Us?´, *Journal of Economic Literature* 33(1), pp. 132–163.

Johnstone, N., Haščič, I., and Popp, D. (2010), ´Renewable Energy Policies and Technological Innovation: Evidence Based on Patent Counts´, *Environmental & Resource Economics* 45(1), pp. 133-155.

Lanjouw, J. O. and Mody, A. (1996), ´Innovation and the International Diffusion of Environmentally Responsive Technology´, Research Policy 25(4), pp. 549 571.

Levinson, A. (2009), ´Technology, International Trade, and Pollution from US Manufacturing´, *The American Economic Review* 99(5), pp. 2177–2192.

Linn, J., (2008), ´Energy Prices and the Adoption of Energy-Saving Technology´, *The Economic Journal* 118(533), pp. 1986-2012.

List, J. A., Millimet, D. L., Fredriksson, P. G. and McHone, W. W. (2003), ´Effects of Environmental Regulations on Manufacturing Plant Births: Evidence from a Propensity Score Matching Estimato´, *The Review of Economics and Statistics* 85(4), pp. 944–952.

Newell, R. G., Jaffe, A. B. and Stavins, R. N. (1999), ´The Induced Innovation Hypothesis and Energy-Saving Technological Change´, *The Quarterly Journal of Economics* 114(3), pp. 941-975.

Pavitt, K. (1984), ´Sectoral Patterns of Technical Change: Towards a Taxonomy and a Theory´, Research Policy 13(6), pp. 343–373.

Piot-Lepetit, I. and Moing, M. L. (2007), ´Productivity and Environmental Regulation: The Effect of the Nitrates Directive in the French Pig Sector´, *Environmental & Resource Economics* 38(4), pp. 433–446.

Popp, D. (2002), ´Induced Innovation and Energy Prices´, *The American Economic Review* 92(1), pp. 160-180.

Popp, D., Newell, R. G. and Jaffe, A. B. (2010), ´Energy, the Environment, and Technological Change´, Chap. 21, in: *Handbook of Economics of Innovation* (Bronwyn H. Hall and Nathan Rosenberg, eds.), North-Holland, Amsterdam, pp. 873–937.

Rennings, K., (2000), ´Redefining Innovation -Eco-Innovation Research and the Contribution from Ecological Economics", *Ecological Economics* 32(2), pp. 319–332.

Rosenberg, N., (1994), "Exploring the Black Box", Cambridge University Press, Cambridge, Massachusetts.

Scherer, F. M. (1965a), ´Firm Size, Market Structure, Opportunity, and the Output of Patented Inventions´, *The American Economic Review* 55(5), pp. 1097–1125.

Shadbegian, R. J. and Gray, W. B., (2005), "Pollution Abatement Expenditures and Plant-level Productivity: A Production Function Approach", Ecological Economics 54(2-3), pp. 196–208.

ANNEX 1: INDEX DECOMPOSITION ANALYSIS

This annex describes the (Log Mean Divisia index) decomposition method used in Section 3.4 to study energy-efficiency performance in the various countries over time. The decomposition of an economic index — e.g. energy intensity or energy use — into sub-indices helps in understanding the different economic factors behind the changes in the index. Three sub-indices were considered: i) economic growth, ii) structural change, and iii) technical change.

Consider the following variables for a given country and $i=1,...N$ sectors in years t=0,..,T

Variable	Description
Y_t	Output in volume of the country in year t
$Y_{t,i}$	Output of sector i in year t
E_t	Total energy use of a country in year t ($E_t = \sum_i S_{t,i} \cdot I_{t,i} \cdot Y_t$)
$E_{t,i}$	Energy use of sector i in year t
$I_t = E_t / Y_t$	Energy intensity of the country in year t
$I_{t,i} = E_{t,i} / Y_{t,i}$	Energy intensity of sector i in year t
$S_{t,i} = Y_{t,i} / Y_t$	Share of sector i in the country's output

The impact of economic growth on the index is called the 'scale effect'. It describes how the index would have changed if the other two factors had remained fixed (i.e. no structural and technical change had taken place). The composition and technical effects are defined in a similar way. In a simple Laspeyres index decomposition (see e.g. Ang and Zhang, 2000), the scale effect can be obtained by holding fixed the sectoral energy intensities and weights ($S_{t,i}$ and $I_{t,i}$ at the base year, 1995 in this case) in the calculation of the index; the 'composition effect' holds Y_t and $I_{t,i}$ fixed in order to isolate the impact of the change in $S_{t,i}$; and the 'technical effect' holds Y_t and $S_{t,i}$ fixed:

$$SCALE = \frac{\sum_i S_{0,i} \cdot I_{0,i} \cdot Y_t}{\sum_i S_{0,i} \cdot I_{0,i} \cdot Y_0}$$

$$COMPOSITION = \frac{\sum_i S_{t,i} \cdot I_{0,i} \cdot Y_0}{\sum_i S_{0,i} \cdot I_{0,i} \cdot Y_0}$$

$$TECHNICAL = \frac{\sum_i S_{0,i} \cdot I_{t,i} \cdot Y_0}{\sum_i S_{0,i} \cdot I_{0,i} \cdot Y_0}$$

$$TOTAL = SCALE \cdot COMPOSITION \cdot TECHNICAL + RESIDUAL$$

The problem with this simple index decomposition is that it leaves a residual that is difficult to interpret. This problem does not appear in the Log Mean Divisia index (developed by Sato, 1976). This decomposition is similar to the Laspeyres method except for the use of a (logarithmic mean) weighting function on the energy used. Let $\omega_{t,i} = E_{t,i} / E_t$ be the share of a country's total energy that is used by sector i. The logarithmic mean of $\omega_{t,i}$ is calculated as:

$$L(\omega_{t,i}, \omega_{0,i}) = \frac{\omega_{0,i} - \omega_{t,i}}{\ln \omega_{0,i} - \ln \omega_{t,i}}$$

Note that when $\omega_{t,i} = \omega_{0,i}$ the logarithmic mean is equal to $\omega_{t,i}$ (including when $\omega_{t,i} = \omega_{0,i} = 0$).

The Log Mean Divisia index decomposition for energy use is computed as follows (see Ang and Liu, 2001 for a detailed discussion of the properties of this decomposition):

$$SCALE = \exp\left(\sum_i \frac{L(\omega_{t,i},\omega_{0,i})}{\sum_i L(\omega_{t,i},\omega_{0,i})} \cdot \ln\left(\frac{Y_t}{Y_0}\right)\right)$$

$$COMPOSITION = \exp\left(\sum_i \frac{L(\omega_{t,i},\omega_{0,i})}{\sum_i L(\omega_{t,i},\omega_{0,i})} \cdot \ln\left(\frac{S_{t,i}}{S_{0,i}}\right)\right)$$

$$TECHNICAL = \exp\left(\sum_i \frac{L(\omega_{t,i},\omega_{0,i})}{\sum_i L(\omega_{t,i},\omega_{0,i})} \cdot \ln\left(\frac{I_{t,i}}{I_{0,i}}\right)\right)$$

$$TOTAL = SCALE \cdot COMPOSITION \cdot TECHNICAL$$

ANNEX 2: ESTIMATION RESULTS FOR ENERGY-EFFICIENCY TECHNOLOGY ADOPTION

Table A.1: Description of the variables used

Variable	Description
EN_INNO=1,0	1 if firm introduced energy saving process innovations, zero otherwise
RD_INT	R&D expenditures in thousands of Euro per employee
PC_INNO=1,0	1 if a firm has introduced a process innovation; zero otherwise
PD_INNO=1,0	1 if a firm has introduced new products; zero otherwise
ln_SIZE	natural logarithm of the number of employees
REG=1,0	1 if firm introduced an environmental innovation in response to existing environmental regulations or taxes on pollution; zero otherwise
REG _EXP=1,0	1 if firm introduced an environmental innovation in response expected further regulation; zero otherwise
SUBS=1,0	1 if firm introduced an environmental innovation in response to governmental grants or subsidies; zero otherwise
DEMAND=1,0	1 if firm introduced an environmental innovation in response to market demand; zero otherwise
VOLUNT=1,0	1 if firm introduced an environmental innovation in response to voluntary environmental agreements; zero otherwise
ENV_MANAG = 1	1 if firm has introduced environmental management practices; zero otherwise
GROUP_DOM=1,0	1 if firm is affiliated in an domestic enterprise group; zero otherwise
GROUP_FOR=1,0	1 if firm is affiliated in an foreign enterprise group; zero otherwise
EXPORT_NATIONAL	1 if firm sells into national market; zero otherwise
EXPORT_ EUROPE	1 if firm exports into the European market; zero otherwise
EXPORT_WORLD	1 if firm exports into the world market; zero otherwise

Source: CIS 2008.

Table A.2 reports the marginal effects (at means) for the probit model estimation

$$\Pr(EN\_INNO = 1 \mid \mathbf{x}) = \Pr(EN\_INNO^* > 0) = \Phi(\mathbf{x}'\beta),$$

where the vector **x** includes all right hind side variable and Φ denotes the (cumulative) standard normal distribution. The marginal effects at means describe by how much the probability of observing *EN_INNO* = 1 changes if the variable of interest changes by one unit observed at the mean of this variable. For a binary dummy variable, a change from zero to one is considered. Sweden and Finland were omitted due to missing data.

Model (1) includes the standard determinants of eco-innovations while model (2) studies the robustness of these variables when conventional process-technology adoption is introduced as well as product innovation.

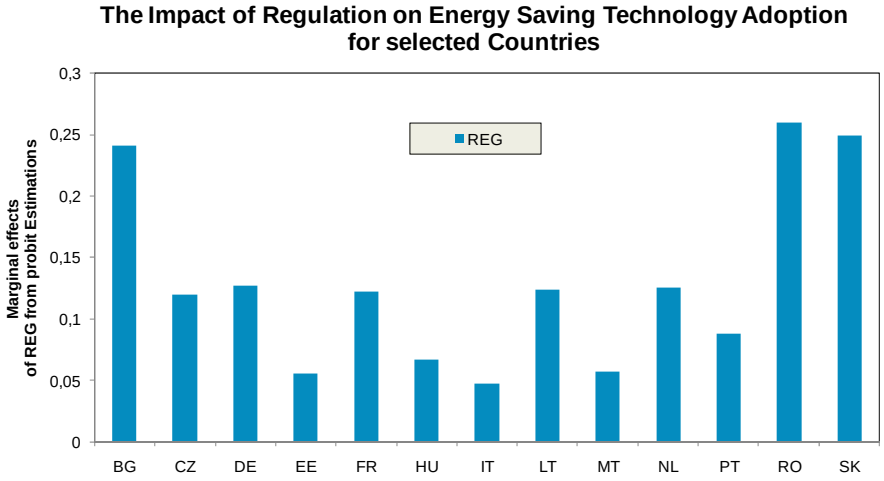
Table A.2: Estimation Results for Energy-efficiency Technology Adoption

Dependent Variable	(1)		(2)	
EN_INNO	**Marginal Effect**	**Std. Error**	**Marginal Effect**	**Std. Error**
RD_INT	-0.0005	(0.0006)	-0.0005	(0.0005)
PC_INNO			0.1315***	(0.0062)
PD_INNO			0.0525***	(0.0052)
ln_SIZE	0.0313***	(0.0020)	0.0265***	(0.0019)
REG	0.1290***	(0.0077)	0.1176***	(0.0074)
REG_EXP	0.1029***	(0.0081)	0.0956***	(0.0080)
SUBS	0.0856***	(0.0097)	0.0804***	(0.0096)
DEMAND	0.1138***	(0.0078)	0.1006***	(0.0076)
VOLUNT	0.1811***	(0.0082)	0.1699***	(0.0078)
ENV_MANAG	0.0253***	(0.0030)	0.0240***	(0.0029)
GROUP_DOM	0.0103*	(0.0056)	0.0103*	(0.0057)
GROUP_FOR	0.0108	(0.0068)	0.0138**	(0.0069)
EXPORT_NATIONAL	-0.0019	(0.0068)	-0.0119*	(0.0068)
EXPORT_EUROPE	0.0235***	(0.0076)	0.0083	(0.0075)
EXPORT_WORLD	0.0356***	(0.0074)	0.0108	(0.0073)
Observations	46160		46160	
Observed Probability	0.2798		0.2798	
Predicted Probability	0.2282		0.2231	
Pseudo-R^2	0.2237		0.2422	

Note: Standard errors appear in parentheses, ***,**,* denotes statistical significance at the 1 %, 5 %, and 10 % level, respectively. The models include 20 sector dummies and 15 country dummies.

Source: CIS 2008.

Figure A.1:



Source: CIS 2008.

ANNEX 3: ESTIMATION RESULTS FOR ENERGY-EFFICIENCY TECHNOLOGY ADOPTION

Table A.3: Description of the variables used

Variable	Description
IS	sum of the turnover share of market novelties in total sales and the share of new products introduced into the market that are new only to the firm
IS_INTERVAL	IS in 10 equal intervals
ESPI=1,0	1 if firm introduced product innovations into the market which allow the customers to save energy; zero otherwise
GROUP_DOM=1,0	1 if firm is affiliated to a domestic enterprise group; zero otherwise
GROUP_FOR=1,0	1 if firm is affiliated to a foreign enterprise group; zero otherwise
CONT_RD = 1,0	1 if firm performs R&D continuously; zero otherwise
EXT_RD=1,0	1 if firm acquires R&D services from external partners; zero otherwise
RD_INT	R&D expenditures in thousands of Euro per employee
COOP=1,0	1 if firm is engaged in R&D cooperation with another external partner; zero otherwise
PC_INNO=1,0	1 if a firm has introduced a process innovation; zero otherwise

Source: CIS 2008.

The descriptive statistics for all variables used in the later regression appear in the following table.

Table A.4: Descriptive Statistics for Innovation Success Analysis

Variable	Unit	Observations	Mean	Std. Deviation
Sample of all Firms				
IS	% of *PD_INNO* in turnover	14877	28.582086	27.896667
IS_INTERVAL	In 10 equal intervals	14877	3.1453922	2.6701385
ESPI	0/1	14877	0.38099079	0.48564664
GROUP_DOM	0/1	14877	0.30389191	0.459952
GROUP_FOREIGN	0/1	14877	0.26698931	0.4424016
CONT_RD	0/1	14877	0.63783021	0.4806437
EXT_RD	0/1	14877	0.42300195	0.4940523
RD_INT	Euro per employee	14877	6679.6596	34722.871
EMPLOYEES	Count	14877	484.30295	3232.5027
COOP	0/1	14877	0.53720508	0.49863062
PC_INNO	0/1	14877	0.58983666	0.4918797
Sample of Manufacturing Firms				
IS	% of *PD_INNO* in turnover	9259	27.458473	26.344554
IS_INTERVAL	In 10 equal intervals	9259	3.0336969	2.5249134
ESPI	0/1	9259	0.41311157	0.49241912
GROUP_DOM	0/1	9259	0.2891241	0.45338014
GROUP_FOREIGN	0/1	9259	0.28610001	0.45196112
CONT_RD	0/1	9259	0.67566692	0.46815041
EXT_RD	0/1	9259	0.43762825	0.4961213
RD_INT	Euro per employee	9259	5616.1638	33443.144
EMPLOYEES	Count	9259	429.39356	2615.15
COOP	0/1	9259	0.52727076	0.49928271
PC_INNO	0/1	9259	0.63818987	0.48055021

Source: CIS 2008.

Table A.5 reports the estimation results of the model:

$$\begin{aligned} IS\_INTERVAL_i = \; & \alpha + \beta_1 ESPI_i \\ & + \beta_2 GROUP\_DOM_i + \beta_3 GROUP\_FOR_i \\ & + \beta_4 CONT\_RD_i + \beta_5 EXT\_RD_i + \beta_6 RD\_INT_i + \beta_7 COOP_i \\ & + \beta_8 \ln\_EMPLOYEES_i + \mathbf{s}'\gamma + \mathbf{c}'\delta + \varepsilon_i \end{aligned}$$

The vectors s and c include sector- and country dummies, respectively. Sweden is now included.

Table A.5: Estimation Results: Innovation Success of European Firms

Dep. Variable	OLS		Interval Regression		
Innovation	All	Product Innovators Only			
Success	Firms Across all Sectors				Manuf. Only
	(1)	(2)	(3)	(4)	(5)
ESPI	3.0797***	2.4069***	2.0818***	2.0333***	2.5276***
	(0.4283)	(0.4671)	(0.4479)	(0.4416)	(0.5283)
GROUP_DOM	-0.9404*	-1.6176***	-1.5504***	-1.7128***	-2.1523***
	(0.5254)	(0.5734)	(0.5499)	(0.5470)	(0.6877)
GROUP_FOR	-0.4156	-0.3844	-0.3878	-0.4777	-1.0518
	(0.5820)	(0.6332)	(0.6072)	(0.5961)	(0.7360)
CONT_RD	4.7795***	3.8565***	3.5568***	3.2505***	2.1004***
	(0.4484)	(0.4943)	(0.4740)	(0.4739)	(0.6058)
EXT_RD	2.4537***	2.1714***	2.1037***	2.1441***	2.0954***
	(0.4360)	(0.4757)	(0.4562)	(0.4504)	(0.5488)
RD_INT	0.0393***	0.0441***	0.0446***	0.0500***	0.0288***
	(0.0059)	(0.0063)	(0.0061)	(0.0064)	(0.0080)
ln_EMPLOYEES	-2.1662***	-2.3761***	-2.1502***	-1.9474***	-1.3668***
	(0.1571)	(0.1700)	(0.1630)	(0.1563)	(0.2112)
COOP	1.7278***	0.6406	0.6758	0.5427	-0.0475
	(0.4380)	(0.4782)	(0.4586)	(0.4560)	(0.5552)
Constant	44.2960***	45.4269***	42.5886***	41.3524***	36.4683***
	(1.9737)	(2.0335)	(1.9499)	(1.9485)	(2.2417)
ln_Sigma					
ln_SIZE				-0.0506***	-0.0410***
				(0.0037)	(0.0050)
PC_INNO				0.0395***	0.0544***
				(0.0122)	(0.0158)
Constant			3.2288***	3.4302***	3.3343***
			(0.0059)	(0.0185)	(0.0257)
R^2	0.1104	0.0975			
Log Likelihood			-34984.514	-34893.501	-21284.462
Observations	17209	14877	14877	14877	9259

Note: Standard errors appear in parentheses, ***,**,* denotes statistical significance at the 1 %, 5 %, and 10 % level, respectively. The models include 20 sector dummies and 16 country dummies.

Source: CIS 2008.

Model specification (1) uses the innovation success variable (IS) as reported in the questionnaire. Model (2) is similar to model (1) but considers only product innovators (estimated by OLS). Model (3) uses the rearranged dependent variable (coded in ten intervals, OLS). Model (4) corrects for heteroscedasticity (factors that are expected to have some impact on the (logged) variance (ln_Sigma) are reported). Finally, model specification (5) further restricts the sample to product innovators in manufacturing sectors.

CHAPTER 4. FDI FLOWS AND EU INDUSTRIAL COMPETITIVENESS

The European Union is a major player in global foreign direct investment (FDI), in terms of both inward and outward FDI. This reflects not only the potential of the single market, but also the ability of EU companies in different industries to successfully compete in markets outside the EU. The crisis has, as expected, caused a disruption in FDI: the EU's share of world (inward) FDI flows have declined substantially, from 45% in 2001 to 23% in 2010. Outward investment flows have also dropped significantly and have been accompanied by a shift of FDI outflows to non-EU emerging markets, less affected by the European crisis.

The recent fall in inward FDI flows raises the following questions: what are the main factors influencing the decision to invest in an EU country, and how can we boost Europe's attractiveness to investors? Despite the conjectural decrease in inward FDI, the EU is generally considered an attractive location for foreign investment, with low FDI regulation, a highly educated workforce, and high productivity levels, to mention but a few of the factors that may make EU countries attractive to foreign investors. The attractiveness of the EU is well reflected in the high inward FDI stock in several industries. An empirical analysis will provide some evidence on the most important determinants.

FDI is generally expected to have positive direct and indirect effects on the recipient economy. On the one hand, foreign enterprises directly increase the capital stock and create employment; on the other, they may bring new technologies, skills and human capital that can spill over to domestic firms and workers. The empirical literature for EU countries finds strong support for positive direct impacts, while the evidence on spillover effects is less clear-cut. A better understanding of the indirect impact of inward FDI is important because it opens the door to public interventions. Hence, governments often provide substantial financial support to attract FDI. The impacts that FDI has on host economies and firms depend on a wide range of factors, e.g. the type of investment, the absorptive capacity of the host country, and the size and other characteristics of firms. It is therefore crucial to gain a clearer picture of how the benefits of FDI for local firms can be maximised and any potential adverse effects minimised.

Likewise, outward FDI is seen as an important engine of economic growth. Multinational enterprises are larger, and more productive, pay higher wages and have better knowledge, technologies and managerial skills. They might also gain competitive advantages by expanding into new markets, through the learning effects of internationalisation, by reducing production costs and by gaining access to natural resources, advanced technologies or know-how. While the positive effects of outward FDI are generally assumed to predominate, there are concerns about its possible drawbacks, particularly the adverse effects on the domestic labour market. The theoretical predictions on home-market effects are far from clear-cut and depend on the type of and motive for outward foreign direct investments and the very specific relationships between the parent company and its foreign affiliates. The analysis of the effects of inward FDI is completed by a discussion on the home country impacts of outward FDI.

In order to better understand the determinants and impacts of inward and outward FDI in Europe this chapter[54] provides the following analysis:

- an overall picture of the main trends and patterns of EU inward and outward FDI flows at the aggregate, sector and firm level;
- the factors that influence FDI flows, both locational factors driving FDI inflows to the EU Member States and the firm specific factors that in turn account for the internationalisation of firms;
- the direct and indirect effects of inward EU FDI on domestic firms and the host country in general;
- the main findings of the literature on the effects of outward FDI on the home country of multinational enterprises (MNEs);

[54] This chapter is based on the background report, Falk et al. (2012) 'FDI flows and impacts on the competitiveness of the EU industry'.

Finally, a policy section discusses a number of debated issues based on the analysis carried out in this study.

Box 4.1 – Definitions

- **Foreign Direct Investment (FDI)**

Foreign direct investment (FDI) is defined as an investment involving a long‑term relationship and reflecting a lasting interest and control by an entity resident in one economy (foreign direct investor or parent enterprise) in an enterprise resident in another economy (FDI enterprise or affiliate enterprise or foreign affiliate) (OECD, 1996). FDI has three components: equity capital, reinvested earnings and intra-company loan.

- **Forms of FDI**

(1) Greenfield investment: establishment of an entirely new firm in a foreign country, including new operational facilities;

(2) Mergers and acquisitions (M&A): a complete or partial purchase of an existing firm in a foreign country.

- **Motives for FDI**

Market-seeking FDI involves investing in a host country market in order to be closer to customers and to serve that market directly rather than through exporting ('horizontal' FDI). Market-seeking investors will rate the attractiveness of a host country mostly with respect to its market size and growth/demand potential, and whether it provides access to both regional and global markets. For non-tradable services (e.g. hotel and catering industry or retail trade), FDI may be the only way to internationalise as there would be no alternatives for accessing foreign markets.

Resource-seeking FDI is driven by the need to gain access to natural resources such as oil, gas, minerals or raw materials. Locations qualify as being more attractive the more they provide access to affordable resources, particularly if the domestic supply of such inputs has come under pressure by becoming more expensive. Scarce supply of and growing needs for natural resources explain the EU's growing interest in resource-rich development countries and the proliferation amount of respective strategies (for instance the Central Asia Strategy and the Joint Africa-EU Strategy launched in 2007).[55]

Strategic asset-seeking FDI aims to gain access to advanced technologies, skills and other highly developed productive capabilities. The aim of this type of investment is to increase the acquiring firm's global portfolio of strategic resources and to block competitors from obtaining access. Either way, strategic asset-seeking investors value locations depending on the quality of the scientific, technological and educational infrastructure they provide and on the availability of a rich pool of highly skilled labour.

Efficiency-seeking FDI takes place when companies try to exploit economies of specialisation and scope across the value chain (product specialisation) and along the value chain (process specialisation). The company will slice its production chain by allocating different parts (or tasks) to countries that allow low-cost production (vertical fragmentation), particularly where the cost of labour is taken into account. The scope for efficiency-seeking FDI and vertical fragmentation originates from advances in information and communication technology (ICT), trade liberalisation and cost-effective transportation, which enable firms to take advantage of international factor cost differentials. Another key determinant is the competitiveness of local industrial infrastructure and its ability to provide strong subcontracting and business partners.

55 http://register.consilium.europa.eu/pdf/en/07/st10/st10113.en07.pdf, http://ec.europa.eu/development/icenter/repository/EAS2007_joint_strategy_en.pdf

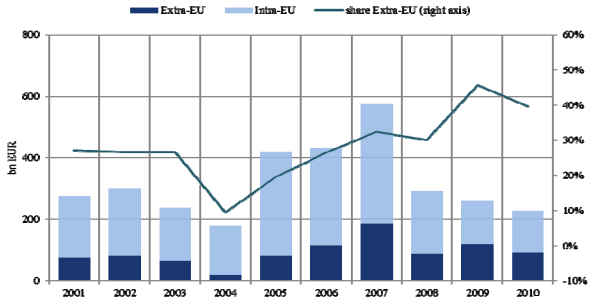
4.1 TRENDS AND STRUCTURE OF EU-27 INWARD FDI

4.1.1. Inward FDI trends: Sharp crisis related contraction and greater role of extra-EU inflows

The EU is by far the largest destination for global FDI. This is primarily the result of the size of the EU market but it also has to do with its openness to FDI and the deep economic integration among EU Member States. Over the past decade, however, the share of global FDI destined for the EU, including intra-EU investments, has declined substantially, from 45% in 2001 to 23% in 2010, in favour of emerging economies.

FDI inflows to the EU were hit significantly by the global recession of 2008/2009. FDI flows to the EU dwindled in 2008 to half of their 2007 peak value and continued to decline slightly in 2009 and 2010 (Figure 4.1). Intra-EU flows continued to decline in 2009, while FDI inflows from non-EU countries recovered somewhat in 2009. In 2010 total FDI flows to the EU amounted to EUR 230 bn of which about 60% originated from EU Member States. Although EU FDI inflows seem to have recovered somewhat in 2011, it seems most unlikely that in the coming years FDI levels will return to that of the 2007 boom year when investment activities were fuelled by excessively high stock prices and overly optimistic business sentiments in some sectors. The current situation may be better described as a return to 'normal' levels than a state of depression.

Figure 4.1 – EU-27 FDI inflows, 2001-2010, EUR bn



Note: EU is EU-25 for 2001-2003 and EU-27 for 2004-2010. EU flows calculated as the sum of EU Member States. Intra-EU flows to Luxembourg are adjusted downwards by 90% in order to exclude activities of Special Purpose Entities (SPEs). Extra-EU flows exclude offshore centres (Guernsey, Jersey, Isle of Man, Gibraltar, Bahamas, Bermuda, British Virgin Islands, Cayman Islands, Netherlands Antilles).

Source: Eurostat, wiiw calculations.

Until recently a standing feature of EU inward FDI was that intra-EU flows were much larger than flows from non-EU countries. The downturn in FDI after the boom years of 2005-2007 affected both extra-EU and intra-EU inflows but the contraction was stronger in the case of the latter. As a consequence the share of extra-EU FDI in total EU inward flows, which until 2006 was less than a third, continued to increase after 2008. In 2010 the share of FDI inflows stemming from non-EU investors stood at 40%. This is clearly linked to the depth of the recession in the EU and the relatively good performance of most emerging economies.

The severe drop in intra-EU FDI flows seems to be linked to a reduced capability of European firms to invest abroad. This appears to be the driving force behind falling FDI activities of European banks whose international expansion plans have been halted by the economic crisis. Outside the financial sector, the low intra-EU flows in the period 2008-2011 may primarily reflect the trouble EU firms are undergoing in this period. Indeed, FDI from outside the EU is not that affected by the contraction. Furthermore, the declining share of intra-EU FDI may also reflect the natural adjustment towards long-run conditions after the exceptional increase in intra EU-FDI flows caused by EU enlargement in 2004 and 2007 and strong economic growth during that period.

4.1.2. FDI inflows from non-EU countries: continued dominance of US investors but new sources emerging

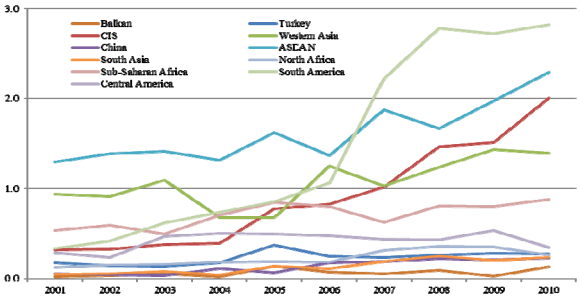
Given the increased volume of extra-EU inflows it is interesting to have a look at the main investor countries and potential new sources of FDI. A first observation is that FDI inflows to the EU from the rest of the world are extremely concentrated.[56] The US and the EFTA countries, principally Switzerland, are the largest investors, accounting for more than half of the total inward FDI stock in 2010. The leading position of US multinationals in EU inward FDI was largely unaffected by the crisis: in the period 2008-2010 the US accounted for about 45% of total extra-EU inflows. At the same time the share of the EFTA countries declined significantly over 2001-2010. A declining trend is also observable for Japan. Investors from these countries

[56] FDI in R&D has been found even more concentrated (European Commission, 2012).

are expected to continue to determine the aggregate trend in inward FDI from non-EU countries. This is in accordance with their economic weight and their high degree of integration with the EU.

In contrast to developed regions, the share of developing regions and transition economies as a whole increased substantially (Figure 4.2). In value terms Western Asia is the most important new investor region for the EU, with average annual inflows amounting to EUR 19 bn in the period 2008-2010[57]. Just to compare, the annual average inflows from developed economies were over EUR 70 bn in the same period. However, the increasing role of the emerging markets in inward EU FDI is not only a crisis-induced phenomenon but a longer-term trend as evidenced by the development of emerging markets' shares in overall extra-EU inward stocks since 2001.

Figure 4.2 – Share of emerging regions and countries in extra-EU inward stocks, 2001-2010, shares in %



Note: EU is EU-25 for 2001-2003 and EU-27 for 2004-2010. Shares calculated on the basis of the inward stocks of the EU-27 aggregate.

Source: Eurostat, wiiw calculations.

The magnitude of FDI inflows (and also stocks because of the shorter 'FDI history') from emerging regions and countries, including China and India[58], is likely to grow, but is still rather small. China's FDI flows to the EU increased substantially in 2010, to EUR 4.5 bn[59] (of which EUR 2.4 bn was destined for Luxembourg).[60] As a comparison, FDI inflows from the US amounted to more than EUR 30 bn in 2010. Furthermore, FDI stocks in 2010 stemming from the US represented 40.5% of the total extra-EU inward FDI, while China's stock of FDI to the EU amounted to only 1.2%.

The growing number of greenfield investment projects suggests the prominent role of China and India as a new source of FDI.[61] Both countries figure among the main new greenfield investors in the EU. China and India established 137 and 93 projects, respectively, followed by Russia, with 44 projects in 2010. The chances are high that in the near future Chinese firms will also become increasingly active in Europe through FDI and no longer serve the EU market only via exports.[62] However, despite the more intensive investment activity of emerging multinationals, the general trend in inward FDI to the EU is expected to be driven by traditional investors.

[57] A particularity of the FDI from Western Asia, however, is that much of it constitutes investments by Sovereign Wealth Funds (SWFs) which must be assumed to have little impact on the EU's real economy in general and to EU competiveness in particular because SWFs do not normally become involved in the management of the firms in which they take a stake. The appetite of SWFs for FDI engagements in the EU seems to have lasted only until 2009 (UNCTAD, 2011). As a consequence, EU inflows from Western Asia dropped to a mere EUR 400 m in 2010.

[58] For example, EU inflows from South America and Sub-Saharan Africa amounted to approximately EUR 1.7 bn annually in 2008-2010 while inflows from South Asia (mainly India) and the ASEAN countries amounted to EUR 1 bn and EUR 1.3 bn respectively. For China Eurostat reports inflows of only EUR 80 m for 2008-2010.

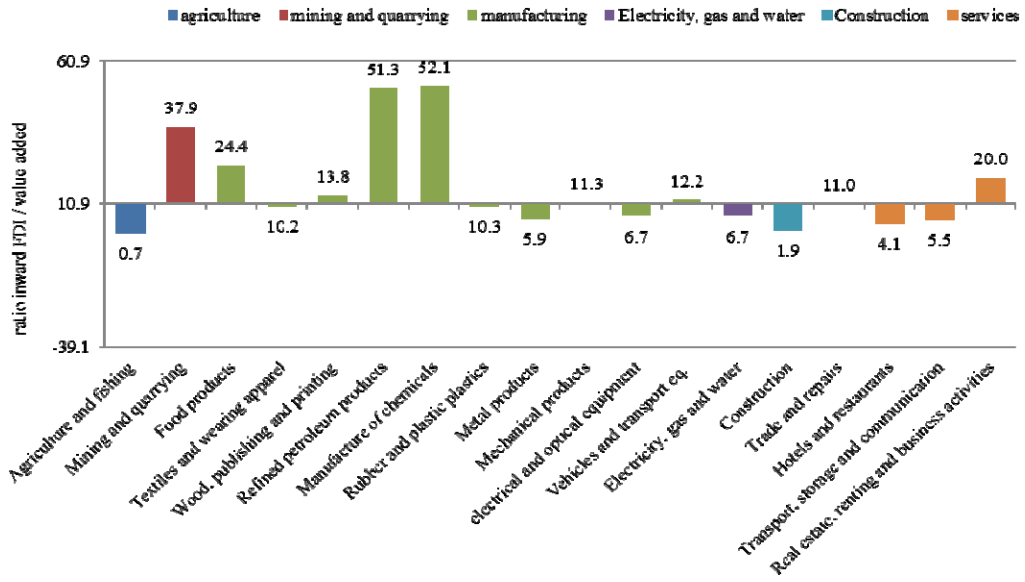
[59] According to the Ministry of Commerce of China. However, Eurostat reports only EUR 100 m for 2010. The difference is partly explained by the fact that for instance, for confidentialility reasons Sweden did not report data on inflows from China.

[60] The strong increase in Chinese FDI flows to the EU in 2010 is mainly but not entirely due to the purchase of the Swedish car company Volvo by China's car manufacturer Geely.

[61] Crossborder Greenfield investment data stem from the 'fDi Intelligence', service provided by The Financial Times Ltd (also called fDi database) See http://www.fdimarkets.com.

[62] This is a natural path in which FDI follows previous export activities. See Conconi, Sapir and Zanardi (2010). In the case of China or India, however, to the extent that trade is based on their specialisation in low-tech, low-wage sectors, the step from exports to FDI may be less straightforward.

Figure 4.3 – Ratio of EU inward stocks owned by the rest of the world to value added, by industry, 2008



Note: EU stocks are stocks of the EU-27 aggregate. FDI stocks and value added excluding financial intermediation (6895).

Source: Eurostat, wiiw-calculations. The horizontal axis intersects the vertical axis at the EU average of 10.9 so that the bars of industries with a lower than average ratio are pointing downwards.

4.1.3. Industry structure of EU inward FDI from non-EU countries: high foreign presence in manufacturing industries

Regarding the structure of inward EU FDI stocks manufacturing industries and services took 47% and 43% shares, respectively, in 2008 - when excluding the financial sector and other business activities.[63] This is in line with the structure of EU trade, which is dominated by manufacturing, with services typically accounting for only 20% of trade.

Among the manufacturing industries the largest shares of investment stemming from non-EU countries are to be found in the chemical industry (EUR 98 bn and 14%) and the food industry (EUR 53 bn and 8%). In contrast, the automotive (and transportation equipment) industries account only for slightly more than 3% of the EU's inward stocks owned by the rest of the world, which is a comparatively low share given the industry's high degree of internationalisation and its great importance in EU trade relations. Turning to the services industries but leaving aside the important financial sector and the activities of holding companies, trade and repairs (20%), real estate (6%) and computer services (4%) emerge as the industries with the largest EU inward stocks owned by non-EU investors.

In an attempt to gain an idea of the foreign presence in EU markets, inward stocks can be compared with the value added generated by the respective industry in the year 2008. For the EU economy as a whole, the ratio of inward FDI to value added amounts to 10.9. [64] This means that non-EU MNEs account for approximately 11% of the EU's value added.

The industry-specific ratio of inward FDI stocks of MNEs from non-EU countries to value added in the EU economy suggests that the foreign presence is above the average in manufacturing industries. In the area of R&D, FDI occur primarily in the manufacturing sector and in particular in high-tech and medium-high-tech manufacturing sectors (European Commission, 2012). It is especially true for capital-intensive branches such as the chemical industry and the petroleum refining industry (Figure

[63] The overwhelmingly large FDI stocks of the financial sector (EUR 1357 bn) include the activities of Special Purpose Entities. 'Other business activities'(EUR 430 bn) include business and management consultancy activities, i.e. FDI undertaken by holding companies. When including other business activities in total inward FDI the share of services increases significantly (64%) and that of manufacturing falls below 30%.

[64] This calculation again excludes the financial sector.

4.3). Probably due to the large number of M&As the European mining industry also faces a competitive pressure. In contrast, the FDI to value added ratio is below the economy-wide average for most services industries (the hotel, transport, storage and communication industries). This is somewhat unexpected given the fact that in several services industries, such as the hotel industry, FDI is the only way to enter a foreign market because market access via exports is not possible. At the same time it also indicates the importance of the domestic EU enterprises in these sectors.

4.2 DETERMINANTS OF FDI - LOCATIONAL ATTRACTIVENESS AND FIRM SPECIFIC FACTORS

Global investment flows have increasingly tended to shift towards high-growth emerging markets. The recession and the eurozone crisis have adversely affected FDI flows in Europe. Nevertheless, the EU in general has maintained its fundamentals (e.g. good institutions, openness, highly skilled workforce), which can be considered as key determinants of inward FDI. In terms of investment perception, Western Europe ranks as the second most attractive region and Central-Eastern Europe as the third most attractive destination worldwide for FDI.[65] The heterogeneity of Member States in terms of factors determining FDI inflows reveals differences between EU countries: several countries have remained among the most popular investment destinations (e.g. Germany or Poland) while others have not attracted substantial amounts of FDI for many years already (e.g. Italy). The literature has investigated extensively what makes a country attractive for foreign real investors. Below a summary and new empirical evidence are provided.

4.2.1. Locational attractiveness

FDI activity depends on a wide range of factors and conditions, including location-specific (host country) determinants and home country characteristics. The next section tries to address some of these questions. According to UNCTAD (1998) the host country determinants of FDI can be classified into three groups: policy framework for FDI, economic determinants and business facilitation (see Table 4.1). Several of the determinants listed below have received quite a lot attention in the literature in the last ten years.[66] However, little is known about the sign and magnitude of the FDI determinants differ according to (i) the country of origin of the investors (e.g. EU versus non-EU investors), (ii) the target industry (e.g. high- vs low-tech), (iii) the type of FDI activity (e.g. production, services, research and development), (iv) the mode of entry (greenfield FDI or cross-border M&As), (v) the type of FDI (vertical and horizontal) (vi) the geographical destination (capital region or elsewhere).

The available empirical findings based on EU countries make it difficult to draw general conclusions about the source of heterogeneity in the determinants of FDI for EU countries. This section therefore also provides some results based on an FDI gravity model estimation using FDI stocks and greenfield FDI flows from 26 OECD/BRIC countries to the EU-27 in the period 2000-2010. (Table A.1 in the Appendix shows the results of the gravity equation estimated in the background study, Falk et al, 2012.) The basic gravity model is augmented by the inclusion of corporate taxes and labour costs of the host and home country, the impact of EU membership in 2004 and 2007 and the introduction of the euro in some EU countries during the period 2007-2010. A number of policy factors (e.g. FDI regulation, costs of starting a business and labour market flexibility indicators) and indicators of factor endowments (e.g. skills, R&D and broadband penetration) are also included.[67]

[65] Ernst &Young (2012).

[66] The backround study (Falk et al., 2012) provides a summary of the literature on the FDI determinants.

[67] The main contribution of this analysis is to investigate the determinants of both total FDI stocks and greenfield FDI flows using panel data methods that make it possible to control for fixed host and home country and common time effects. In addition, the presence of zero values of FDI flows is taken into account by using a variant of the Poisson regression model.

Table 4.1. – Host country determinants of FDI

I. Policy framework for FDI
Economic, political and social stability
Rules regarding entry and operations
Standards of treatment of foreign affiliates
General legal and administrative system that shape the structure and functioning of markets (e.g. competition & M&A policies, corporate and labour taxation, product & labour market regulations, IPRs)
International agreements on FDI
Privatization policies
Trade policies (tariffs and non-tariff barriers) and the coherence of FDI and trade policies
II. Economic determinants (by FDI motive)
II. 1 Market seeking
Market size and per capita income
Market growth (potential)
Access to regional and global markets
Country-specific consumer preferences
Structure of markets (e.g. market concentration, entry barriers, pricing)
II. 2 Resource seeking
Availability of natural resources (e.g. oil and gas, minerals, raw materials, agricultural land)
Physical infrastructure (ports, roads, power, telecommunication)
II.3 Strategic asset seeking
Skilled labour and quality of educational infrastructure (e.g. schools, colleges, universities)
Quality of technological and R&D infrastructure (e.g. research institutions, universities, ICT)
Innovation clusters
II.4 Efficiency seeking
Cost and productivity of local labour supply
Cost of raw materials and intermediate inputs
Cost of transport and communication to/from and within host economy
Financing cost
Industrial infrastructure (e.g., subcontracting and business services, supplier industries, industry clusters)
III. Business facilitation
Investment promotion
Investment incentives (tax and financial)
Costs related to corruption and bureaucratic inefficiency
Social amenities (e.g. quality of life)
Infrastructure and support services
Cluster and network promotion
Social capital

Source: Adapted from UNCTAD (1998).

4.2.1.1. POLICY FRAMEWORK FOR FDI

The institutional settings, such as the rules regulating entry and operations, and the legal and administrative system, are very important factors in determining every type of investment decision. For instance, FDI barriers (such as legal, legislative and regulatory frameworks, the strength of investor protection, foreign ownership restrictions and red tape) are likely to discourage inward FDI since they lead to higher investment costs. FDI restrictions have declined considerably in the EU and they are currently among the lowest in the world,[68] providing a favourable business environment for foreign companies. Similarly, the administrative burden on enterprises and product-market regulations in the host country impose additional costs on businesses and create barriers to entry for FDI (Azémar and Desbordes, 2010). In the EU-27 countries there is a significant and negative relationship between the foreign employment share in the manufacturing sector and the costs of starting a business. A significant and positive correlation between the ratio of FDI inflows and the strength of investor protection has been found for the EU countries. Labour market flexibility is also considered to have positive impacts on FDI inflows.

[68] Most EU countries have a low (under 0.1) FDI Restrictiveness Index (OECD).

For instance, based on a sample of 19 EU countries Javorcik and Spatareanu (2005) found that a more flexible labour market in the host country leads to higher FDI inflow (see also Bénassy-Quéré et al. 2007 based on OECD data; Dewit, Görg and Montagna, 2009).

Most of the policy and non-policy factors are excluded from the final specification for the gravity model on the EU-27, because they are not significant at conventional significance levels (see explanatory variables in Table A. 2. in the Appendix). In particular, labour market flexibility, indicators of intellectual property rights protection and investor protection are not significant when source- and host country fixed effects and common time effects are taken into account. The cost of doing business and the FDI regulatory index have the expected negative sign but are statistically insignificant. One reason for the insignificance of these variables is that the annual time variation is very small.

Trade policies, trade agreements and regional integration have significant effects on FDI flows. Regional preferential trade agreements (RTAs) not only stimulate trade in goods and services due to the removal of trade barriers but may also have an impact on FDI flows for the participating countries and on third countries. The empirical literature strongly suggests that European economic integration (e.g. EU membership, creation of the European single market in 1992) has been accompanied by a rising level of foreign direct investment within the EU, and increased FDI flows from third countries (Pain, 1997; Clegg and Green, 1999; Lafourcade and Paluzie, 2011). The introduction of the euro is also expected to have a positive impact on FDI flows because of lower transaction costs and elimination of exchange rate uncertainty. The gravity model estimation (Table A.1 in the Appendix) finds that the introduction of the euro and EU membership (2004, 2007) leads to higher FDI activity among the euro area and EU members. The effect is more pronounced in the case of countries that joined the EU in 2007, with an increase in FDI inflow of more than 100% between 2007 and 2010. Previous empirical studies also found large positive effects of the euro on FDI inflows (Coeurdacier, De Santis and Aviat, 2009; Petroulas, 2007; De Sousa and Lochard, 2011 and Brouwer et al., 2008).

The signature and ratification of double taxation agreements (DTAs) have reduced barriers to FDI. DTAs deal with the allocation of the taxable capital flows, dividends, interest and royalties generated by multinational firm activity (Hallward-Driemeier, 2003). DTAs are expected to have a positive impact on FDI flows. Since most EU countries had double taxation treaties with other EU and/or OECD countries at the end of 2010, the expected effects of DTAs are not likely to be significant for the last decade.

4.2.1.2. ECONOMIC DETERMINANTS

The second group of FDI determinants comprises economic factors which can be further classified according to the motives for FDI. Surveys among foreign investors typically find that factors such as the size and growth of the local market, the presence of suppliers and business partners and access to international/regional markets are the most important determinants for a location's attractiveness (UNCTAD, 2011). In the case of the EU-15 countries, market size and a stable investment environment play the most prominent role. For EU-12 countries, growth of the market is the most important factor, followed by cheap labour, the availability of skilled labour, a stable investment environment and the size of the market (see Table 4.2).[69] Results of the gravity model also confirm this: a 1% increase in the level of GDP in the EU-27 countries in the previous year leads to an increase in the inward FDI stock in the current year by 1% on average.

[69] Similar results are found when focusing on R&D only. In that case however, the labour cost proved to be a less important determinant. (European Commission, 2012).

Table 4.2 - Locational attractiveness: the view of business

	World	EU-15	EU-12
Size of local market	21	20	12
Growth of local market	20	12	19
Stable investment environment	10	19	12
Access to regional markets	10	11	7
Cheap labour	9	n.a	12
Availability of skilled labour	9	11	12
Access to natural resources	6	4	8
Access to capital market (finance)	2	6	2
Incentives, government effectiveness	5	11	6
Follow the leader	4	3	3
Total	100	100	100

Note: The table provides the main location factors for attracting FDI for the period 2007-2009 in %.

Source: UNTCAD's World Investment Prospect Survey (2009).

Among the economic determinants both cost -and non-cost based factors have been intensively discussed in the literature. Cost-based factors such as the unit labour costs and effective average corporate tax rate in the host country are expected to have a negative impact on bilateral FDI stocks.

Differentials in labour costs (unit labour costs, labour taxation) between the home and host countries play an important role, particularly for vertical or efficiency-seeking FDI. Results of the gravity model show that a 1 percentage point increase in the unit labour costs of the host country leads to a decrease in the FDI stock by 1%. Unit labour costs increased over the sample period on average but the change is highly uneven across EU countries. While the literature based on data for the EU-10 countries shows that unit labour costs have a negative impact on FDI inflows into the host country, for the EU-15 countries a number of studies found that labour costs are not a significant determinant (Wolff, 2007, for EU-25 and EU-15 countries; de Sousa and Lochard, 2011, for EMU countries Bellak and Leibrecht, 2011, for 10 EU countries and the US). This is in contrast with what has been found for the EU-15 in the current analysis: in some EU-15 countries rising unit labour costs are considered as a major factor in the slow growth of inward FDI. One explanation of the higher impact of unit labour costs is the difference in the time period: the sample used for the current analysis ends in 2010. The increase in unit labour costs particularly accelerated between 2007 and 2010 in most of the EU-15. The increase in unit labour costs is associated with a 3% lower growth rate of the bilateral FDI inward stock as compared to EU-15 countries with stable unit labour costs. Furthermore, the analysis shows that high productivity growth together with moderate wage growth plays an important role in attracting FDI flows in the EU-15 countries.

Regarding indirect labour costs, such as labour taxation, Egger and Radulescu (2011) found that average effective taxes on individual earnings have a significantly negative effect on FDI. Other authors (Head and Mayer, 2004) find negative effects of the social security contributions and/or labour taxation on FDI inflows in the EU. With respect to other indirect taxes, Buettner and Wamser (2009) find that indirect taxes do not play a role for foreign location choice.

Previous empirical studies largely agree that FDI flows are sensitive to changes in corporate tax rates in the host and also the home countries. In general, higher home country tax rates lead to higher FDI outflows, whereas a higher host country tax rate leads to lower FDI inflows (De Mooij and Ederveen, 2003). On the other hand, some recent studies based on data for the EU-15 countries did not find that corporate taxes had a significant impact on FDI activity (e.g. Hansson and Olofsdotter, 2012, for the EU-15 countries; Egger, 2001, for the EU-15 countries; Bénassy-Quéré, Gobalraja and Trannoy, 2007, for 18 EU countries; and Wolff, 2007, for the EU-15 and EU-25 countries). Similarly, using FDI data for 28 OECD countries for the period estimates, Hajkova et al. (2006) found that the effects of taxation on FDI are quantitatively small and are much less relevant than other factors such as labour costs, the regulation of FDI and product markets and openness. In contrast, studies that explicitly focus on the EU-12 countries find that corporate taxes have a negative effect on FDI activity (Bellak et al., 2007).

The results of the gravity model on the effects of taxes on FDI stocks are difficult to compare with previous studies due to the difference between country coverage and time period, etc. Corporate tax rates decreased in both the EU-15 and the EU-12 by 8 and 9 percentage points, respectively, over the sample period. According to the estimations a 1 percentage point increase in the effective average tax rate reduces the bilateral FDI stock by 1.6%. Furthermore, the coefficient on statutory corporate taxes in the home country are not significantly different from zero, indicating that the outward FDI stock is not higher in high-tax countries than in low-tax countries. In addition, the factors of FDI are different when the sample is split into EU-15 and EU-12 host countries. The results show that corporate taxes matter only in the EU-12 countries and not in the remaining EU-15 countries. Taking exclusively greenfield investments into account, it has been found that greenfield FDI is much more sensitive to changes in taxes than total FDI in both the EU-15 and the EU-12 (See Table A.3. in the Appendix). The insignificance of corporate taxes for total FDI might be related to the composition of FDI stocks and flows, since in the EU-15 the bulk of FDI activity is due to M&As whereas in the EU-12 greenfield investments account for the most of the FDI flows.

Among the non-cost determinants a skilled labour force in the host country has long been recognised as being important to FDI inflows. For the sample of EU-12 host countries tertiary education has a significant impact. Hence, investing in education and training helps to attract FDI and to increase the benefits from FDI. For the EU-15 countries, no significant relationship has been found. The European Commission (2005) also found that a high qualification of the workforce in the EU-10 is a more important location factor for multinationals as compared to the EU-15 countries. Furthermore, when focusing only on R&D internationalisation human capital, as proxied by the share of tertiary graduates in technology related fields is important only for the group of EU-12 countries (European Commission, 2012). A possible explanation is that the EU-15 countries already have a high proportion of workers with tertiary education, while in the case of the EU-12 a significant increase in the number of graduates can be observed during the sample period. The insignificance of the education variables might also be related to the fact that length of education quantity is a poor measure of the skills of the workforce in the EU-15. Based on the sample of OECD countries, Nicoletti et al. (2003) found that the average number of years of education in the host country is significantly positively correlated with FDI inflows. Studies investigating the location choice of multinational companies within a European country also found a positive relationship between the level of formal qualification of workers and FDI. However, it is important to be aware that in European countries differences in skill quantitative measures of skill levels (e.g. average years of schooling) are much less pronounced than differences in education quality (e.g. PISA scores).

Infrastructure covers a range of aspects such as transport infrastructure, ICT infrastructure and electricity generation capacity. In particular, the accessibility of highways, railways, airports and seaports is an important aspect for location choice, for all types of FDI. Studies based on regional data for individual EU countries confirm this (see Cieślik, 2005a; Cieślik, 2005b for Poland; Barrios, Görg and Strobl, 2011 for Ireland). Based on FDI inflows for eight EU countries in Central and Eastern Europe, Bellak, Leibrecht and Damijan (2009) found that information and communication infrastructure is more important than transport infrastructure and electricity generation capacity. Using a broader sample of inward FDI activity in EU countries and the US, Bellak and Leibrecht (2011) confirm that ICT endowment is a significant and important location factor.

Agglomeration economies are one of the most important factors affecting firm location decisions of multinational enterprises. FDI tends to cluster in certain locations that are characterised by a large share of foreign enterprises. One explanation for this is that foreign subsidiaries tend to co-locate with foreign suppliers and foreign customers. Another reason is that foreign firms may interact with each other rather than with domestic firms if the quality or the productivity of local suppliers is low (Pusterla and Resmini, 2007). Another reason for clustering of foreign firms is to take advantage of a common pool of skilled workers and knowledge inputs and ideas. Previous studies based on the location choice of foreign firms moving into EU countries found strong agglomeration effects (e.g. Crozet et al., 2004; Disdier and Mayer, 2004;

Pusterla and Resmini, 2007; Basile et al, 2008; Hilber and Voicu, 2010; Procher, 2011).

4.2.1.3. BUSINESS FACILITATION

The third group of FDI determinants consists of business facilitation measures, including investment incentives and promotion, measures directed at reducing costs linked to corruption and administrative inefficiency, and social amenities (e.g. quality of life).[70] Proactive measures aimed at facilitating the business that foreign investors undertake in a host country include investment incentives and investment promotion. Investment promotion mainly reduces the transaction costs of foreign investors, who are not familiar with the business environment of some locations, while incentives more directly increase the rate of return on some investment projects. Investment incentives fall into two broad classes: financial incentives and tax incentives (Thomas, 2000). The most common forms of financial incentives include subsidies and government loans at subsidised rates. Tax incentives may take the form of general measures to reduce the corporate tax burden (e.g. through lowering the rates of corporate income tax or providing tax holidays). Alternatively, countries may offer investment allowances, accelerated depreciation or tax credits, all of which would promote capital formation (OECD, 2003).

State aid rules prohibit aids to undertakings that distort competition and affect trade between member States unless they meet one of the exceptions. These exceptions principally deal with equity issues and market failures (e.g. the development of disadvantaged regions, the promotion of SMEs, R&D, training, employment and protection of the environment). While the EU-12 countries predominantly focus on tax reliefs or allowances, the EU-15 countries prioritise innovation policies to stimulate investment from abroad.

According to business surveys among foreign investors, financial incentives and grants are not regarded as primary location factors for multinational enterprises (UNCTAD, 2011). However, in a number of EU countries, local authorities often use regional policy grants to attract FDI.[71] More recently, Basile et al. (2008) found a positive relationship between FDI inflows and the overall amount of Structural Funds.

Within the EU, investment promotion activities have proliferated both, in terms of numbers and in terms of scope (Harding and Javorcik, 2011; Filippov and Costa, 2007). In the EU countries, investment promotion agencies offer a variety of services, such as practical information and guidance on setting up the business and assistance in obtaining financial support (grants) from public resources.[72] Furthermore, generally investment promotion agencies may concentrate activities on a few priority sectors or target activities. The priority sectors most often listed are ICT (computer, software and IT services), pharmaceuticals, medical devices, biotechnology, aerospace, automotive, energy and environmental technologies. The existence and activities of investment promotion agencies (IPAs) are expected to have a positive and significant effect on attracting FDI flows. Harding and Javorcik (2011) show that the effect is only significant for developing countries, including the EU-10. For high-income countries no significant relationship has been found. This may indicate that investment promotion does not work in high income countries where information asymmetries are relatively low and bureaucratic procedures are less complex.

4.2.2. Firm-level determinants of FDI

Using firm-level data enables important observations to be made that cannot be drawn from aggregate statistics. In this section new evidence is provided on the specific characteristics of firms and firm-level determinants of FDI decisions is provided. The theoretical and the empirical literature on multinational enterprises (MNEs) actively investing abroad suggests that MNEs score better than non-MNEs on a number of performance indicators. The performance gaps between MNEs and other firms are born out of the existence of firm-specific assets such as specific know-how, technology, unique products or intangibles (trademarks, reputation for quality). In turn, only

[70] This overview is based on various issues of UNCTAD's World Investment Report.

[71] According to Wren and Jones (2011) countries such as the UK and France spend half of their regional grant budgets on attracting FDI flows.

[72] Information is based on the websites of the investment promotion agencies of the EU-27 countries.

the most productive firms can pay the entry costs associated with exporting and FDI and will find it profitable to engage in foreign production. This idea goes back to Dunning (1977) and Markusen (2002) and was most recently formalised by Helpman et al. (2004), who link productivity differences to exporting and FDI and suggest a productivity ranking with the most productive firms setting up production facilities abroad. At the same time firms with an intermediate level of productivity choose to export and the least productive firms neither export nor invest abroad.[73] The econometric model used here[74] integrates and tests separately two parts of the FDI decision: the decision whether or not to invest in a foreign location (the logit part of the model), and then the decision on the number of affiliates to be set up (the count data component of the model).

The evidence on multinational activity in the EU-15 is largely consistent with the set of predictions drawn from the theoretical MNE literature and from the earlier empirical findings for individual countries and the euro area. The analysis reveals that EU-15 multinational firms are larger, employ more capital per worker, pay higher wages and are more productive than domestic firms and these firm characteristics are significant determinants of the FDI decision. This is confirmed by the non-parametric Kolmogorov-Smirnov stochastic dominance test (not shown) and by the econometric results based on the count data model.[75]

The analysis also corroborates theoretical results establishing the fact that foreign direct investment activities are driven by firm-specific advantages and superior performance in the pre-investment period and that firms self-select into FDI. Comparing purely domestic firms with investing firms at the beginning of the investment period, the evidence reveals that they are larger and more productive, have a larger share of intangible assets, and are more capital-intensive. Firms that start foreign activities are ex-ante different from purely domestic firms. Foreign MNEs (multinationals with foreign headquarters) dominate domestic MNEs in all size and performance indicators except for the share of intangible assets. This could signal the fact that in the case of multinational networks, firms still tend to undertake most of their R&D and related activities in the home country of the headquarters (Dunning and Lundan, 2009).

Results from the count data model (see Table A.4. in the Appendix) show that the size and the capital intensity of firms have the strongest effects, while productivity and the share of intangible assets play a statistically significant, but quantitatively more limited role in determining the FDI status of EU-15 firms. The relatively small impact of labour productivity might be due to (a) the lack of a more detailed distinction among different types of non-MNEs such as between domestic exporters and domestic non-exporters and (b) inadequate discrimination between the various types of MNEs. Both reasons might confound the relationship. Domestic exporters are more productive than non-exporters; MNEs with only one subsidiary might be more equal to domestic exporters than MNEs with a higher number of subsidiaries.

The analysis also finds significant heterogeneity within the group of MNEs. Multinational firms holding more than one foreign subsidiary outperform all MNEs with a single subsidiary in terms of size, productivity, capital intensity and the share of intangible assets. Multinationals holding subsidiaries in more than one market score better on performance indicators than multinationals serving only one foreign market.

Furthermore, entry costs vary across locations of foreign subsidiaries. First, the analysis reveals a strong relationship between firm size and location choice. Larger firms invest in more distant high-income and emerging countries overseas. It also finds the highest performance premium in terms of productivity and capital intensity for EU-15 multinational firms setting up affiliates in emerging regions in Asia and in CEEC. Furthermore, a significant, but lower impact of capital intensity on the decisions to invest in Eastern Europe has been found. This might indicate that relative to other host regions, a greater share of MNEs invest in Eastern European markets for vertical ('cost-seeking') motives.

[73] The sample is limited to the EU-15 countries due to severe data limitations and the very low coverage of MNEs with respect to a number of EU-12 countries.

[74] To test the significance of the results the Kolmogorov-Smirnov stochastic dominance test is applied along with the more formal econometric tests based on the zero-inflated negative binominal (ZINB) count data model.

[75] See the background study for this chapter, Falk et al. (2012).

The evidence reported in this section also reveals that while MNEs are clearly larger than domestic firms, the median size of foreign direct investors is found to be about 60 employees. It is larger in manufacturing (131 employees) than in the services sectors (35 employees). For first-time foreign direct investors in 2011 ('switching firms'), the median firm size is about 100 employees in manufacturing and 30 employees in non-manufacturing. Thus, many medium-sized manufacturing firms and small service firms engage in FDI. Multi-country FDI strategies and FDI in more distant emerging markets, however, involve mostly larger manufacturing firms with a median size between 200 employees and 300 employees.

4.3 HOST COUNTRY EFFECTS OF INWARD FDI IN THE EU-27

What are the channels through which FDI stimulates economic growth and productivity? What are the main factors that influence the magnitude of this effect? Does FDI contribute to growth? The question should rather address whether and when foreign-owned companies contribute to more desirable patterns of resource allocation or industrial restructuring. Policy making sees FDI as positive for long-term development; however, the impacts of FDI depend on many factors that can be varied in order to maximise the benefits of foreign investments.

The aim of this section is to provide a conceptual framework offering a better understanding of the main factors and channels through which FDI affects productivity and economic growth. Most importantly, FDI can provide financing for the acquisition of new plants and equipment, and can be an important catalyst of economic restructuring. It can also directly transfer technology to foreign affiliates, as well as indirectly diffuse or 'spill over' into local economies. While FDI is capable of producing all these effects, this does not mean that it necessarily does so. Whatever the direct and indirect impact FDI has on a given host economy, the effects produced will be conditional upon many factors (Table 4.3). For instance, the nature of FDI and the reasons why MNEs carry out investments in foreign economies can be very different (distinguishing between efforts focused on markets, resources, efficiency, and strategic assets). Furthermore, the scale of the effects of FDI also depends on the industries targeted by foreign companies e.g. setting up a retail store vs establishing a business in high-tech manufacturing. Similarly, the mode of entry of MNEs (greenfield; takeover, merger and acquisition; minority shares in domestic firms) may exert different impacts on host economies. Greenfield FDI is linked to setting up a completely new business establishment in a foreign country, and therefore the impacts on employment, human capital, productivity and growth might be larger than in the case of a takeover, where these impacts are generally less pronounced. The impact of FDI also depends on the development level of the host country, including the absorptive capacity of local firms, as well as other factors such as the size of the market, institutional settings or the level of competition.

Table 4.3 - Main determinants of the magnitude of FDI impact on local firms

Local firm/ economy characteristics	Foreign inestor (MNE) characteristics	Other environmental characteristics
Absorptive capacity	Country of origin of the investor	Distance
Technological gap	Entry mode (i.e. M&A versus greenfield)	between local
Exporting markets	Degree of foreign ownership (e.g. wholly owned, JVs)	firm and foreign
Intangible assets/R&D	Industry affiliation (i.e. primary sector, manufacturing, services)	subsidiary
Human capital	High-tech, medium and low-tech industries)	
Size of the local firms	Innovation and training activities	
Level of competition in the local markets	Investment motives	
Government assistance, incentives for FDI	Technology-based ownership Technology sourcing	

Source: Crespo and Fontoura (2007) and Kravtsova (2008).

4.3.1. Direct effects of inward FDI

A distinction can be drawn between direct and indirect effects of FDI. If foreign-controlled firms achieve higher labour productivity and capital productivity and create more jobs than domestic firms, then the direct effects are positive. This is because MNEs provide a bundle of characteristics in the host countries that are not necessarily available locally: technologies, brands, management procedures, market access, and so on.

In a more systematic taxonomy, FDI has the potential to directly provide:

- Financial resources, FDI inflows are more stable, long-termist, and easier to service than commercial debt and portfolio investment.
- Technology, MNEs can introduce modern technologies, some of which are only available through FDI, some through technology licences. These corporations can stimulate the technical efficiency of local firms by providing assistance, acting as role models, and intensifying competition.
- Market access, MNEs can provide access to export markets for goods and some services that are already provided in the host country.
- Skills and management techniques, MNEs have worldwide access to individuals with advanced skills and knowledge, which they can transfer to their foreign affiliates.
- Good practices (regarding the environment, for example), MNEs are leading the way in clean technologies and modern environmental management systems. Some of these can also spill over to host country firms (see the next section on indirect effects) and other MNEs.

4.3.1.1. GROWTH EFFECTS OF FDI

One possible approach to measure the direct impact of FDI in the EU countries is to estimate Barro-type growth regressions based on cross-section data where GDP per capita growth is a function of initial GDP per capita, average years of education and the domestic investment ratio. OLS estimates of Barro-type growth regressions [76] show that FDI stocks and flows have a direct impact on growth of GDP per capita with relatively large marginal returns given the factor share of FDI in GDP (see Table A.5. in the Appendix). Overall, a 1 percentage point increase in the ratio of FDI inflows to GDP increases the growth rate by 1.5 percentage points in the EU-12 countries and 1.2 percentage points in the EU-15 countries. The magnitude of the effects indicates that for the EU-12 countries the increase in FDI inflows between the second half of the 1990s and the second half of the 2000s by 2 percentage points accounted for 30% of the increase in the growth rate of GDP per capita (from 1.4% to 5.1% based on unweighted averages)[77].

4.3.1.2. EMPLOYMENT SHARE OF FOREIGN AFFILIATES IN THE EU COUNTRIES

The direct importance of inward investment can be measured by the share of employment of foreign affiliates in the host market based on the inward FATS statistics (i.e. foreign controlled enterprise

[76] The data consist of a sample of 29 EU and EFTA countries plus Turkey for the period 1985-2010 where data are measured as five-year averages.

[77] Unreported results show that the growth effect of FDI increases with the relative level of GDP per capita to the country with the highest GDP per capita.

statistics).[78] Foreign-controlled companies play a major role in the EU Member States in terms of employment, value added and turnover.

Based on NACE rev. 2 for the year 2008 the employment share of foreign affiliates in manufacturing was 21% (EU-15: 19% and EU-12: 30%).[79] Other industries where the employment share of foreign-controlled enterprises is significant are the followings: information and communication (EU-27: 18%; EU-15: 16% and EU-12: 32%), administrative and support service activities (EU-27: 15%; EU-15: 14% and EU-12: 22%) and financial and insurance activities (EU-27: 13%; EU-15: 9% and EU-12: 68%). The role of foreign multinationals in employment in the EU is smallest in construction (3%) and real estate activities (4%). Within manufacturing a very large variation can be observed in the employment share of foreign affiliates. This is much higher than the average in pharmaceuticals, chemicals, transport equipment and electrical and optical equipment. At the same time, textiles and wood are considered as the least FDI-intensive sectors. Almost all industries in the EU-12 proved to be more reliant on FDI than in the EU-15.

The employment share of foreign-controlled enterprises in the manufacturing sector increased in almost all Member States between 1997 and 2007.[80] In terms of employment multinationals play an important role in the EU-12 (most importantly in Hungary, the Czech Republic and Slovakia), employing 42-50% of the total workforce in 2007. Other FDI-intensive countries reach similar levels of employment share (e.g. Ireland and Belgium). Over a roughly ten-year period the increasing role of multinationals can be also observed in the Scandinavian and UK manufacturing sectors. At the same time in southern countries, such as Italy, Spain and Portugal, the share of total workers employed by foreign manufacturing multinationals did not change much and remained at a relatively low level.

It is interesting to compare the change in the share of foreign affiliate employment in services to that in manufacturing. In the case of non-financial services and business services, all EU countries for which data are available show an increase in the employment share of foreign affiliates, with larger increases than in manufacturing. A high (21-23%) and increasing employment share of foreign enterprises can be observed for instance in Denmark, Sweden and Estonia. However, manufacturing is still much more globalised than services with the exception of information and communication services.

4.3.1.3. VALUE ADDED SHARE OF FOREIGN MNES

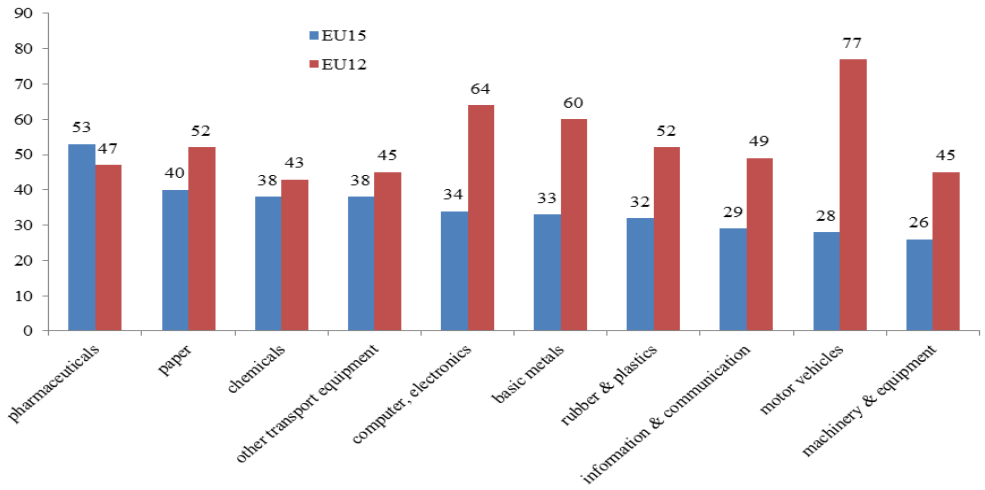
Regarding the manufacturing sector foreign firms' share of value added was larger than their share of employment: 28% in the EU-15 countries and 42% in the EU-12 countries. The economic importance of foreign-controlled enterprises varies significantly across industries. In the EU-15 foreign affiliates have the highest share of value added in pharmaceuticals (53 %) followed by paper, chemicals, other transport equipment, computer, electronic and optical products, basic metals and motor vehicles (see Figure 4.4). These industries feature either high capital intensity (e.g. paper and metals) or a high level of innovation and R&D activities (e.g. pharmaceuticals, computer, electronic and optical products).[81] Within services, information and communication services have the highest share of foreign-controlled enterprises (29%), exceeding the degree of internationalisation of total manufacturing. One reason for the high degree of internationalisation in terms of FDI in this sector is the rise of ICT. For the EU-12 there is a similar ranking of industries with respect to foreign presence.

[78] Note that inward FATS statistics and balance of payments based FDI flows are not directly comparable since FATS is based on the 50.1 % rule (share of the voting rights) while FDI is based on 10% voting power. The number of countries for which data are avaialbe is limited to 20-22, depending on the sectors.

[80] Except Ireland, Spain and Portugal.

[81] In these high-tech and medium high-tech manufacturing sectors, the internationalisation of firms' R&D activities is more pronounced than in other sectors (European Commission, 2012).

Figure 4.4 – Share of value added of foreign affiliates in the EU based on NACE rev. 2



Note: Number of EU countries for which data are available range between 16 and 21, except for pharmaceuticals with 10 countries.

Source: WIFO calculations using Eurostat Foreign-controlled enterprises data (Eurobase).

4.3.1.4. PRODUCTIVITY OF FOREIGN CONTROLLED ENTERPRISES

Foreign-controlled firms exhibit a productivity advantage over domestically owned firms and this holds true for almost all industries. The ratio of labour productivity between foreign - controlled and nationally controlled enterprises is highest in information and communication services, and wholesale and retail trade (see Table 4.4).

However, productivity differences between foreign-owned firms and domestic firms should be interpreted with some caution. The productivity gap between foreign and local firms may also be due to foreign investors' cherry-picking of the best firms

Table 4.4 - Labour productivity of foreign-controlled and nationally controlled firms ('000 EUR)

Value added per person employed in 2008										
	EU-12 countries					EU-15 countries				
	For-eign	Dome stic	all	ratio	# ind	For-eign	Do-mestic	all	ratio	# of ind
manufacturing	29	17	21	171	(10)	89	53	60	168	(11)
water supply sewerage, waste	30	23	24	128	(6)	75	82	81	91	(8)
construction	35	19	20	182	(11)	71	55	55	131	(11)
wholesale & retail trade; repairs	32	19	21	*167*	(8)	84	37	43	*228*	(10)
transportation & storage	29	22	23	132	(7)	61	56	57	109	(10)
accommodation & food service	16	13	13	122	(8)	32	39	38	82	(8)
information & communication	73	36	48	*200*	*(9)*	209	97	115	*216*	*(11)*
professional, scientific & tech. act.	39	30	31	132	(7)	83	58	60	143	(10)
administrative & support service act.	24	16	18	143	(8)	53	37	39	145	(10)

Note: The ratio is defined as value added per person employed. Number of countries for which data is available in parenthesis.

Source: WIFO calculations using Eurostat Foreign-controlled enterprises data (Eurobase).

Recent firm-level studies show that the productivity gap partly disappears when foreign affiliates and domestically owned multinationals are compared (Griffith, Redding and Simpson, 2002, 2004; Criscuolo and Martin, 2009). This suggests that multinationality rather than foreign ownership per se is the main explanation for the higher productivity level of foreign owned firms as compared to domestic firms.

Empirical evidence on the direct effects of FDI can be obtained by calculating the contribution of foreign-controlled enterprises to total labour productivity growth. Table 4.5 provides evidence on the direct contribution of foreign-controlled enterprises to real labour productivity growth for the EU manufacturing sector using the growth accounting framework introduced by Criscuolo (2005). The results show that foreign affiliates contribute more than proportionally to productivity growth when compared it with the employment share of foreign affiliates. In the EU-15 countries foreign-controlled enterprises in the manufacturing sector account for 54% of total labour productivity growth. The corresponding contribution for the EU-12 countries is 62%. This is a large effect given that employment share of foreign-controlled enterprises is 20% in the EU-15 and 29% in the EU-12. When the direct contribution of foreign-controlled enterprises is decomposed into the within effect and the between or compositional effect (i.e. contribution by the increase in the employment share of foreign affiliates in the host economy), it can be seen that the between effects account for 45% in the manufacturing sector in EU-15 countries and 55% in EU-12 countries.

Table 4.5 - Contribution of foreign-controlled enterprises to labour productivity growth in manufacturing

		Contribution in percentage points				foreign	between
	Average annual productivity growth	domestic	foreign	within	between	%	effect
EU-15	4.0	1.8	2.2	1.2	1.0	54	45
EU-12	10.1	3.7	6.5	2.9	3.6	62	55

Note: The EU-15 countries include Austria, Denmark, Estonia, Finland, France, Italy, the Netherlands, Portugal, Spain, Sweden and the United Kingdom. The EU-12 countries include Bulgaria, the Czech Republic, Latvia, Hungary, Romania, Slovakia and Slovenia. The time spans are 1999-2007 for the EU-15 countries and 2003-2007 for the EU-12 countries.

Source: WIFO calculations using Eurostat Foreign-controlled enterprises data, National accounts database (Eurobase) and the EUKLEMS database.

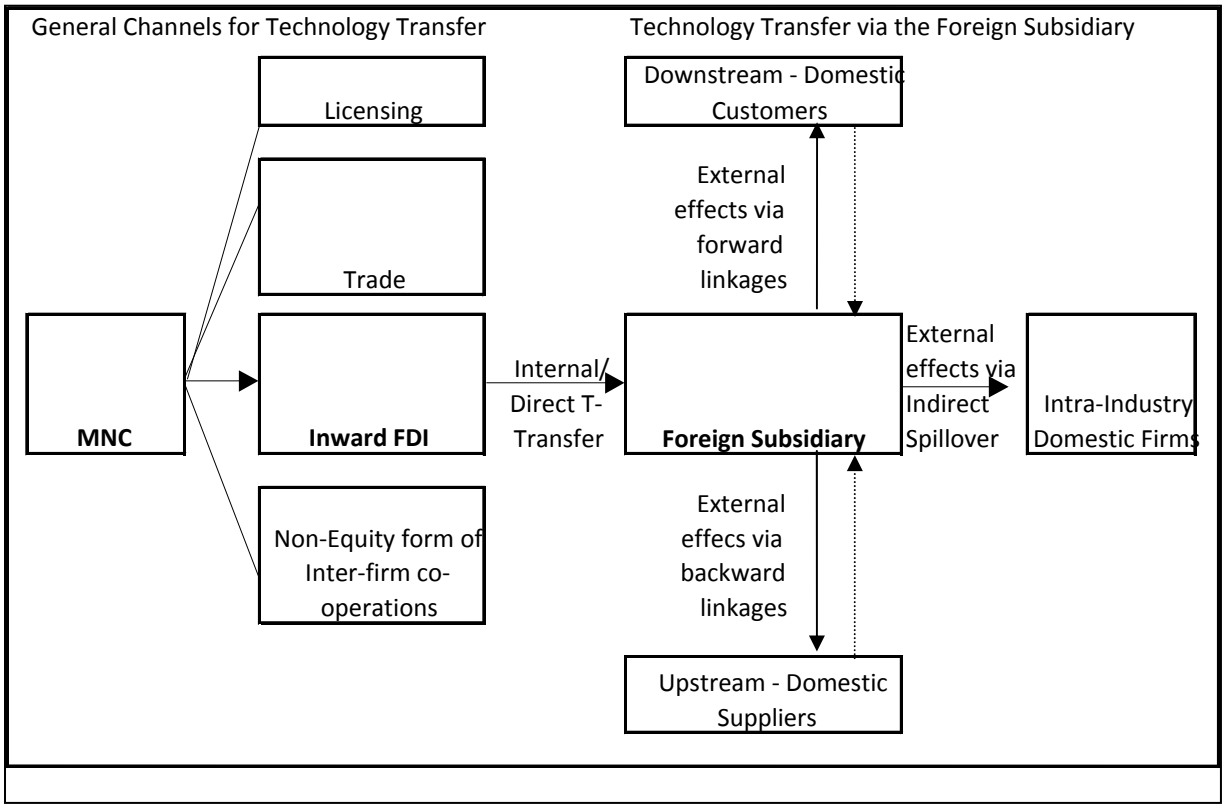
4.3.2. Indirect effects of FDI on productivity and performance

The unintended indirect impact of FDI on host countries has been already studied from many points of view, including economic growth and development, employment and technology transfer.

The assumption underlying recent policy initiatives to attract FDI is that FDI inflows upgrade the technological capabilities, skills and competitiveness of local firms in the host countries. How does FDI contribute to this when MNEs try to protect their knowledge? What is the empirical evidence that FDI upgrades the capabilities and competitiveness of host countries?

It has been suggested that spillovers from MNEs to local firms (or other MNEs) represent an important channel for the dissemination of technology and knowledge. Unintended knowledge and technology transfers from MNEs to local economies are usually referred to as the indirect effect of FDI. Figure 4.5 highlights the main channels through which a multinational corporation can engage in activities that affect a host country. Inward FDI is only one of the possible business strategies undertaken by MNEs: licensing, trade and non-equity forms of inter-firm cooperation (e.g. joint ventures) are also available options. The impact can be direct (on the foreign subsidiary) or indirect (on domestic firms). In the latter case, the indirect effect is divided horizontally (intra-industry effect) and vertically (inter-industry). Finally, the vertical effect can be divided into forward linkages (downstream domestic customers) and backward linkages (upstream domestic suppliers).

Figure 4.5 - Channels for technology transfer



Source: WIFO illustration.

At least four ways can be identified in which knowledge may spill over from foreign affiliates to other firms in a given host economy.[82]

1. Imitation and demonstration effects

These can be implemented by reverse engineering – efforts in which a firm takes a foreign product apart, analyses it and learns about the technologies. Domestic companies do not need FDI for this; imports can be sufficient for the purpose. However, it is easier to imitate and copy – also in terms of managerial and organisational innovations – if MNEs are located in the country.

2. Foreign linkage effects

The foreign linkage effect is a related demonstration effect: through imitation (or sometimes through collaboration), domestic firms can learn how to export and reach foreign markets.

3. Movement of labour and skills acquisition (i.e. mobility)

When an MNE transfers practices or technology to affiliates, it has to train its employees in the host country in question. This new managerial and technical knowledge can spill over to host country firms when employees with these new skills move to other firms or set up their own businesses. A number of empirical studies suggest that the movement of workers between firms is the most important mechanism for technology and knowledge spillovers[83].

4. Competition – Market interactions

It is argued that the entry of an MNE (with better technology and managerial practices) into a host country will force that country's firms to use existing technology and resources more efficiently and/or upgrade to more efficient technologies. However, competitive pressure can force domestic firms to exit

[82] Kokko (1992) and Blomström and Kokko (1998).

[83] See Barry, Görg and Strobl, 2004, for Ireland; Pesola, 2011, for Finland; and Martins, 2011, for Portugal.

(crowding-out or business-stealing effects) (Dunning, 1993).

Do these spillovers take place in all countries and industries? According to the 'absorptive capacity' literature (Cohen and Levinthal, 1989 and 1990)[84] and the recent 'distance to the frontier' literature[85] the wider a given development gap is, the less likely it is that the host country or host country firms will have the human capital, physical infrastructure and distribution networks – therefore more generally the absorptive capacity – to attract advanced FDI.

Absorptive capacity can be defined as the ability to recognise the value of new external information, assimilate it, and apply it to commercial ends – a factor critical to firms' innovative capabilities. This definition has also become a key concept in the FDI literature, which has extended the notion of absorptive capacity by relating it to a firm's prior knowledge: the more a local firm already knows when an MNE enters the market, the more likely it is to be able to learn from and imitate the MNE's knowledge (positive FDI spillovers). In the context of a given local enterprise, it is the enterprise's absorptive capacity that enables it to appropriate some of this knowledge.[86]

4.3.2.1. NEW EMPIRICAL EVIDENCE ON THE INDIRECT EFFECTS OF FDI ON PRODUCTIVITY IN THE EU-27

The results shown in section 4.3.1 have addressed the direct impacts of foreign affiliates on productivity growth. However, they do not allow us to infer whether foreign firms raise overall growth. The aim of this section is to investigate whether domestic firms benefit from the presence of foreign MNEs in both the same and customer industries. Knowledge about the magnitude of FDI spillovers is important because it can help policy makers to maximise the benefits of FDI for local enterprises and minimises its adverse effects.

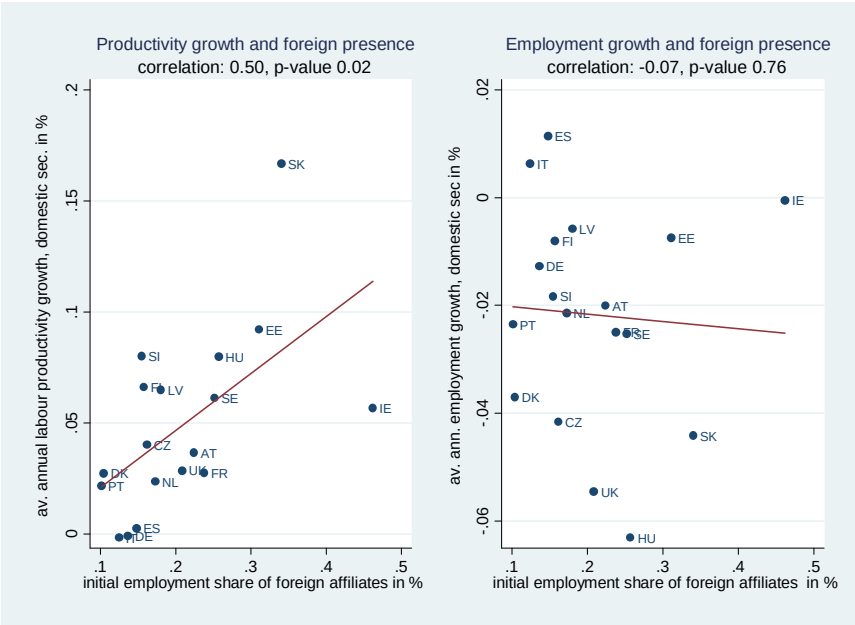
In order to gain a first idea of the relationship between foreign presence and the performance of the domestic sector a simple scatter plot using aggregate country-level data is provided. The results show that in EU countries where foreign-controlled enterprises in the manufacturing sector initially have a large share of employment (starting in 1999 for most EU-15 countries and 2003 for EU-12 countries) the growth in the labour productivity of domestically controlled firms in the manufacturing sector is significantly higher over the period 1999-2007 (alternatively 2003-2007 for the EU-12 countries; Figure 4.6, left-hand panel). However, employment growth in manufacturing is not significantly correlated with foreign presence (Figure 4.6, right-hand panel).

[84] See also Alfaro et al. (2004): Noorbakhsh and Paloni (2001); Borensztein, De Gregorio and Lee (1998).

[85] Sabirianova, Svejnar, and Terrell (2009); Rodriguez-Clare (1996); Acemoglu, Aghion and Zilibotti (2006).

[86] The background study summarises the results of more than 70 studies investigating the effects of FDI published after 2000. The absorptive capacity hypothesis is confirmed in 12 out of 20 studies, with the relative productivity level between domestic and foreign firms the most widely used measure of absorptive capacity.

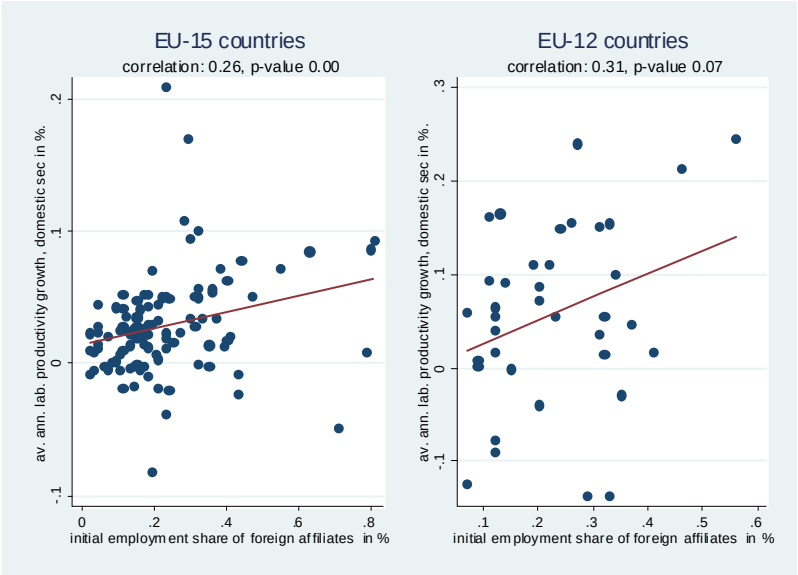
Figure 4.6 - Productivity and employment dynamics in the domestic sector and initial employment share of foreign-controlled enterprises in manufacturing (EU-27)



Source: WIFO calculations using Eurostat, Foreign-controlled enterprises data, National accounts database (Eurobase) and the EUKLEMS database.

When disaggregated data at the one/two-digit level for the manufacturing sector are used a significant correlation between foreign presence and labour productivity growth can be observed. This holds true for both the EU-15 and EU-12 countries for which data are available (see Figure 4.7).

Figure 4.7 - Employment growth and initial employment share of foreign-controlled enterprises in manufacturing at the one-digit level in EU-15 and EU-12 countries



Source: WIFO calculations using Eurostat Foreign-controlled enterprises data, National accounts database (Eurobase) and the EUKLEMS database.

The inward FATS database has been combined with national accounts data,[87] which makes it possible to estimate the impact of foreign presence within the same industry and in customer industries on the performance of domestically owned firms. For the manufacturing sector in the EU-15 and EU-12, OLS estimates at the industry level show that the impact of foreign presence in the same and in customer (buying) industries in the initial year has a positive impact on the average annual growth rate of real labour productivity of the domestic sector. In summary, the presence of both horizontal and vertical backward spillovers from FDI can be observed.

The next step is to investigate the impact of the presence of foreign affiliates on the productivity growth of domestic companies. Since the activity of foreign firms is unlikely to affect all firms equally, it is interesting to examine, whether firms characterized by low productivity growth rates benefit from the presence of MNEs. The interaction term between the backward production linkage variable and the productivity gap between the domestic and foreign sector is significant, indicating that the FDI effect through backward linkages increases with the labour productivity level of the domestic firms to that of foreign firms. For the EU-15 countries in the manufacturing sector, the magnitude of the FDI effect is twice as large as in the industries characterised by a small relative labour productivity gap as compared to those with a large relative productivity gap (coefficient of 1.17 for a relative productivity level of 1.9 (=90%) as compared to 1.9 for a productivity of 1.5 (=50%; see Table A.6 in the Appendix).

In addition, the results based on firm level data for seven EU-12 countries (including manufacturing and service firms) show strong evidence of productivity spillovers from backward linkages. However, the FDI effect is highly uneven across the different types of firms, with insignificant effects for laggards (e.g. shrinking firms) and newly founded firms. Companies with lower than average labour productivity growth are unlikely to benefit from the presence of MNEs, while spillover effects of FDI on highly productive firms in the customer industries proved to be significant. In particular, the spillover effects through backward linkages are higher for fast-growing firms when compared with the total sample. A negative relationship has been found between productivity growth of domestically owned firms and the presence of foreign firms in the same industry, indicating negative horizontal spillovers probably due to a market stealing effect (see Table A.7 in the Appendix). However, the above results should be interpreted with caution, because limited data may lead to an aggregation bias. To overcome the limitations, the Community Innovation Survey (CIS) is used in the next section to investigate the impact of foreign MNEs on local firms.

4.3.2.2. New empirical evidence on the indirect effects of FDI on employment growth and technological innovations in the EU-10

The findings of the empirical analysis in this subchapter so far have strongly supported the view that backward spillovers are more important than horizontal spillovers with regard to productivity growth. However, an open question remains as to what extent the magnitude of FDI spillovers depends on local firm characteristics and absorptive capacity. The entry of multinational enterprises may not only have an impact on productivity and employment growth but may also induce local firms to introduce new products and/or services or new production processes. This part of the analysis investigates the impact of FDI on the employment performance and innovation activities of domestically owned companies based on CIS 2006 data for eight EU-10 countries is investigated.[88] Particular attention is paid to the role of spillovers from downstream multinational enterprises on upstream local suppliers (backward linkages).

Special emphasis is put on the question of the absorptive capacity of local firms and firm characteristics (e.g. firm size). The analysis is based on a large firm sample, namely the CIS 2006 for eight EU-10 countries with about 36000 observations. This analysis focuses on the EU-10 countries.[89] The reason is that the productivity differences between domestically and foreign-

[87] Background study, Falk et al. 2012.

[88] This section is based on yet unpublished results from the EU funded project INNO Grips ENTR-09-11-LOT2.

[89] The eight EU-10 countries considered are: Bulgaria, the Czech Republic, Estonia, Poland, Romania, Slovenia and the Slovak Republic.

owned firms are much more pronounced in the EU-10 countries than in the EU-15 countries.

The major contribution of this analysis is that it investigates the relationship between the employment performance of local firms and FDI along with the impact of FDI on the innovativeness of local companies. Few studies have investigated the impact of foreign presence on technological innovation in domestically-owned firms[90]. Using data for 27 countries in Central and Eastern Europe (including the EU-10 countries), Gorodnichenko et al. (2010) find that domestic firms' innovation activities increase through backward linkages by supplying multinational enterprises.

OLS estimates (see Table A.8 in the Appendix) based on eight EU-10 countries show that foreign presence has a positive impact on employment growth of firms located in local supply industries. In particular, local firms with backward linkages in industries with a large initial foreign employment share have a significantly higher average employment growth rate in the next two years. In other words, local firms with a larger supply of inputs to industries where foreign firms are present tend to create more jobs than industries with no such linkages. The magnitude of the spillover effect through backward linkages increases with the absorptive capacity of local firms measured as the initial productivity level of domestic firms to that of foreign firms. However, the additional effect of the increased absorptive capacity is relatively modest.

Furthermore, foreign competition leads to a higher probability that local firms will introduce new product innovations where foreign competition is measured as a subjective qualitative indicator as perceived by local firms. A new empirical finding is that the magnitude of the impact of FDI through backward linkages increases for innovative local firms (i.e. firms that introduce new products and/or new services) in the manufacturing sector. Overall, the results show strong evidence in support of vertical spillovers through backward linkages from foreign buyers to local suppliers. Local firm characteristics also influence the strength of FDI spillovers. Spillovers through backward linkages to local firms are present for local firms in the manufacturing sector and generally for firms with 25 or more employees but do not exist for small firms with less than 25 employees and for domestically owned firms in the service sector. Moreover and somewhat unexpectedly, the results show that spillovers through backward linkages to local firms are much larger for non-exporting firms than for exporting firms. There is also evidence that firms in the same industry benefit from industry-level FDI that increases with absorptive capacity. However, the magnitude of the effects is much smaller than that of spillovers through backward linkages.

The relationship between foreign presence and the innovation performance of local firms is also investigated (Table A.9 in the Appendix). The results show a positive association between innovation performance of domestically owned firms and foreign presence in customer industries. This suggests that local firms in industries that supply a larger share of their output to industries with a larger share of multinational enterprises are more likely to introduce product innovations or new market products. However, the positive effect only occurs when the productivity gap is not too wide and increases with the relative labour productivity level between local and foreign-owned firms. Furthermore, the positive impact of FDI can be observed in all kinds of innovation activities (i.e. new market products, product and process innovations[91]) but it is the largest for product innovations. Hence, FDI favours technology adoption (i.e. goods and services that are new to the firm) rather than radical innovations (i.e. market novelties).

Overall, the results suggest that foreign firms act as catalysts for domestic suppliers to introduce technological innovations in the case of EU-10 countries. In addition, foreign firms do not crowd out domestic innovation in the same industry and there are positive effects with increased absorptive capacity. An important result is that not only do domestic suppliers benefit in their innovation performance from the presence of multinational enterprises, but technological innovations of local firms and that of foreign firms are also significantly positively correlated. In other words, the introduction of technological innovations by

[90] Exceptions are Vahter (2011) for Estonia or Bertschek (1995) and Blind and Jungmittag (2004) for German firm level data.

[91] Process innovation refers to new or significantly improved production process, distribution method or supporting activity.

domestic and foreign firms goes hand in hand (holding everything else constant and accounting for industry effects). [92]

4.3.2.3. EVIDENCE FOR TECHNOLOGY TRANSFER THROUGH BACKWARD LINKAGES AND THE USE OF TECHNOLOGY LICENCES

The aim of this section is to analyse the characteristics of local firms that supply goods and services to multinational enterprises. It also examines to what extent foreign affiliates contribute to technology transfers in the form of technology licences.

There are a number of reasons why multinationals prefer local procurement rather than suppliers from abroad. Geographical proximity can lower production costs and makes face-to- face contacts easier, and close relationships with local suppliers make it easier to tailor products and services to local market conditions. However, in some industries local sourcing is less frequent because multinational companies prefer to work with their established suppliers (UNCTAD, 2001, 2003). The factor determining the supply status of supplies MNEs is estimated using a probit model. Information on the level of use of local suppliers by foreign firms also makes it possible to estimate an ordered probit model.[93]

In the EU-10 in 2004, 17% of local firms supplied goods or services to foreign affiliates located in the same country (not including the parent company) (see Table 4.6). This share is higher than the average in the case of transport services (24%), mining (23%), manufacturing firms (19%), and business services (19%). Most of the local firms have a low share of goods and services supplied to MNEs. Furthermore, the supplier status and the share of sales increase with firm size. Overall, the incidence of supplier linkages between local and multinational firms is quite significant given the practice of multinational enterprises of purchasing from established suppliers.

[92] This important result has also been found when analysing specifically R&D investmtnes of firms abroad (European Commission, 2012). R&D intensities of domestic and foreign firms are positively correlated. Furthermore, no evidence has been found that inward R&D crowds out R&D activites of domestic firms. On the contrary both are found complementary. Reciprocically, there is no evidence that R&D activities performed abroad are a substitutions for similar domestic actitivites.

[93] The data used here are based on the Business Environment and Enterprise Performance Survey (BEEPS) 2005 and 2009 provided by the World Bank. The data contains information for the years 2004 with about 3500 observations for the business enterprise sector. Information on technology licences obtained from foreign-owned firms in the manufacturing sector is taken from the BEEPS 2009 survey.

Table 4.6 – Share of domestic sales to multinational enterprises and their foreign affiliates by local firms in 2004 by industries, EU-10

Share of domestic sales to multinational enterprises in host country of local firms							
	0	1-24	25-49	50-74	75-100	total	1-100
				by industry			
mining	77	9	5	9	0	100	23
construction	86	7	4	1	1	100	14
manufacturing	81	9	4	3	3	100	19
transport	76	11	7	4	2	100	24
trade	87	9	2	1	1	100	13
real estate, renting, business serv.	81	11	2	3	2	100	19
hotel and restaurants	87	8	4	0	0	100	13
other services	90	7	1	1	1	100	10
total	83	9	3	2	2	100	17
				by size			
firm size							
>5	93	4	1	2	1	100	7
5 - 24.9	85	9	3	2	1	100	15
25-49.9	78	12	5	3	2	100	22
>=50	79	11	5	3	2	100	21
total	85	8	3	2	1	100	15

Note: Figures are based on the question 'What percentage of your domestic sales are to multinationals located in your country (not including your parent company, if applicable)?' using 3500 firm observations.

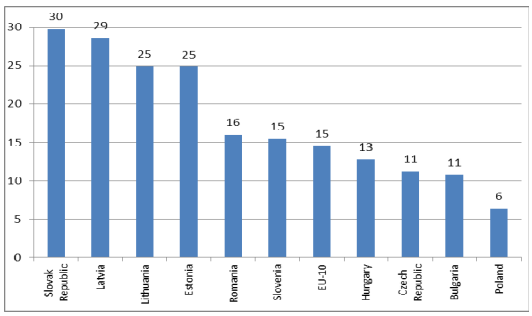
Source: BEEPS 2005.

Unreported results show that firms with new products are more likely to become a supplier to multinational enterprises in the same country. Innovative firms have a 7 percentage points higher probability of being a supplier than non-innovative firms. Local firms in construction, wholesale and retail trade, and hotels and restaurants have a lower likelihood of being a supplier to multinational enterprises. As expected, firm size has a positive impact on being a supplier to MNEs, with the probability decreasing slightly with increased firm size. Furthermore, the skill structure is of great importance in being a supplier to foreign affiliates: firms with a larger share of workers with some or completed university education have a significantly higher probability of being a supplier to MNEs.

The next step is to investigate the extent of technology transfers from foreign-owned firms to local firms in the form of technology licences. In particular, it is examined to what extent foreign affiliates contribute to technology transfer and help to upgrade local suppliers in the host economy with respect to innovation performance and innovation input. The focus is on externalised technology transfer, i.e. linkages and transfers outside direct transfers such as licences, franchises or subcontracting (Ivarsson and Alvstam, 2005). These types of technology transfers have the potential to contribute to technology upgrading (UNCTAD, 1999).

Figure 4.8 shows the share of firms that use technology licensed from foreign-owned enterprises in the manufacturing sector in the EU-10. About 15% of the firms use licences from foreign-owned firms with large differences across the EU-10 countries.

Figure 4.8 - Use of technology licensed from a foreign-owned company, excluding office software, manufacturing in 2008, in %



Note: Weighted using sample weights.

Source: BEEPS 2009 based on 1100 observations

As expected, firms that use technology licences are more likely to introduce new products and product innovations and to undertake R&D. In the manufacturing sector 63% of local firms having licences with foreign MNEs engaged in product innovation in 2008. At the same time only 51% of local companies without technology licences proved to be innovative. The percentage of firms with R&D activities is 40% for firms with licences and 21% for those with no licences. This may indicate that the use of licences from foreign-owned companies leads to technological upgrading of local firms but may also indicate that innovative firms and R&D-intensive firms are more likely to use technology licences.

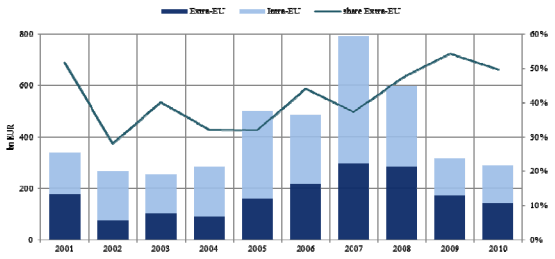
4.4 TRENDS AND STRUCTURES OF EU-27 OUTWARD FDI

At global level, the EU is the largest direct investor, typically accounting for more than half of global FDI outflows (intra-EU flows included). In line with the global trend, the investment activity of EU MNEs decreased substantially and resulted in the EU's share of global outflows dropping to a third in the years 2009 and 2010.

Both extra-EU and intra-EU outflows contracted in absolute terms after 2007 and did not return to the peak levels of 2006 and 2007 until 2010. EU MNEs curtailed FDI activities particularly within the EU, which is reflected in a marked decline in intra-EU flows since the peak in 2007 (Figure 4.9). Intra-EU outflows dropped by almost 40% in 2008 and again by 50% in 2009 to around EUR 140 bn and stabilised at that level in 2010.

Outward FDI flows to countries outside the EU also contracted and were down for the third consecutive year in 2010 shrinking to EUR 143 bn, less than half of their peak value in 2007. Despite their severe 40% decline in 2009 extra-EU flows have gained relative importance since the crisis. Between 2008 and 2010 the share of extra-EU outflows hovered around 50%. The number and value of EU greenfield investments went down and the average size of projects was typically smaller in the period 2009-2011.

Figure 4.9 - EU FDI outflows, 2001-2010 (EUR bn)



Note: EU is EU-25 for 2001-2003 and EU-27 for 2004-2010. EU flows calculated as the sum of EU Member States. Intra-EU flows to Luxembourg are adjusted downwards by 90% in order to exclude activities of Special Purpose Enterprises (SPEs). Extra-EU flows exclude offshore centres (Guernsey, Jersey, Isle of Man, Gibraltar, Bahamas, Bermuda, British Virgin Islands, Cayman Islands, Netherlands Antilles).

Source: Eurostat, wiiw calculations.

The shift in outward FDI from intra-EU to extra-EU flows might indicate that EU MNEs have perceived the EU as a less attractive location for FDI since 2008, inducing several European MNEs to seek investment opportunities in fast-growing emerging markets outside the EU. Another factor contributing to the shift in the destinations of FDI is that until mid-2008 the EU-10 countries provided excellent investment opportunities for EU MNEs, but the convergence process was interrupted by the economic crises of 2008/2009 and these countries stopped being a focus destination for EU MNEs.

4.4.1. EU outward FDI by destinations: a shift towards emerging markets

Like the main sources of the EU's inward FDI from the rest of the world, the main recipients of EU outward FDI are the US and the EFTA countries. These two regions accounted for more than half of the total extra-EU outflows in the period 2008-2010. This supports the view that the dominant share of EU FDI is market-seeking FDI targeted at high-income economies. However, as a result of the crisis, investment by EU MNEs in developed destinations – with the exception of Switzerland - declined significantly. This is partly linked to the recession in developed countries and the dominant role of M&As between developed countries, which are more sensitive to business fluctuations than greenfield investments.

At the same time emerging economies, mainly in Asia and South America have clearly become more important destinations for EU FDI. This trend had

started well in advance of the economic crisis of 2008/2009 but the European recession intensified it. In 2008-2010, 11 out of the 15 largest FDI destinations were emerging and transition economies, including Russia, Brazil, Mexico, China, Turkey and India. Developing regions bordering the EU benefited to a lesser extent from EU FDI, with the notable exception of North Africa (see more about this in Chapter 5). In general, flows to emerging countries were much more resilient to the crisis. This is due to the fact that these markets have higher growth performance and prospects and are thus ideal targets for greenfield investments.

EU MNEs account for a significant share of overall FDI stocks in major destination countries. The overwhelming majority of the EU FDI stock in non-EU countries is owned by companies from the EU-15 (97%) while the EU-12 accounted for about 3% in 2010.[94] EU multinationals are particularly well positioned in the US, Switzerland, Russia and Argentina[95] accounting for 64%, 71%, 83% and 55%, respectively, of the total FDI stock in the country. EU companies represent a much larger share of inward FDI stocks in many countries than US or Japanese competitors, indicating a good competitive position in foreign markets. For instance, in both India and Argentina, the EU's share of the FDI stock is two and three times larger than that of the US. Only in China, EU firms seem to be on a par with the US in terms of accumulated FDI stocks. China seems to be a particularly competitive market for foreign direct investors as there is strong competition there also comes from South Korea and Singapore.

4.4.2. Industry structure of the EU outward FDI: the EU possesses comparative advantages for FDI in manufacturing industries

Like FDI in general, EU outward FDI by broad economic sectors takes place predominantly in services. Services emerge as the main sector accounting for 72% of the total outward FDI of the EU, while manufacturing represents 20%. These figures are biased towards the services sector due to the massive FDI stocks of the financial sector. However, excluding the financial sector and the activities of holding companies (other business services), the services industries account for 29 % of total EU outward stocks. Most investments in this sector target the trade and repair industry (10 %) and the post and telecommunications industry (7.4 %). Manufacturing industries account for half of the total (adjusted) EU outward stocks in non-EU countries amounting to EUR 645 bn. The chemical industry (14%) is the leading industry in terms of EU outward FDI stocks owned in the rest of the world, followed by the metal industry (6%) and the food industry (6%). Generally speaking, the magnitude of the EU outward stocks in the individual industries reflects the strong competitive positions of the EU companies in the respective industries. The variation across destinations markets shows that host country factors, including resource endowments and the importance of the industry in the host economy, also play a role in investment decisions of EU firms. For instance, the EU and Switzerland both have large multinationals in the chemical industry, and a large share (43%) of EU total outward FDI stock in the chemical sector is located in Switzerland. Another example is the low presence of EU (and other) multinationals in the Indian market in the trade and repair industry, which is a clear consequence of the prohibition of the FDI in multibrand retailing.

In the analysis of trade flows it has become common to investigate the relative position of a country in a specific industry by looking at revealed comparative advantages (RCAs). Basically, RCAs signal the industries in which a given country exports relatively more than it imports in comparison to the export and import ratio in the total economy. EU outward FDI stocks by industries are used to apply the concept of RCAs to FDI stocks by comparing inward with outward stocks. Calculating RCAs based on inward and

[94] The share of the EU-12 in intra-EU-27 stocks is even lower, at around 2% in 2010; it is, however considerably higher within the EU-12 amounting to 8.7%. More details about the FDI activities of MNEs from the EU-12 are provided in the next section.

[95] In the case of Russia, EU investments may to some extent be overstated because a third of the EU's FDI stock in Russia is owned by Cyprus (which makes it the largest investor) but these flows are understood to mainly constitute 'round-tripping'' capital. 'Round-tripping' FDI refers to Russian investment channelled back via Cyprus for tax purposes (Hunya and Stöllinger, 2009). Moreover, these figures also include FDI stocks owned by Luxembourg which to a very large extent represents financial intermediation activity. The main results from this analysis are not affected by these 'anomalies'.

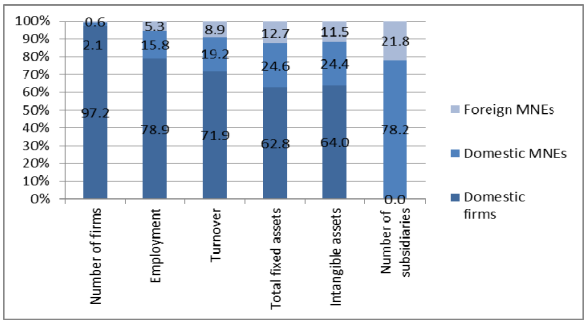
outward EU FDI stocks suggests that EU MNEs are competitive in manufacturing industries, including the EU's traditional industry strongholds (i.e. chemicals, machinery, vehicles) see Figure A.1.in the Appendix. The EU's RCAs in both manufacturing industries and the mining and quarrying sector are based on technological capacities. In manufacturing, this conclusion is derived from the fact that the EU enjoys RCAs mainly in relatively more technology-intensive industries. In mining and quarrying EU MNEs seem to have developed technologies that allow them to exploit natural resources abroad despite the EU's relative resource scarcity. In contrast in services industries, including knowledge-intensive industries such as R&D and computer activities, revealed comparative disadvantages have been found. This suggests that EU MNEs in these sectors are less competitive than foreign MNEs.

4.4.3. The importance of EU MNEs in the EU-15 countries

Looking beyond the major developments in FDI outflows at the aggregate and sector level, the analysis at the firm level provides additional insights into the number of multinational firms and their importance for the EU. Due to data limitations the sample is restricted to EU-15 firms.[96] The empirical literature suggests that foreign MNEs are more productive, more capital-intensive, larger and pay higher wages than firms operating exclusively in the domestic market. Furthermore, only a very small fraction of EU-15 firms own foreign affiliates, but they account for a disproportionately large share of domestic activity. The share of MNEs is typically larger in small countries. The share of domestic MNEs is larger than that of foreign MNEs in all EU-15 countries except for Luxembourg.

Despite their small share in total number of firms (2.8%), MNEs (domestic and foreign MNEs together) account for 21.1% of employment, 28.1% of turnover, 37.2% of total fixed assets and 36% of intangible assets in the EU-15. Domestic multinational enterprises – domestic to each individual country in the EU-15 – account for the largest share of these activities, while foreign multinational enterprises account for a much smaller proportion (Figure 4.10).

Figure 4.10 - Contribution of EU-15 multinational enterprises to domestic activities



Source: AMADEUS database (2011 release), WIFO calculations.

Multinational firms that own subsidiaries in more than one foreign country account for a mere 1% of the total number of firms in the sample, but generate 15% of employment, 20% of turnover and 27% of total fixed assets and intangible assets. Roughly the same picture emerges for multinationals that own more than four foreign subsidiaries. This is an indication that these MNEs are on average larger firms.

The international activity of multinational firms is quite concentrated. The largest 25% of MNEs account for almost 30% of the total number of foreign subsidiaries, 76% of total turnover and intangible assets and generate 90% of employment. However, they represent only 15% of the total number of MNEs in the sample.

Activities of EU-15 MNEs are highly concentrated in the EU. The firm-level data reveal that 70% of EU MNEs choose the EU-15 and 45% choose locations within the EU-15 exclusively. The top three destinations in the EU-15 are Germany, the UK and France. Regarding non-EU countries most European firms prefer to operate in the US market. MNEs in the service sector tend to invest more outside the EU than manufacturing firms. First-time investors prefer closer locations in Western and Eastern Europe. Furthermore, almost half of the new investors place their initial investment in the EU-15 and 15% in the EU-12 and only a very few first-time investors operate affiliates outside Europe.

Most MNEs own only a small number of foreign subsidiaries, and are active in a small number of different host countries. More than half of MNEs hold only one subsidiary, and nearly 60% of the MNEs are active in only one foreign market.

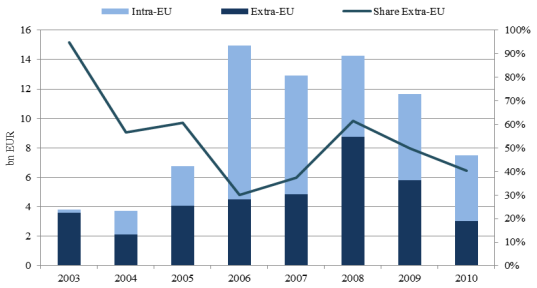
[96] Firm level data stem from the AMADEUS database.

In terms of location choice, the analysis reveals weak evidence of a sequence of markets, in the sense that on average MNEs tend to set up affiliates in less popular markets only if they already have a subsidiary in one of the more popular markets.

4.4.4. Emerging outward FDI from the new EU Member States (EU-12)

The trends in overall EU outward FDI reflect mostly the pattern of EU-15 countries. Linked to their high GDP per capita level, as expected, most of these countries are net capital exporters, with outward FDI stocks exceeding inward FDI stocks. The new EU Member States (EU-12) in turn have been clearly the focus of inward FDI over the past decade. Foreign MNEs made a significant contribution to structural change and development. While EU-12 countries were the source of very low levels of outward FDI, there are several signs that FDI outflows and outward FDI positions are gradually catching up. In line with the theoretical notion of the 'investment development path'[97] (Dunning, 1981, 1986), there has been a growing number of 'emerging multinationals' operating from the EU-12. FDI outflows from these countries increased from around EUR 4 bn in 2003 to EUR 7.5 bn in 2010 and peaked at levels of up to EUR 14 bn in some of the pre-crisis years (Figure 4.11).

Figure 4.11 - EU-12 FDI outflows, 2003-2010



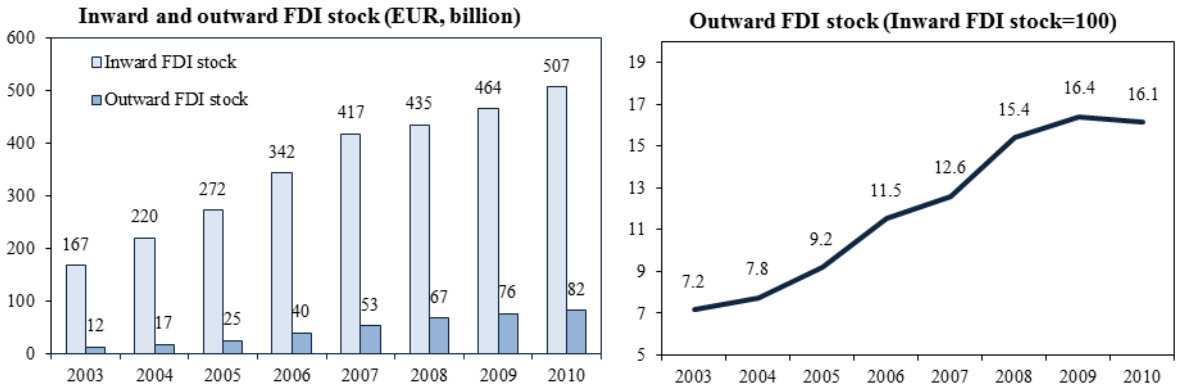
Source: Eurostat.

The total stock of capital invested abroad by EU-12 countries reached EUR 81.8 bn in 2010, having increased nearly sevenfold from its 2003 value. As a result, these countries almost tripled their share in total EU outward FDI, from 1.3% in 2003 to about 1.8 % in 2010. Moreover, the EU-12 outward FDI stock grew also in relation to the inward FDI stock in these countries: from 7.2% in 2003 to over 16% in 2010 (Figure 4.12). This growth occurred despite a more than threefold increase in the value of inward FDI stock in these countries: from EUR 167 bn in 2003 to EUR 507 bn in 2010.[98]

[97] This assumes a systematic relationship between the development level of a country and the net outward investment position.

[98] This phenomenon was initially described by Svetlicic and Jaklic (2006), Boudier-Bensebaa (2008), Gorynia, Nowak and Wolniak (2010), Sass, Éltető and Antalóczy (2012), Radło and Sass (2012) Ferencikova and Ferencikova (2012), Radło (2012) and Zemplinerová (2012).

Figure 4.12 - Inward and outward FDI stock (EU-12, 2003-2010)

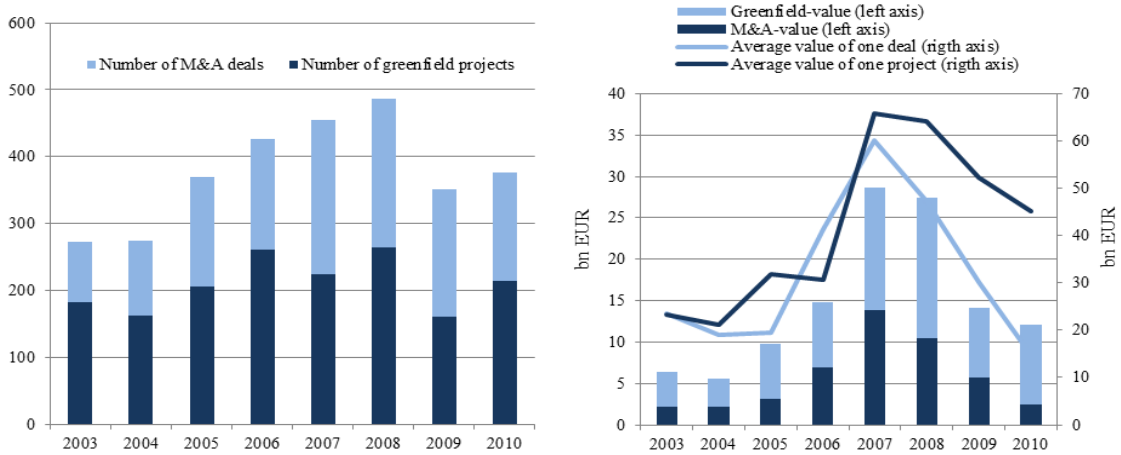


Source: WERI calculations based on Eurostat.

In line with the general downturn in outward FDI activities during the crisis, activities in the EU-12 also slowed down. However, this does not indicate a change in the overall trend of an increasing outward flows from the region. The decline was not steep and the value of outflow investments from the region in 2009-2010 was still significantly higher than in 2003-2005.

In most years greenfield FDI projects outweigh M&A deals in numbers (Figure 4.13). The crisis-related fall in M&A was steeper than that in greenfield investments and the average size of investment projects has declined since the crisis, for both types of investment projects, but much more so for M&A deals than for greenfield investments. While greenfield investments recovered in 2010, the number and the value of M&A continued to decline.

Figure 4.13 - Greenfield FDI projects and M&A deals by MNEs from EU-12 (number of deals and value in EUR bn)



Source: WERI calculations based on the fDi markets database.

Regarding individual countries, Poland, the biggest economy in the EU-12, held a 35.7% share of the value of the total outward FDI stock from the region. Hungary was the second largest investor from the EU-12 region (18.0%), followed by the Czech Republic (13.3%). However, relative to GDP, smaller countries such as Estonia, Slovenia

and Hungary are the best performers in terms of internationalisation through outward FDI.

While in the pre-accession period FDI outflows from the EU-12 were strongly concentrated in regions outside the EU-27, this changed to a much stronger focus on intra-EU flows after accession. In 2010 well over 50% of the total EU-12 stock of outward FDI constituted intra-EU-27 investments (see Figure 4.11). Note that this is a different trend to the one that has been found inherently for the EU-15 in the analysis of overall EU foreign direct investment trends.

Distinguishing between the types of outward FDI projects, the geography of M&A is highly influenced by 'round-tripping' FDI deals, referring to investments that are channelled back to the original investing country by Special Purpose Entities (holding companies) located in financial centres or tax havens. This trend is mostly reflected in foreign direct investments in Cyprus, the Netherlands, the UK, Switzerland and Luxembourg. Another clean dominant trend is for M&A deals in proximate, neighbouring countries within the Central-East European region. The largest EU-15 locations for EU-12 M&A activities are Germany, Austria and Italy, while Romania, Lithuania, the Czech Republic, Bulgaria and Slovenia are the main destinations within the EU-12. Extra-EU M&As are most intensively undertaken in neighbouring Croatia, the Ukraine, Serbia and Russia.

The geography of greenfield FDI is less influenced by factors related to financial flows resulting from tax optimisation. The main focus is on countries within the EU-12 region itself – foremost Romania, the Slovak Republic and Bulgaria – and neighbouring countries in Eastern Europe (Russia and Ukraine) along with markets of the former Yugoslavia in South-Eastern Europe. The most important target countries for greenfield investments from the EU-12 are Germany, Italy, the UK and Austria. It is worth noting that some outward investment is oriented toward emerging regions in Asia.

The main feature of the sector structure in the EU-12 is a very strong focus on construction and engineering and on the coke and refined petroleum products. Comparable to the overall EU sector pattern of outward FDI, the investment activity of EU-12 MNEs is dominated by the service sector. The total value of manufacturing projects is greater than that of greenfield projects. Apart from finance and insurance which leads in M&A projects, the focus of FDI from the EU-12 is on transportation and wholesale and retail trade.

4.5 Home country effects of outward FDI on EU industry

A debate is ongoing in most developed countries about the possible adverse effects of outward FDI on domestic industries. In particular, the fear of job-exporting has sparked widespread concerns due to the increasing attractiveness of emerging and fast-growing and low-wage countries. This is a highly controversial issue in the EU-15 Member States, which see themselves as affected by such concerns, especially since the eastern EU enlargements in 2004 and 2007 and the intra-EU reallocation. A related issue is the increase in the internationalisation of corporate R&D and fears that the offshoring of R&D activities of multinational enterprises is hollowing out the innovation base in the home country. On the other hand, outward FDI is seen as a means to gain market access and secure market shares, to reduce production costs and gain access to technologies and know-how of foreign countries, with positive feedback to the growth and the international competitiveness of home-based parent companies. Moreover, as reviewed in section 4.2.2 multinational firms are found to be more productive, larger and more capital- and technology-intensive, to pay higher wages and to employ a more highly skilled labour force. For all these reasons, countries with an increasing share of multinational firms should experience an increase in aggregate productivity and aggregate competitiveness on international markets.

The theoretical predictions on the home-market effects of outward FDI are far from clear-cut and depend on the type of motive for outward foreign direct investments and the very specific relationships between the parent company and its foreign affiliates. The main questions that are raised in terms of direct effects typically treat FDI as an exogenous event and then seek to examine the impact on performance or employment. This is highly dependent on the motivation of the firm, home country characteristics and the industry in which FDI takes place.

The motivation of the firm to undertake FDI influences both the scale and scope and also the level and destination of FDI. In turn, these factors will also lead to very different impacts at home (Buckley and Casson, 2009; Driffield et al., 2009; Driffield and Love, 2007). Table 4.7 provides a synopsis of the impacts of the different types of FDI, based on the existing literature, in terms of the effects on employment, skill structures, technology transfer, productivity and profitability.

Table 4.7 – Home-market effects of outward FDI depend on the motive for going abroad

Typology	Motivation	Employment	Technology transfer	Productivity	Skills	Profitability
market seeking	the desire to exploit existing firm-specific assets in new markets	little reallocation, some expansion at home, may also replace exports	technology is exported	neutral	potential increase for skilled labour at home to coordinate new activity	positive
resource seeking	the desire to access (natural) resources abroad	positive	neutral	neutral	neutral	positive
efficiency seeking	(re)location of activity to low-cost locations	negative for low-skilled workers and positive for high-skilled workers	neutral	potentially positive on average as more productive activities are retained at home	home- country activities become more skill-intensive, as demand for low-skilled workers is reduced at home	positive
technology sourcing	the desire to access new technology abroad	may be positive in the long run	positive	positive	increased demand for skilled workers at home	positive, but only in long run

Source: WIFO illustration.

The background study provides an overview of the empirical literature reviewed. While it is possible to draw feasible conclusions on the impact of FDI from this review with respect to productivity, profitability and technology transfers, there remain some areas where the home -country effects remain uncertain. These mostly relate to employment effects, where the literature presents a very heterogeneous picture.

4.5.1. Employment effects

The most pressing question in terms of the employment effects of outward FDI is the extent to which it leads to a reduction in employment at home. A glance at the literature on home country employment effects in the background study (Falk et al. 2012) shows that European firms that have engaged in FDI in low-cost locations are more likely to decrease the demand for low skill worker and increase the demand for high skill workers with an overall ambiguous effect. However, this represents only about a third of the total FDI by EU firms, with FDI in general producing more positive impacts on employment. Even where outward FDI does lead to a reduction in employment, the 'employment substitution' is much less than 100%.

When it is possible to differentiate between motivations and locations, it has been typically found that a doubling of FDI to low-cost locations reduces the demand for unskilled workers by some 4%, while it leads to a similar increase in the demand for skilled workers, (Driffield et al., 2009). The findings of Copenhagen Economics (2010) suggest that EU outward FDI has had no measurable impact on employment at the aggregate level. However, bearing in mind the very different data sets and estimation techniques that are used, and the different measures of FDI (from employment abroad to capital flows, and even assets held abroad), it is impossible to draw strong

conclusions about the employment effects of outward FDI.

4.5.2. Skill structure

In recent years both academics and policy makers have expressed concern that increasing globalisation, in the form of both foreign direct investment (FDI) and international trade, is causing dramatic changes in labour demand in the developed world. Specifically, that demand for unskilled workers in the US and Western Europe has been declining and will continue to decline as unskilled workers face significant competition from the newly industrialised countries and other parts of the developing world.

One of the biggest problems when seeking to examine the impact of FDI on skill structures in Europe, and to arrive at any clear conclusions, is that labour market flexibility differs greatly even within the EU-15 countries, and has changed over time. In general, labour market flexibility rewards more skilled workers, who not only have higher earnings but more secure employment. Outward FDI enhances this, rewarding more skilled workers while relocating low-skill activities elsewhere.

Empirical work on the impact of outward FDI on relative employment of different skill levels is limited in scope. A central aspect of the relevant literature is the difficulty of separating the effects of outward FDI from that of skill-biased technological change. The introduction of new technologies and the decision to offshore production activities or services often occurs simultaneously, making it difficult to isolate the effects. This literature can be summarised by two key points. The first is that where the home country has a technological advantage and where this is reinforced by lower unit labour costs then outward FDI increases the demand for skilled labour. Secondly, the higher level of skills an individual has, the better placed they are to gain from FDI in either direction.

4.5.3. Technology transfer

Benefits from knowledge flows between MNE parent companies and their affiliates abroad are most likely in cases where strategic knowledge and technology sourcing are the key motive for FDI, especially between advanced economies. Recent evidence suggests that corporations are increasingly moving their R&D facilities abroad. This is being done as part of a strategic move away from merely adapting 'core' technology to a foreign market towards a much more central role in product innovation and development. Companies which previously exerted rather tight control over their R&D sites are now granting more autonomy and empowerment to R&D laboratories situated abroad. Since the 1990s organisations have begun to take a more decentralised approach to R&D (Pearce, 1999; Niosi, 1999). In addition, the literature suggests that there is a growing willingness to locate such facilities close to leading centres of research and innovation specifically with a view to absorbing learning spillovers from geographical proximity to such sites (Serapio and Dalton, 1999; Ito and Wakasugi, 2007).

The existing empirical studies also provide evidence on extensive 'reverse' knowledge flows from affiliates to parents. This indicates that knowledge-sourcing is indeed an important determinant of outward FDI. However, these flows might not always spill over to the home economy. On the other hand, outward FDI, without any intra-firm knowledge transfers, creates spillovers of knowledge back to the home country. Thus, intra-firm knowledge transfers are neither necessary nor sufficient for subsequent spillovers to the home economy. However, the fact remains that spillovers are overwhelmingly more likely to occur where there exists parent-affiliate knowledge transfer exists.

4.5.4. Productivity

In line with the evidence reported on the characteristics of EU-15 MNEs, the bulk of the empirical literature on FDI and productivity finds that firms self-select into foreign markets, via either exports or FDI. This self-selection means that they are already performing better than the rest of the population of firms. These companies are more productive than average, sometimes as much as 25% more productive than the rest of the firms. However, there is additional evidence suggesting that there is a positive productivity gain associated with increased outward FDI, which in turn depends on the type of investment undertaken.

Typically, the main theoretical rationale for the home country to expect benefits from outward FDI is based on the likely indirect effects (Driffield et al., 2009). As firms locate abroad, they may

improve their overall performance and efficiency by relocating only low value-added production abroad and keeping and even expanding high value-added activities at home. The standard analysis suggests that such FDI flows merely reflect the desire to locate in the lowest possible cost locations. FDI of this type may well generate productivity growth at home, through what Blomström and Kokko (1998) highlight as the 'batting average' effect of outward FDI that can occur as a result of the reallocation of resources that may accompany FDI, especially to low-cost locations.

Positive feedbacks from FDI to productivity at home are also associated with successful technology and knowledge sourcing and benefits from agglomeration effects in specific sectors (Barba Navaretti and Venables, 2004), or effects related to the general notion of 'learning by exporting' due to exposure to international competition, best practice and the technology frontier as well as demonstration effects (Clerides et al., 1998).

4.5.5. Profitability

Much of the literature concerning the relationship between outward FDI and profitability centres on what has become known as the multinationality-performance debate. Overall, the literature finds that multinationals are more profitable than others, but with some evidence that this is because the more successful firms become multinational. However, overall multinationality is associated with long-run profitability. One weakness in this literature is that it typically fails to distinguish between either the location of the FDI or its type. For example, Driffield and Yong (2012) find that FDI from EU firms to developing countries is more profitable (though less productive) than FDI between EU countries.

The importance of mergers and acquisition (M&A) activity also has to be considered in this regard. Gugler et al. (2003) analyse the effects of M&A activity around the world for a 15- year period. They separate the effects of domestic and cross-border M&A on firms' profits and market shares and show that mergers on average do result in significant increases in profits, but reduce the sales of the merging firms. Differences between mergers in the manufacturing and the service sectors, and between domestic and cross-border mergers are also found to be minimal.

4.6 CONCLUSIONS AND POLICY IMPLICATIONS

Impacts and motivation for FDI policies. Investment in its various forms is generally acknowledged to be the main driver of economic growth, without ever giving rise to much controversy about its desirability. In contrast, due to its transnational character, FDI conducted by multinational enterprises demands additional attention. It is important to continue designing smart policies to encourage more and responsive FDI, while applying the principle of Policy Coherence for Development. On the one hand, economies aim to attract inward FDI, counting on its direct contribution to the job creation and productivity growth and anticipating of positive indirect effects through knowledge spillovers and user-supplier linkages. This applies in particular to greenfield investments, whereas M&As are sometimes viewed with reservations in the host country. On the other hand, outward FDI is often considered a sign of economic strength, e.g. by securing competitive assets or opening markets abroad. Again, the positive attitude towards internationalisation does not always predominate, for example when there is a fear that domestic jobs will be offshored to lower- cost locations.

This chapter has reviewed the literature and provided new empirical evidence on the trends, determinants and impacts of FDI. Overall, the evidence confirms the general view that FDI inflows into the EU have a direct and significant effect on economic growth and productivity growth in the host country. And the marginal contribution of foreign investment appears to be greater than the growth stimulus of an equivalent amount of domestic investment. Greenfield investment especially not only brings new capital, but often creates employment both directly in the affiliate and indirectly through supplier linkages to local firms.

The review of the home country effects of outward FDI also shows the effects on productivity in the home economy are predominantly positive. The evidence in the literature on the impact on employment is less clear. When employment substitution takes place, it is mostly to the detriment of low-skilled workers, but it is difficult to disentagle the impact of skill-biased technical

change from that of internationalisation. Researchers therefore agree that there is a substantial need for labour market policies which facilitate the process of adjustment towards a higher proportion of high-skilled employees.

In short, from a policy perspective the internationalisation of firms is a major driver of competitiveness, exerting positive impacts on growth, technological capabilities, labour productivity and wages and also the aggregate international performance of an economy.

The firm's decision to invest abroad. Two findings of the firm-level analysis of internationalisation are especially relevant. First, self-selection of firms into FDI seems to prevail over learning effects from internationalisation. Thus, the causality runs from superior performance to the FDI decision and then (possibly) to some growth effects from learning, while the observed performance premia are not the result of internationalisation. Consequently, inducing low-performing to engage in foreign activities does not turn them into high-performing firms. Second, aggregate performance (growth, competitiveness) is to a large extent driven by reallocation effects between well-performing and poorly performing firms. That is, aggregate competitiveness (productivity) increases because of an increase in the number of high-performing firms and not so much because of an increase in the productivity growth of these firms.

Both the evidence of self-selection of high-performing firms into FDI and the importance of reallocation effects for aggregate performance lead to the conclusion that the best policy measures to promote outward FDI are not subsidies and targeted support, but the promotion of a competitive business environment in general (Greenaway, 2004). This would ensure an intra-industry reallocation of resources from the worst-performing to the best-performing firms with the effect of increasing the MNE base of countries and increasing aggregate productivity, growth and wages. The policy question, thus, is not so much which firms to support, but what policy environment ensures reallocations and leads more firms to reach the threshold levels of performance indicators to self-select into internationalization.

It is also crucial to provide conditions which allow small firms and small MNEs to grow. The analysis has shown a strong relationship between firm size and multinational activity, both in terms of starting foreign operations and in terms of the number of affiliates. While the findings do not imply that firms need to be very large - and a lot of medium-sized firms actually undertake both intra-EU and extra-EU FDI - the firm size must reach critical levels to cover the fixed and variable costs of global operations. The growth of SMEs seems to be especially important in efforts to promote multi-country strategies of MNEs and FDI into dynamic emerging economies. The firm growth literature finds that US firms enjoy more dynamic growth than European firms and suggests that there are still sizeable barriers to firm growth in Europe which need to be identified properly (Scarpetta et al., 2002; Bartelsman et al., 2004; Bartelsman et al., 2005; and Navaretti et al., 2011).

From a policy perspective it will be important to ascertain why firms with similar size and performance characteristics to MNEs fail to self-select into FDI. Entry costs could vary across firms due to information asymmetries and uncertainties (Eaton et al., 2008; Todo, 2011). If the choice to not operate internationally via FDI is due to firms's different abilities to gather information about foreign markets, there is room for policy to set up an infrastructure to alleviate these factors of uncertainty. If the failure to embark on FDI activities or to broaden the country base of FDI activities is due to management failures within firms, any policy action in terms of subsidies 'will simply be a waste of resources' (Greenaway, 2004). Thus, policy should focus on curing market failures (information and knowledge problems, missing insurance markets, etc.), while any targeted support and promotion of particular firms with high internationalisation potential will always run into problems of ex-ante selection.

Determinants of FDI flows – how to attract FDI. The empirical evidence shows that factor cost advantages, the introduction of the euro and EU membership are driving forces behind FDI in the EU-27. Skills also play a positive role in attracting FDI in supporting the importance of improving education and training systems to develop higher levels and better quality skills in the workforce. While the effects of unit labour costs are larger in the EU-15 than in the EU-12, tax effects are larger and only significant in the latter group of countries.

Only for greenfield FDI do corporate taxes have a strong impact in both the EU-12 and EU-15 countries.

Furthermore, changes in employment protection and the cost of starting a business cannot explain the change in FDI activity over time but are significant at the cross-sectional level. Moreover, some determinants (e.g. ICT infrastructure, intellectual property rights and labour market protection) fail to have a significant impact on FDI activity when other effects are controlled for. All these determinants are only significant at the cross-sectional level.

Although the empirical analysis in this study indicates that in the EU-15 countries, differences in the corporate tax rate have little impact in attracting FDI to a country, these differences have generated much debate on corporate tax consolidation (see Bettendorf et al. 2010), tax competition (Genschel and Schwarz, 2011) and transfer pricing (Gresik, 2001).

Differences in tax rates can have negative impacts on productivity growth and in other areas of the European market. Transfer pricing may have negative consequences when multinational enterprises reduce their overall tax burden by moving earnings from subsidiaries in high-tax to low-tax countries through the prices they set on internal transactions (Gresik, 2001). Estimates of the mean semi-elasticity of FDI with respect to the tax rate provided in this chapter are higher for the EU-12 than the EU-15, suggesting that some profit shifting happens between Eastern and Western Europe. In the EU-12 greenfield FDI accounts for the majority of FDI, which is more sensitive to taxes than M&As, which account for the bulk of FDI in the EU-15. As a solution all EU Member States have in place transfer pricing rules following OECD arm's length principle. According to this principle transfer pricing for transactions within multinationals is considered arm's length, if it is within a range of market prices for comparable transactions. However, it may not be easy to identify the correct arm's length price for a transaction, as comparable market prices are not available for some transactions and it is difficult to monitor all transactions.[99]

A second solution would be to implement some kind of tax harmonisation, either partially through the tax base, or fully through both the tax rate and the tax base (Bettendorf et al., 2010). Harmonised tax systems also provide an attractive solution to the tax competition problem. Tax competition encourages a steady decline in the corporate tax rate when countries maintain relatively lower tax rates or offer tax incentives on a unilateral basis. This trend has the potential to create certain perverse incentives through greater differentials, especially if the corporate income tax rate is below the individual income tax rate (European Commission, 2011). However, the idea of tax harmonisation remains very controversial, mainly because Member States generally want to retain sovereignty over their tax systems.

Furthermore, greenfield FDI is much more sensitive to changes in host- and home country GDP than total FDI. Since distance may be related to transport costs, improving transportation infrastructure can help to increase greenfield FDI.

Finally, a sizable share of the slow growth of FDI stocks in some EU-15 countries can be attributed to rising unit labour costs. Hence, Member States should attempt to improve their cost competitiveness by ensuring that rates of real wage growth do not exceed the rate of labour productivity growth.

Policies to maximise the benefits of inward FDI. Multinational enterprises can be an important conduit of international technology transfer and spillovers. Linkages are relevant and the effects are sizable. Hence, fears that FDI may create an 'economic enclave' or 'cathedrals in the desert' are not justified. The size of spillovers and technology transfers is clearly shown to depend on firm-specific characteristics of local enterprises, especially their absorptive capacity.

Both technology transfer and knowledge spillovers are strongly dependent on how much multinationals are embedded in the host country, or the extent to which multinationals include local enterprises in their global production and innovation networks. Estimates based on CIS data suggest that local suppliers to multinational enterprises introduce new products more often than non-collaborators. This indicates that technology transferred to local firms may also lead to spillovers often associated with

[99] Barba Navaretti and Venables (2004).

competitive behaviour. An implication of these findings is that neither inward FDI nor spillovers should be targeted as policy variables, but instead industrial policy should focus on encouraging the formation of networks between local enterprises and multinational enterprises (see more about this in Chapter 5). Targeted incentives to promote the strengthening of linkages can be important but the use of such incentives should be compatible with the EU regulations on subsidies and countervailing measures.

Estimates based on firm-level data for the EU-12 suggest that labour productivity growth in local firms is significantly positively correlated with the extent of backward linkages from foreign-owned industries to local firms, but not with the presence of foreign-owned firms in the same industry. Estimates based on CIS data for the EU-12 also show that local firms with backward linkages from multinational enterprises have a significantly higher average employment growth rate (except for small firms). Furthermore, the magnitude of the employment effect through backward linkages increases with the absorptive capacity of local firms. These estimates confirm the need to introduce policies that facilitate the transfer of technology between local firms and multinationals and assist firms in building capabilities.

Investment promotion in practice. There is considerable controversy over what kind of investment promotion measures the EU and/or individual Member States should adopt. Many national and regional investment promotion agencies offer services to reduce transaction cost and information asymmetries for foreign firms. These can ease the burden of bureaucratic procedures and help to better assess the costs and opportunities in a particular business environment. Harding and Javorcik (2011) suggest that investment promotion does not work in countries where information asymmetries are relatively low and bureaucratic procedures less complex, but that it could work in less developed countries, including the EU-12 countries. The above statistical analysis reveals, however, that information asymmetries and other regulations did not discourage investors in the EU-12. Furthermore, the trend toward consistency of external relations and the internal market will likely further reduce these barriers over the next few years. In any case, policy can benefit from the mutual learning about good practices among the variety of approaches and agencies currently operating in the different Member States.

Free movement of capital is one of the four freedoms of the internal market which means that there should not be any barriers to or restrictions on capital movements within the European Union. While this policy is resolutely part of EU law, harmonisation of corporate taxation remains highly controversial.

Expanding the common commercial policy. The common commercial policy, enshrined in the Treaty of Rome in 1957, is central to the European Union's external relations. Article 206 of *the Treaty on the Functioning of the European Union* (Lisbon Treaty), which entered into force in 2009, requires external relations to be harmonised by progressive abolishing of restrictions on international trade and FDI, and the lowering customs and other barriers. The Lisbon Treaty expands the scope of the common commercial policy by providing the EU with exclusive competence to negotiate international agreements concerning FDI.

The EU pays particular attention to develop a common international investment policy: the Communication '*Towards a comprehensive European international investment policy*' COM(2010) 343 explores how the EU may develop an international investment policy that increases the EU's competitiveness and thus contribute to smart, sustainable and inclusive growth, as set out in the Europe 2020 Strategy.[100] In July 2010, the European Commission released another communication on establishing transitional arrangements for bilateral investment agreements between Member States and third countries (COM(2010)344). By improving investment protection and reducing the investor's risk of entering a foreign market these agreements reduce the costs of investments. Furthermore, from the host country perspective clear and enforceable rules add to their attractiveness as a destination for FDI.

On the one hand, the EU should ensure 'an open, properly and fairly regulated business environment' for investors throughout Europe. Article 173 *of the Treaty on the Functioning of the European Union*

[100] COM(2010) 2020.

specifies a number of objectives to ensure all necessary conditions for the competitiveness of the EU industry. As such FDI can play an important role in delivering these objectives, such as 'speeding up the adjustment of industry to structural changes and better exploitation of industrial potential of policies of innovation, research and technological development'. At the same time *Article 173* highlights the importance of a favourable business environment, a crucial factor for attracting foreign investors. More recently, on 3 July 2012, the European Parliament adopted a non-legislative resolution on *Attractiveness of investing in Europe (2011/2288(INI)*. The basic approach of the resolution is that Europe needs more investment from both EU and non-EU investors. It covers a range of recommendations, such as exploiting the EU's position, maximising cohesion policy, improving access to finance and education, combating tax evasion in order to provide better framework conditions for attracting FDI.

On the other hand the Communication COM(2010) 343 points out that 'the EU should ensure that EU investors abroad enjoy a level playing field'. The Communication on *'An Integrated Industrial Policy for the Globalisation Era'*[101] among others highlights the role of internationalisation of enterprises (especially that of SMEs) both within and outside the EU and the enterprises ability to 'access international markets and exploit global value chains'.

[101] COM(2010) 614.

REFERENCES

Acemoglu, D., Aghion, P. and Zilibotti, F. (2006), ´Distance to Frontier, Selection and Economic Growth´, *Journal of the European Economics Association*, 4(1), 37-74.

Alfaro, L., Chanda, A., Kalemli-Ozcan, S. and Sayek, S. (2004), ´FDI and economic growth: the role of local financial markets´, *Journal of International Economics*, 64(1), pp. 89-112.

Altomonte, C. and Pennings E. (2009), ´Domestic plant productivity and incremental spillovers from foreign direct investment´, *Journal of International Business Studies*, 40(7), pp. 1131–1148.

Azémar, C. and Desbordes, R. (2010) ´Short-run strategies for attracting foreign direct investment´, *The World Economy*, 33(7), pp. 928-957.

Barba Navaretti G. and Venables, A.J. (2004), *Multinational Firms in the World Economy*, *Princeton University Press*.

Barrios, S. and Strobl, E. (2002), ´Foreign Direct Investment and Productivity Spillovers: Evidence from the Spanish Experience", *Review of World Economics*, 138(3), pp. 459-481.

Barrios, S., Görg, H. and Strobl, E. (2011), ´Spillovers through backward linkages from multinationals: Measurement matters´, *European Economic Review*, 55(6), pp. 862-875.

Barro, R. (1991), ´Economic Growth in a Cross Section of Countries`, *The Quarterly Journal of Economics,* 106(2), 407-443.

Barry, F., Görg, H. and Strobl, E. (2004), ´Multinationals and training: some evidence from Irish manufacturing industries´, *Scottish Journal of Political Economy*, 51(1), pp. 49–61.

Bartelsman, E., Haltiwanger, J. and Scarpetta, S. (2004), ´Microeconomic Evidence of Creative Destruction in Industrial and Developing Countries´, *Tinbergen Institute Discussion Paper No 04-114/3.*

Bartelsman, E., Scarpetta, S., and Schivardi, F., (2005), ´Comparative Analysis of Firm Demographics and Survival: Evidence from Micro-Level Sources in OECD countries", *Industrial and Corporate Change*, 14(3), pp. 365-391.

Basile, R., Castellani, D. and Zanfei, A. (2008), ´Location choices of multinational firms in Europe: The role of EU cohesion policy´, *Journal of International Economics* 74(2), pp. 328-340.

Békés, G., Kleinert, J. and Toubal, F. (2009), ´Spillovers from multinationals to heterogeneous domestic firms: Evidence from Hungary´, *The World Economy*, 32(10), pp. 1408-1433.

Bellak, C. and Leibrecht, M. (2009), ´Do low corporate income tax rates attract FDI? - Evidence from Central- and East European countries´, *Applied Economics*, 41(21), pp. 2691-2703.

Bellak, C. and Leibrecht, M. (2011), ´Does the Impact of Employment Protection Legislation on Foreign Direct Investment Differ by the Skill Intensity of Industries? An Empirical Note´, *The World Economy*, 34(10), pp. 1726-1744.

Bellak, C., Leibrecht, M. and Damijan, J.P. (2009), ´Infrastructure Endowment and Corporate Income Taxes as Determinants of Foreign Direct Investment in Central and Eastern European Countries´, *The World Economy*, 32(2), pp. 267–290.

Bellak, C., Leibrecht, M. and Roemisch, R. (2007), ´On the appropriate measure of tax burden on foreign direct investment to the CEECs´, *Applied Economics Letters*, 14(8), pp. 603-606.

Bénassy-Quéré, A., Gobalraja, N., and Trannoy, A. (2007), ´Tax and public input competition´, *Economic Policy,* 22(50), pp. 385–430.

Bertschek, I., (1995), ´Product and Process Innovation as a Response to Increasing Imports and Foreign Direct Investment´, *The Journal of Industrial Economics*, 43(4), pp. 341–357.

Bettendorf, L., Devereux, M.P., Van Der Horst, A., Loretz, S. and De Mooij, R.A. (2010), ´Corporate tax harmonization in the EU´, *Economic Policy*, 25(63), pp. 537-590.

Bevan, A., and Estrin, S. (2004), ´The determinants of foreign direct investment into European transition economies´, *Journal of Comparative Economics*, 32(4), pp. 775-787.

Blind, K. and Jungmittag, A. (2004), ´Foreign Direct Investment, Imports and Innovations in the Service Industry´, *Review of Industrial Organization*, 25(2), pp. 205-227.

Blinder, A.S. (2006), ´Offshoring: the next industrial revolution?´, *Foreign Affairs*, 85(2), pp. 113-128.

Blomström, M. and Kokko, A. (1998), ´Multinational Corporations and Spillovers´, *Journal of Economic Survey*s, 12(3), pp. 247–277.

Blonigen, B.A., and Piger, J., (2011), ´Determinants of Foreign Direct Investment´, *NBER Working Papers* No 16704.

Borensztein, E., De Gregorio, J. and Lee, J-W. (1998), ´How does foreign direct investment affect economic growth?´, *Journal of International Economics*, 45(1), pp. 115-135.

Boudier-Bensebaa, F. (2008), ´FDI-Assisted Development in the Light of the Investment Development Path Paradigm: Evidence from Central and Eastern European Countries´, *Transnational Corporations*, 17(1), pp. 37-63.

Brouwer, J., Paap, R. and Vianne, J.-M. (2008), ´The trade and FDI effects of EMU enlargement´, *Journal of Money and Finance*, 27(2), pp. 188- 208.

Bruno, R.L. and Cipolla, C.M. (2012), *A meta-analysis on the direct and indirect impacts of FDI on performance in the EU member states*, Birmingham Business School, mimeo.

Buckley, P.J. and Casson, M. (2009), ´The internalisation theory of the multinational enterprise: a review of the progress of a research agenda after 30 years´, *Journal of International Business Studies*, 40(9), pp. 1563-1580.

Buettner, T. and Wamser, G. (2009), ´Internal Debt and Multinationals' Profit Shifting - Empirical Evidence from Firm-Level Panel Data´, *Oxford University Centre for Business Taxation Working Papers* No 0918.

Cernat, L. and Parplies, K. (2010), ´Chinese foreign direct investment: What's happening behind the headlines´, *voxEU policy brief*, 16 July 2010.

Chaisse, J. (2012), ´Promises and Pitfalls of the European Union Policy on Foreign Investment — How will the new EU competence on FDI affect the emerging global regime? ´, *Journal of International Economic Law*, 15(1), pp. 51-84.

Cieślik, A. (2005a), ´Location of Foreign Firms and National Border Effects: The Case of Poland´, *Journal of Economic & Social Geography*, 96(3), pp. 287–297.

Cieślik, A. (2005b), ´Regional Characteristics and the Location of Foreign Firms within Poland´, *Applied Economics*, 37(8), pp. 863–874

Clegg, J. and Green, S.S. (1999), ´The Determinants of New FDI Capital Flows into the. EC: Statistical Comparison of USA and Japan´, *Journal of Common Market Studies*, 37(4), pp. 597-616

Clerides, S.K., Lach, S. and Tybout, J.R. (1998), ´Is learning by exporting important? Micro-dynamic evidence from Colombia, Mexico, and Morocco´, *Quarterly Journal of Economics*, 113(2), pp. 903-947.

Conconi, Sapir and Zanardi (2010): The internationalization process of firms : From exports to FDI?," *Working Paper Research 198*, National Bank of Belgium.

Coeurdacier, N., De Santis, R.A. and Aviat, A.(2009), ´Cross-Border Mergers and Acquisitions and European Integration´, *Economic Policy*, 24(57), pp. 55-106.

Cohen, W.M., and Levinthal, D.A. (1989), ´Innovation and Learning: The Two Faces of R&D´, *Economic Journal*, 99(397), pp. 569-596.

Cohen, W.M., and Levinthal, D.A. (1990), ´Absorptive capacity: A new perspective on learning and innovation´, *Administrative Science*, 35(1), pp. 128-152.

Copenhagen Economics (2010), Impacts of EU outward FDI, Report for Directorate General for Trade of the European Commission.

Crespo, N. and Fontoura M.P. (2007), ´Determinant factors of FDI spillovers - What do we really know? ´ *World Development*, 35 (3), pp. 410-425.

Criscuolo, Ch. (2005), ´Foreign Affiliates in OECD Economies: Presence, Performance and Contribution to Host Countries' Growth´, *OECD Economic Studies,* 41(2), pp. 109-139.

Criscuolo, Ch. and Martin, R. (2009), ´Multinationals and U.S. Productivity Leadership: Evidence from Great Britain´, *Review of Economics and Statistics*, 91(2), pp. 263-281.

Crozet, M., Mayer, T. and Mucchielli, J.L. (2004), ´How do firms agglomerate? A study of FDI in France´, *Regional Science & Urban Economics,* 34(1), pp. 27–54.

De Mooij, R.A. and Ederveen, S. (2003), ´Taxation and foreign direct investment: a synthesis of empirical research´, *International Tax and Public Finance,* 10(6), pp. 673–693.

de Sousa, J. and Lochard, J. (2011), ´Does the Single Currency Affect Foreign Direct Investment?´, *The Scandinavian Journal of Economics,* 113(3), pp. 553–578.

Dewit, G., Görg, H. and Montagna, C. (2009), ´Should I stay or should I go? Foreign direct investment, employment protection and domestic anchorage´, *Review of World Economics*, 145(1), pp. 93–110.

Driffield, N. and Love, J.H. (2007), ´Linking FDI Motivation and Host Economy Productivity Effects: Conceptual and Empirical Analysis´, *Journal of International Business Studies*, 38(2), pp. 460-473.

Driffield, N. and Temouri, Y. (2012), ´Effects of Outward Foreign Direct Investment on EU industry´, in Falk, M. et al., (2012).

Driffield, N. and Yong, Y. (2012), ´Multinationality-Performance Relationship: A Meta-Analysis´, *Management International Review*, 52(1), pp. 23-47.

Driffield, N., Love, J.H. and Taylor, K. (2009), ´Productivity and Labour Demand Effects of Inward and Outward Foreign Direct Investment on UK Industry´, *Manchester School*, 77(2), pp. 171-203.

Dunning, J.H. (1977), ´Trade, Location of Economic Activity and the MNE: A search for an eclectic approach´, in Ohlin, B., Hesselborn, P.O., and Wijkman, P.M. (eds.), *The international allocation of economic activity, London*, Macmillan, pp. 395-418.

Dunning, J.H., (1981), ´Explaining the international direct investment position of countries: towards a dynamic or developmental approach´, *Weltwirtschaftliches Archiv*, 119(1), pp. 30-64.

Dunning, J.H., (1986), ´The investment development cycle revisited´, *Weltwirtschaftliches Archiv*, 122(4), pp. 667-677.

Dunning, J.H., (1993), *Multinational Enterprises and the Global Economy*, Wokingham, Addison Wesley.

Dunning, J.H. and Lundan, S.M. (2009), ´The Internationalization of Corporate R&D: A Review of the Evidence and Some Policy Implications for Home Countries´, *Review of Policy Research*, 26(1-2), pp.13-33.

Eaton, J., Kortum, S. and Kramarz, F. (2008), ´An Anatomy of International Trade: Evidence from French Firms´, *NBER Working Paper* N°13531.

Egger, P. (2001), ´European exports and outward foreign direct investment: A dynamic panel data approach´, *Review of World Economics*, 137(3), pp. 427-449.

Egger, P. and Merlo, V. (2007), ´The Impact of Bilateral Investment Treaties on FDI Dynamics´, *The World Economy*, 30(10), pp. 1536–1549.

European Commission (2005), The EU Economy 2005 Review, Rising international economic integration. Opportunities and challenges, European Commission, Brussels

European Commission (2010) 343, 'Towards a comprehensive European international investment policy', European Union, Brussels

European Commission (2010) 344, ´Proposal for establishing transitional arrangements for bilateral investment agreements between Member States and third countries`, European Union, Brussels

European Commission (2010) 2020, ´Europe 2020, A strategy for smart, sustainable and inclusive growth´ European Union, Brussels

European Commission (2011), Taxation Trends in the European Union, 2011 Edition, European Union, Brussels.

European Commission (2012), ´Internationalisation of business investments R&D and analysis of their economic impact´, http://ec.europa.eu/research/innovation-union/pdf/internationalisation_business-rd_final-report.pdf

European Parlaiment (2012), ´Draft Report on the attractiveness of investing in Europe´ (2011/2288(INI)), European Union, Brussels

Ernst&Young (2012): Growth, actually, European Attractiveness Survey http://www.ey.com/Publication/vwLUAssets/Attractiveness_2012_europe/$FILE/Attractiveness_2012_europe.pdf, accessed on 20.06.2012

Falk, M., Falk, R., Wolfmayr, Y. (coord.), Bruno, R., Driffield, N., Hunya, G., Knell, M., Kowalewski, O., Napiórkowski, T., Radlo, M., Stöllinger, R., Temouri, Y. and Weresa, M. (2012), *FDI flows and impacts on the competitiveness of the EU industry, Background Report to the European Competitiveness Report*, carried out under the Framework Service Contract No ENTR/2009/033, European Commission.

Feld, L. and Heckemeyer, J.H. (2011) ´FDI and Taxation: A Meta-Study´, *Journal of Economic Surveys,* 25(2), pp. 233-272.

Ferencikova, S. sr., and Ferencikova, S. jr. (2012), ´The Outward Investment Flows and Development Path: The case of Slovakia´, *East European Economics*, 50(2).

Filippov, S. and Costa, I. (2007), ´Redefining foreign direct investment policy: a two dimensional framework´, *UNU-MERIT Working Paper Series* No 029.

Genschel, P. and Schwarz, P. (2011), ´Tax competition: a literature review´, *Socio-Economic Review*, 9(2), pp. 339-370.

Girma, S. (2005), ´Technology transfer from acquisition FDI and the absorptive capacity of domestic firms: an empirical investigation´, *Open Economies Review* 16(2), pp. 175–187.

Girma, S., Kneller, R. and Pisu, M. (2007), ´Do Exporters Have Anything to Learn from Foreign Multinationals?´, *European Economic Review*, 51(4), pp. 981–998.

Görg, H. and Greenaway, D. (2004), ´Much Ado About Nothing? Do Domestic Firms Really Benefit from Foreign Investment?´, *World Bank Research Observer*, 19(2), pp. 171-197.

Görg, H. and Strobl, E. (2001), ´Multinational Companies and Productivity Spillovers: A Meta-Analysis´, *Economic Journal*, 111(475), pp. 723-739.

Gorodnichenko, Y., Svejnar, J. and Terrell, K. (2010), ´ Globalization and Innovation in Emerging Markets´, *American Economic Journal: Macroeconomics,* 2(2), pp. 194–226

Gorynia, M., Nowak, J. and Wolniak, R. (2010), ´Investment Development Paths of Central European Countries: A Comparative Analysis´, A*rgumenta Oeconomica*, 1(24), pp. 65-87.

Greenaway, D. (2004), ´The assessment: Firm-level adjustment to globalization´, *Oxford Review of Economic Policy*, 20(3), pp. 335-341.

Gresik, T.A. (2001), ´The taxing task of taxing transnationals´, *Journal of Economic Literature*, 39(3), pp. 800-839.

Griffith, R., Redding, S. and Simpson, H. (2002), ´Productivity Convergence and Foreign Ownership at the Establishment Level´, *CEPR Discussion Paper* No 3765.

Griffith, R., Redding, S. and Simpson, H. (2004), ´Foreign Ownership and Productivity: New Evidence from the Service Sector and the R&D Lab´, *Oxford Review of Economic Policy*, 20(3), pp. 440-456.

Hajkova, D., Nicoletti, G., Vartia, L. and Yoo, K.-Y. (2006), ´Taxation, business environment and FDI location in OECD countries´, *Economics Department Working Papers* No 502.

Hallward-Driemeier, M. (2003), ´Do bilateral investment treaties attract FDI? Only a bit and they could bite´, Working paper No 3121, *The World Bank*, Washington, DC.

Halpern, L. and Muraközy, B. (2007), ´Does distance matter in spillover?´, *Economics of Transition*, 15(4), pp. 781-805.

Hansson, Å.M. and Olofsdotter, K. (2012), ´FDI, taxes and agglomeration economies in the EU15´, *Applied Economics*, 45(18), pp. 2653-2664

Harding, T. and Javorcik, B.S. (2011), Roll out the red carpet and they will come: investment promotion and FDI inflows´, *The Economics Journal*, 121(557), pp. 1445 – 1476.

Head, K. and Mayer, T. (2004), ´Market Potential and the Location of Japanese Investment in the European Union´, *Review of Economics and Statistics*, 86(4), pp. 959–972

Helpman, E., Melitz, M. and Yeaple, S. (2004), ´Export versus FDI with Heterogenous Firms´, *American Economic Review*, 94(1), pp. 300-316.

Hilber, C.A.L. and Voicu, I. (2010), ´Agglomeration Economies and the Location of Foreign Direct Investment: Empirical Evidence from Romania´, *Regional Studies*, 44(3), pp. 355-371.

Hunya, G. and Stöllinger, R. (2009), ´Foreign Direct Investment Flows between the EU and the BRICs´, *wiiw Research Report No 358*.

Ivarsson, I. and Alvstam, C.G. (2005), ´Technology transfer from TNCs to local suppliers in developing countries: A study of AB Volvo's truck and bus plants in Brazil, China, India, and Mexico´, *World Development*, 33(8), pp. 1325-1344.

Knell, M. and Rojec, M. (2011), Why Is There Little Evidence of Knowledge Spillovers From Foreign Direct Investment?, 9th Globelics Conference in Buenos Aires.

Kokko, A. (1992), Foreign Direct investment, host country characteristics and spillovers, Ph.D Thesis, Stockholm School of Economics.

Lafourcade, M. and Paluzie, E. (2011), ´European integration, foreign direct investment (FDI), and the geography of French trade´, *Regional Studies*, 45(4), pp. 419- 439.

Markusen, J.R. (2002), Multinational firms and the theory of international trade, Cambridge, MA, *MIT Press.*

Markusen, J.R. and Venables, A.J. (1999), ´Foreign direct investment as a catalyst for industrial development´, *European Economic Review*, 43(2), pp. 335-356.

Martins, P.S. (2011), ´Paying More to Hire the Best? Foreign Firms, Wages, and Worker. Mobility´, *Economic Inquiry*, 49(2), pp. 349-363.

Ministry of Commerce of China, (2011), *2010 Statistical Bulletin of China's Outward Foreign Direct Investment*, Beijing.

Molnar, M., Pain, N. and Taglioni, D. (2007), ´The internationalization of production, international outsourcing and employment in the OECD´, *OECD Economic Study*, 44(561).

Navaretti, B.G., Bugamelli, M., Schivardi, F., Altomonte, C., Horgos, D. and Maggioni, D. (2011), *The Global Operations of European Firms*, Bruegel Blueprint 12, Bruegel.

Nicoletti, G., Golub, S., Hajkova, D., Mirza, D. and Yoo K.-Y. (2003), ´Policies and International Integration: Influences on Trade and Foreign Direct Investment´, *OECD Economics Department Working Papers* No 359, OECD Publishing.

Niosi, J. (1999), ´The internationalization of industrial R&D: from technology transfer to the learning organization´, *Research Policy*, 28(2-3), pp. 107-117.

Noorbakhsh, F. and Paloni, A. (2001), ´Human Capital and FDI Inflows to Developing Countries: New Empirical Evidence´, *World Development*, 29(9), pp. 1593-1610.

OECD (1996), OECD Benchmark Definition of Foreign Direct Investment, Third edition

OECD, (2003), Attracting International Investment for Development, Global Forum on International Investment, Paris.

OECD (2010), ´The Arm's Length Principle, in OECD, OECD Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations 2010, OECD Publishing.

Pain, N. (1997), ´Continental drift: European integration and the location of UK foreign direct investment´, *The Manchester School Conference Supplement*, 65, pp. 94-117.

Pearce, R.D. (1999), ´Decentralised R&D and strategic competitiveness: globalised approaches to generation and use of technology in multinational enterprises (MNEs) ´, *Research Policy*, 28(2-3), pp. 157-178.

Pesola, H. (2011), ´Labour Mobility and Returns to Experience in Foreign Firms´, *The Scandinavian Journal of Economics*, 113(3), pp. 637-664.

Petroulas, P. (2007), ´The effect of the euro on foreign direct investment´, *European Economic Review*, 51(6), pp. 1468-1491

Procher, V. (2011), ´Agglomeration effects and the location of FDI: evidence from French first-time movers´, *Annals of Regional Science*, 46(2), pp. 295–312

Pusterla, F. and Resmini, L. (2007), ´Where do foreign firms locate in transition countries? An empirical investigation", *Annals of Regional Science,* 41(4), pp. 835–856

Radło, M-J., (2012), ´Emerging Multinationals and Outward FDI Development: Case of Poland´, *East European Economics*, 50(2).

Radło, M-J. and Sass, M. (2012), ´Outward Foreign Direct Investments and Emerging Multinationals from Central and Eastern Europe: Case of Visegrad Countries´, *East European Economics*, 50(2).

Rodriguez-Clare, A. (1996), ´Multinationals, Linkages and Economic Development´, *American Economic Review*, 86(4), pp. 852-873.

Sabirianova, K., Svejnar, J. and Terrell, K. (2009), ´Distance to the Efficiency Frontier and Foreign Direct Investment Spillovers´, *Journal of the European Economic Association*, 3(2/3).

Sass, M., Éltető, A. and Antalóczy, K. (2012), ´Emerging multinationals and the role of virtual indirect investors: the case of Hungary´, *East European Economics*, 50(2).

Sauvant, K.P. (2005), ´New Sources of FDI: The BRICs. Outward FDI from Brazil, Russia, India and China´, *Journal of World Investment & Trade*, 6(5), pp. 639–709.

Scarpetta, S., Hemmings, P., Tressel, T. and Woo, J. (2002), ´The Role of policy and institutions for productivity and firm dynamics: Evidence from Micro and Industry Data´, *OECD Working Papers* No 329.

Svetlicic, M. and Jaklic, A. (2006), Outward FDI from new European Union Member States, manuscript, Faculty of Social Sciences, University of Ljubljana.

Thomas, K.P., (2000), Competing for Capital: Europe and North America in a Global Era, Washington, Georgetown University Press.

Todo, Y., (2011), ´Quantitative evaluation of the determinants of export and FDI: Firm-level Evidence from Japan´, *The World Economy*, 34(3), pp. 355-381.

UNCTAD, (1998), World Investment Report, trends and determinants, Geneva, United Nations.

UNCTAD, (1999), World Investment Report, Foreign Direct Investment and the Challenge of Development, Geneva, United Nations.

UNCTAD, (2001), World Investment Report, Promoting Linkages, Geneva, United Nations.

UNCTAD (2009), World Investment Prospect Survey 2009 –2011, Geneva, United Nations.

UNCTAD (2011), World Investment Report, Non-equity modes of international production and development, Geneva, United Nations.

Vahter, P. (2011), ´Does FDI Spur Productivity, Knowledge Sourcing and Innovation by Incumbent Firms? Evidence from Manufacturing Industry in Estonia´, The *World Economy*, 34(8), pp. 1308–1326.

Wolff, G.B. (2007), ´Foreign direct investment in the enlarged EU: do taxes matter and to what extent? ´, *Open Economies Review,* 18(3), pp. 327–346.

World Bank, (2009), Global investment promotion benchmarking, summary report, The World Bank Group, Washington D.C.

Zemplinerová, A. (2012), ´Czech OFDI: Investment Strategies and Motivation to Invest Abroad´, *East European Economics*, 50(2).

APPENDIX

Table A.1: Panel data estimates of the determinants of bilateral FDI stocks in the EU-27 countries

	Fixed effects estimates				HT-estimates			HT-estimates			HT-estimates		
	coef		t	t clust adj. a)	coef		T	coef		t	coef		T
host ln GDP in EUR host country, t-1	0.83	***	6.67	2.77	1.00	***	15.10	1.01	***	15.19	1.05	***	13.69
parent ln GDP in EUR parent country, t-1	0.85	***	11.03	5.35	0.81	***	11.35	0.80	***	11.08	0.80	***	11.23
host effective average corporate tax rate t-1	-1.80	***	-4.42	-1.61	-1.56	***	-4.03				-1.52	***	-3.96
host statutory corporate tax rate, t-1								-0.64	*	-1.85			
parent statutory corporate tax rate, t-1								-0.41	**	-0.94			
host unit labour costs, t-1	-0.83	***	-2.74	-1.55	-1.02	***	-3.73	-1.05	***	-3.80	-0.91	***	-3.30
parent ln tertiary graduates share, t-1	0.56	***	3.81	2.49	0.59	***	4.12	0.55	***	3.79	0.65	***	4.56
parent ln R&D/GDP ratio, t-1	0.50	***	4.22	1.93	0.49	***	4.26	0.50	***	4.31	0.45	***	3.91
ln distance					-1.64	***	-18.93	-1.63	***	-19.0	-1.65	***	-19.4
common language					0.85	**	2.51	0.83	**	2.49	0.78	**	2.31
former colony					1.25	***	3.27	1.27	***	3.34	1.28	***	3.39
contiguity					-0.88	***	-2.68	-0.90	***	-2.77	-0.93	***	-2.88
year 2001 (base year 2000)	-0.17	***	-3.07	-2.96	-0.17	***	-3.22	-0.15	***	-2.81	-0.17	***	-3.19
year 2002	-0.11	**	-2.01	-1.45	-0.13	**	-2.38	-0.11	**	-2.08	-0.13	**	-2.47
year 2003	-0.06		-0.97	-0.68	-0.07		-1.37	-0.06		-1.10	-0.08		-1.58
year 2004	0.07		1.08	0.75	0.05		0.91	0.06		1.03	0.05		0.97
year 2005	0.06		0.93	0.65	0.04		0.69	0.06		0.92	0.06		1.08
year 2006	0.08		1.15	0.78	0.06		0.93	0.09		1.31	0.07		1.08
year 2007	0.10		1.26	0.67	0.07		0.96	0.10		1.33	0.07		1.08
year 2008	0.00		0.03	0.02	-0.03		-0.41	0.00		0.06	-0.01		-0.18
year 2009	0.00		0.04	0.02	-0.03		-0.33	0.01		0.16	-0.04		-0.43
year 2010	0.12		1.33	0.69	0.10		1.21	0.13		1.43	0.11		1.25
year 2004*EU-12	0.08		0.95	1.14	0.07		0.87	0.10		1.23			
year 2005*EU-12	0.17	**	2.09	1.97	0.16	**	2.00	0.19	**	2.47			
year 2006*EU-12	0.14	*	1.79	1.69	0.12		1.58	0.15	*	1.94			
year 2007*EU-12	0.27	***	3.50	2.51	0.24	***	3.35	0.27	***	3.75			
year 2008*EU-12	0.32	***	4.11	2.68	0.29	***	3.91	0.31	***	4.23			
year 2009*EU-12	0.25	***	2.93	1.79	0.20	***	2.58	0.22	***	2.77			
year 2010*EU-12	0.39	***	3.96	2.23	0.35	***	3.77	0.38	***	4.06			
year 2007*(dBG | dRO)											0.65	***	4.59
year 2008*(dBG | dRO)											0.63	***	4.43
year 2009*(dBG | dRO)											0.47	**	2.35
year 2010*(dBG | dRO)											0.75	***	3.72
year 2007*newEURO											0.19		0.83
year 2008*newEURO											-0.04		-0.23
year 2009*newEURO											0.19		1.38
year 2010*newEURO											0.31	*	1.93
constant	-34.5	***	-9.26	-3.91	-25.3	***	-11.2	-25.5	***	-11.2	-26.1	***	-10.9
host country effects (p-value)	0.00				0.00			0.00			0.00		
home country effects (p-value)	0.00				0.00			0.00			0.00		
R^2 within	0.34				0.68			0.67			0.67		
number of observations	5116				5116			5116			5116		
number of country-pairs	626				626			626			626		

Note: The dependent variable is the log of bilateral inward FDI stock held by EU country i from country j; a)t-values are based on cluster-adjusted standard errors accounting for common host country effects. ***, ** and * denote statistical significance at 1 percent, 5 percent and 10 percent levels, respectively. The within transformation is used to wipe out country-pair fixed effects. In the HT-estimator all time varying variables except time dummies and their interaction terms are assumed to be endogenous. The sample includes 26 home countries: Australia, Austria, Belgium, Brazil, Canada, China, Denmark, Finland, France, Germany, Hong Kong, India, Ireland, Italy, Japan, Luxembourg, the Netherlands, Norway, Portugal, Russia, South Korea, Spain, Sweden, Switzerland, the United Kingdom and the United States. The host countries are the EU-27 countries.

Source: European Commission, World Bank, OECD, Eurostat Eurobase.

The empirical specification is based on a standard gravity equation augmented by several host and home country factors:

$$\ln(FDI)_{ijt} = \beta_0 \ln GDPHOME_{it-1} + \beta_1 \ln GDPHOST_{jt-1} + \beta_2 \ln DIST_{ij} + \beta_3 CORPTAXHOME_{it-1} +$$
$$+ \beta_4 CORPTAXHOST_{jt-1} + \beta_5 ULCHOME_{it-1} + \beta_6 ULCHOST_{jt-1} + \beta_7 \ln TERTIARYHOME_{it-1} +$$
$$\beta_8 TERTIARYHOST_{jt-1} + \beta_9 \ln RELGDPCAP_{ijt-1} + \beta_{10} EURO_{ijt} \cdot NEWEURO_{ijt}$$
$$+ \beta_{11} EU_{ijt} \cdot EUNEW_{ijt} + \phi X_{ijt-1} + \theta Z_{ij} + \delta Y_{ij} + \alpha_{ij} + \lambda_t + \varepsilon_{ijt} \quad ,$$

where i is the home country and j is the host country and Ln is the natural logarithm. The variables are defined as follows:

FDI_{ijt} is the inward FDI stock (book value of foreign assets) in current million EURO held by a EU country j from parent country i in a given year (or alternatively FDI_{ijt} plus EUR 1); in addition Greenfield FDI flows from country i to country j is used;

$GDPHOME_{it-1}$, $GDPHOME_{tj-1}$ are home and host country GDP in current EUR;

$DIST_{ij}$ is the distance between capital cities of the investing and host country;

$CORPTAXHOME_{it-1}$, $CORPTAXHOST_{jt-1}$ are the effective average tax rate for the nonfinancial sector of the home and host country respectively;

$ULCHOME_{jt-1}$, $ULCHOST_{jt-1}$ are unit labour costs of the home and host country respectively;

$TERTIARYHOME_{it-1}$, $TERTIARYHOST_{jt-1}$, are the share of labour force aged 15 to 74 with tertiary education (levels 5 and 6) of the home and host country respectively;

$RELGDPCAP_{ijt} = \left| \frac{GDPHOSTpp_{jt}}{POP_{jt}} - \frac{GDPHOMEpp_{it}}{POP_{jt}} \right|$ is the absolute value of the difference in GDP per capita in purchasing power parities between the source and the host country respectively;

$EURO_{ijt} \cdot NEWEURO_{ijt}$ is a time-varying dummy variable which takes the value of one if the parent country belongs to the Euro area, $EURO_{ijt}$, and the host country introduced the EURO, $\cdot NEWEURO_{ijt}$ (Slovenia in 2007, Cyprus and Malta 2008 and Slovakia starting from 2009) and zero otherwise respectively;

$EU_{ijt} \cdot EUNEW_{ijt}$ takes the value one if the parent country is a EU member state, EU_{ijt} and the host country is joining the EU, $EUNEW_{ijt}$ (2004 for EU-10 countries and 2007 for Bulgaria and Romania) respectively;

X_{ijt-1} represents a set of time varying host and parent country factor variables (i.e., R&D/GDP ratio, FDI regulatory restrictiveness index, strength of legal rights index for getting credits, strength of investor protection index, cost of starting a business as a percentage of income per capita, employment protection legislation; top marginal tax rate, protection of intellectual property, hiring and firing practices, labor force share with wages set by centralized collective bargaining, fixed broadband internet subscribers, internet users per 100 people, total tax rate of businesses in percent of commercial profits);

Z_{ij} represents time invariant control variables (i.e. contiguity, sharing the same language and when they share a (former) colonial link);

t are time dummies (TD); λ_t are time effects; α_{ij} are country-pair specific effects and ε_{ijt} is the error term.

The gravity equation contains bilateral country-pair fixed effects, α_{ij} to control for unobserved time-invariant heterogeneity includes common time effects, λ_t. In addition, a large number of policy factors of the home and host country are included.

Table A.2.: Means and correlations coefficients between the ratio of the FDI stock to (home and host country) GDP and the explanatory variables

	means unweighted		correlation with the ratio of inward FDI stock to host country GDP		
host country factors:	2000	2010	coef.	p-value	# of observations
adjusted top statutory tax rate on corporate income in %	31.9	23.3	-0.01	0.46	6228
effective average corporate tax rate in %	27.5	21.8	-0.02	0.12	6228
bilateral effective average corporate tax rate (host) in %	31.3	25.2	-0.13	0.00	3238
total tax rate (% of commercial profits)	50.3	45.4	-0.10	0.00	2909
top marginal tax rate in %	55.4	50.3	-0.04	0.00	5648
unit labour costs (ratio)	0.54	0.72	-0.01	0.33	5845
hourly wage compensation in EUR	13.8	18.8	0.08	0.00	6204
tertiary graduates share in %	16.5	22.0	0.08	0.00	6228
R&D/GDP ratio in %	1.2	1.6	0.02	0.07	6083
fixed broadband internet subscribers (per 100 people)	0.8	24.2	0.10	0.00	5947
internet users per 100 people	19.6	69.7	0.10	0.00	6228
strength of investor protection index (0-10) (10=highest investor protection)	5.5	5.6	0.04	0.03	2909
protection of intellectual property (0-10) (10=highest protection)	6.6	6.9	0.09	0.00	5624
getting credit - strength of legal rights index (0-10) (10=best)	6.7	7.0	0.05	0.00	4032
FDI regulatory restrictiveness index (0-1) (0=open; 1=closed)	0.07	0.05	-0.09	0.00	5516
cost of starting a Business (% of income per capita)	11.4	5.6	-0.06	0.00	4564
hiring and firing practices (1-10) (1=least regulated, 10=most regulated)	3.6	4.1	0.04	0.01	5604
employment protection legislation, (0-6) (0= least and 6 most restrictive	2.13	2.09	-0.07	0.00	3477
labour force share with wages set by centralized collective bargaining (1-10) (=1 highly centralized, 10=least centralized, i.e. best)	5.7	5.7	0.00	0.79	5604
GDP per capita in int. $ US ppp	23025	26711	0.20	0.00	6228
distance in kilometres	3969.3		-0.23	0.00	0.00
former colony	7.0		0.20	0.00	0.00
common language	7.1		0.26	0.00	0.04
contiguity	3.6		0.27	0.00	0.00
			correlation with the ratio of outward FDI stock to home country GDP		
home country factors:	2000	2010	correlation	p-value	# of observations
adjusted top statutory tax rate on corporate income in %	34.3	28.2	-0.01	0.28	6237
effective average corporate tax rate in %	n.a.	n.a.			
bilateral effective average corporate tax rate (host) in %	31.3	25.2	-0.01	0.48	3238
total tax rate (% of commercial profits)	51.1	46.5	-0.19	0.00	3081
top marginal tax rate in %	52.5	49.1	-0.03	0.02	5511
unit labour costs (ratio)	0.59	0.72	-0.11	0.00	4864
hourly wage compensation in EUR	19.2	24.4	0.09	0.00	6206
tertiary graduates share in %	20.6	26.6	-0.01	0.35	6237
R&D/GDP ratio in %	1.8	2.4	-0.03	0.01	5974
fixed broadband internet subscribers (per 100 people)	1.7	26.2	0.05	0.00	6137
internet users per 100 people	27.6	71.3	0.08	0.00	6172
strength of investor protection index (0-10) (10=highest investor protection)	5.9	6.0	0.04	0.05	2907
protection of intellectual property (0-10) (10=highest protection)	7.2	7.5	0.06	0.00	5676
getting credit - strength of legal rights index (0-10) (10=best)	6.6	6.9	0.00	0.79	4268
FDI regulatory restrictiveness index (0-1) (0=open; 1=closed)	0.15	0.10	-0.12	0.00	6237
cost of starting a Business (% of income per capita)	9.9	6.5	-0.03	0.07	4809
hiring and firing practices (1-10) (1=least regulated, 10=most regulated)	3.8	4.5	-0.04	0.00	5676
employment protection legislation, (0-6) (0= least and 6 most restrictive	1.88	1.96	0.07	0.00	4068
labour force share with wages set by centralized collective bargaining (1-10) (=1 highly centralized, 10=least centralized, i.e. best)	5.4	5.7	-0.04	0.00	5676
GDP per capita in int. $ US ppp	27638	31103	0.29	0.00	6237
distance in kilometres					
former colony					
common language					
contiguity					

Note: Data refer to unweighted means for the year 2000 and 2010 or the latest available year. In some cases data refer to 2003 and 2004.

Source: European Commission, World Bank, OECD, Eurostat Eurobase.

Table A.3: Pseudo Poisson maximum likelihood (PPML) estimates of the determinants of bilateral greenfield FDI flows in the EU-27 countries (marginal effects)

	Host countries: EU-27, home countries: 26 OECD and BRICs								
	(i)			(ii)			(iii)		
	marg eff		t	marg eff		t	marg eff		t
host ln GDP in EUR host country, t-1	5.53	***	3.21	3.36		1.25	5.11	**	2.03
parent ln GDP in EUR parent country, t-1	2.96	***	3.06	3.17	***	3.17	3.13	***	3.14
host effective average corporate tax rate, t-1	-11.98	***	-2.93	-10.90	***	-2.58	-12.70	***	-3.16
host ln hourly wages costs, t-1	-6.05	***	-2.76	-6.17	***	-2.58	-7.18	***	-2.99
host ln share of tertiary education, t-1	2.32		1.53						
parent ln share of tertiary education, t-1	2.68	*	1.87						
parent ln R&D/GDP ratio, t-1	3.98	***	3.44						
GDP per capita dissimilarity, t-1	3.90	***	4.66						
new EMU members 2007, 2008, 2009							1.76	**	2.31
new EU members 2007				2.07	***	3.92			
ln distance	-2.07	***	-3.84	-1.84	***	-3.14	-1.79	***	-3.01
Contiguity	-0.66		-0.93	-0.60		-0.79	-0.60		-0.79
common language	1.23		1.77	1.01		1.44	1.05		1.50
former colony	1.19		1.26	1.22		1.26	1.22		1.27
time dummy variables	yes			yes			yes		
host country effects	yes			yes			yes		
home country effects	yes			yes			yes		
R^2	0.44			0.426			0.42		
number of observations	5348			5348			5348		
number of country-pairs	688			688			688		

Note: The dependent variable is the log of bilateral greenfield FDI flows from country i to country j in current euros. t-values are based on cluster-adjusted standard errors accounting for common host country effects. ***, ** and * denote statistical significance at 1 percent, 5 percent and 10 percent levels, respectively. The marginal effects can be interpreted as elasticities and semi-elasticities.

Source: European Commission, World Bank, OECD, Eurostat Eurobase, fDi Intelligence database.

Table A. 4: ZINB estimates of the number of subsidiaries and market coverage of EU-15 multinational firms

	Manufacturing						Non-Manufacturing					
	Number of subsidiaries			Market coverage			Number of subsidiaries			Market coverage		
	Coef.		**z-value**	**Coef.**		z-value	Coef.		z-value	Coef.		z-value
	(1)			**(2)**			(3)			(4)		
	Logit model component explaining zero subsidiaries											
log age in years	-0.39	***	-5.6	-0.39	***	-5.2	-0.04		-0.8	0.00		-0.1
log number of shareholders	0.31	***	6.4	0.34	***	6.5	0.19	***	5.8	0.21	***	5.6
log employment	-1.33	***	-28.8	-1.37	***	-28.1	-0.97	***	-27.7	-1.05	***	-25.6
log turnover per employee	-0.28	***	-4.3	-0.30	***	-4.2	-0.09	***	-2.7	-0.09	**	-2.4
log total fixed assets per employee	-0.80	***	-12.8	-0.86	***	-12.9	-0.74	***	-25.0	-0.80	***	-24.1
log intangible assets to fixed assets	-0.07	***	-3.1	-0.07	***	-2.8	-0.06	***	-4.0	-0.03	**	-2.0
Industry dummy	yes			yes			yes			yes		
Constant	12.40	***	27.5	12.86	***	26.8	9.26	***	34.8	9.49	***	31.6
lnalpha	1.08	***	32.8	0.88	***	26.2	1.63	***	46.0	1.42	***	36.5
alpha	2.93			2.42			5.08			4.15		
	Marginal effects of the count data component of the model											
log age in years	0.022	***	13.2	0.020	***	12.1	0.004	***	7.0	0.003	***	5.3
log number of shareholders	-0.005	***	-3.6	-0.006	***	-4.3	0.002	***	2.9	0.000		0.1
log employment	0.071	***	37.1	0.066	***	36.7	0.030	***	43.1	0.027	***	39.5
log turnover per employee	-0.003		-1.8	-0.001		-0.5	0.0002		0.4	0.001		1.3
log total fixed assets per employee	0.062	***	30.6	0.056	***	29.3	0.028	***	43.4	0.024	***	43.6
log intangible assets to fixed assets	0.003	***	5.8	0.003	***	5.5	0.000	***	3.3	0.001	***	3.4
Industry dummy	yes			yes			yes			yes		
number of observations	88,690			88,690			248,783			248,783		
number of nonzero observations	7,321			7,321			10,481			10,481		

Note: ***, **, * indicates significance at the 1-, 5- and 10-percent-level, respectively. Model specification is not shown.
Source: AMADEUS database (2011 release), WIFO calculations.

Table A.5 - Estimates of the Barro-type growth model (pooled OLS)

	Total sample			EU-15+NO and CH			EU-12 + TR		
	Impact of FDI inflows as a percentage of GDP								
	coef		t	coef		t	coef		t
log GDP per capita, PPP (const. 2005 intern. $) lagged one period	-0.004		-0.77	-0.021	***	-2.73	-0.01		-0.87
Investment % GDP	0.203	***	2.57	0.08	*	1.93	0.333	**	2.36
Average years of schooling	0.001		1.05	0.002	*	1.77	0		0.04
Foreign direct investment inflows % GDP	0.104	***	2.69	0.106	**	2.34	0.203	*	1.9
Constant	0.001		0.02	0.194	***	2.81	0.035		0.33
R^2	0.166			0.232			0.227		
number of observations	128			82			46		
number of countries	29			17			12		
	Impact of FDI inflows as a percentage of GDP adjusted for double counting								
	coef		t	coef		t	coef		t
log GDP per capita, PPP (const. 2005 intern. $) lagged one period	-0.004		-0.77	0.008		0.01	-0.01		-0.87
investment % GDP adjusted by FDI inflows	0.203	**	2.57	0.08	*	1.93	0.333	**	2.36
average years of schooling	0.001		1.05	0.002	*	1.77	0		0.04
foreign direct investment inflows % GDP	0.307	***	3.68	0.186	***	2.65	0.536	***	3.75
Constant	0.001		0.02	0.194	***	2.81	0.035		0.33
R^2	0.166			0.232			0.226		
number of observations	128			82			46		
number of countries	29			17			12		
	Impact of FDI inward stock GDP ratio								
	coef		t	coef		t	coef		t
log GDP per capita, PPP (const. 2005 intern. $) lagged one period	-0.006	*	-1.47	-0.018	***	-2.37	-0.026	*	-1.95
Investment % GDP	0.215	**	2.92	0.076		1.82	0.336	***	3.11
Average years of schooling	0		0.05	0.001		1.16	-0.002		-1.06
Foreign direct investment stock % GDP	0.024	**	3.91	0.013	***	2.21	0.08	**	3.43
Constant	0.031		0.62	0.171	**	2.44	0.191		1.57
R^2	0.227			0.225			0.421		
number of observations	129			82			47		
number of countries	29			17			12		

Note: Dependent variable is real GDP per capita growth. ***, ** and * denote significance at the 1 percent, 5 percent and 10 percent level. t-values are based on robust standard errors. The sample for EU-12 + Turkey includes the following countries and years: MT and TR all for the five year periods 1985-1990, 1990-1995, 1995-2000, 2000-2005 and 2005-2010; , BG, EE, HU. LV, RO and SK all for the five year periods 1990-1995, 1995-2000, 2000-2005 and 2005-2010; CZ, PL, LT and SI all for the five-year periods 1995-2000, 2000-2005 and 2005-2010. The sample for EU-15 + NO and CH includes following countries and years: AT, BE, CH, DE, DK, ES, FI, FR, EL, IE, IT, NL, NO, PT, SE and UK all for the five year periods 1985-1990, 1990-1995, 1995-2000, 2000-2005 and 2005-2010; and LU for the five-year periods 2000-2005 and 2005-2010.

Source: World Development Indicators database, Barro-Lee database, UNCTAD.

Table A.6 - Productivity effects of foreign presence in the same industry and in customer industries (backward production linkages)

(Manufacturing, EU-15 countries)	Robust regression method								
	(i)			(ii)			(iii)		
	coef		t	coef		t	coef		t
Initial employment share of foreign affiliates	0.10	***	4.01	0.11	***	4.14	0.09	***	3.56
Initial employment share of foreign affiliates among customers (FORCUST)	0.11	***	2.77	0.08	*	1.77	-0.01		-0.25
Relative labour productivity domestic/foreign sector	0.01		1.32	0.01		0.95	-0.02		-1.47
Av. annual labour productivity growth foreign sector				0.28	***	4.70	0.33	***	5.80
Interaction term rel. labour productivity X FORCUST							0.20	**	2.28
Industry and country dummies	yes			yes			yes		
Constant	0.00	0.01	-0.09	-0.02		-2.08	0.02		1.07
number of observations	94			94			94		
number of co	11			11			11		
number of industries	11			11			11		
Interaction term (p-valued							0.025		
Impact of initial foreign employment share among customers with varying levels of the relative labour productivity									
Relative labour productivity domestic/foreign sector:									
0.50							0.09		
0.60							0.11		
0.70							0.13		
0.80							0.15		
0.90							0.17		
1.00							0.19		

(Manufacturing EU-12 countries)	Robust regression method					
	(i)			(ii)		
	coef		t	coef		t
Initial employment share of foreign affiliates	0.48	***	2.85	0.57	**	3.57
Initial employment share of foreign affiliates among customers	0.88	**	2.30	0.04		0.05
Relative labour productivity domestic/foreign sector	-0.06		-1.18	-0.24		-1.30
Av. annual labour productivity growth foreign sector						
Interaction term				1.25		1.14
Industry and country dummies	yes			yes		
Constant	-0.12		-1.11	-0.04		-0.31
number of observations	45			45		
number of co	6			6		
number of industries	11			11		
Interaction term (p-value)				0.10		
Impact of initial employment share of foreign affiliates among customers with varying levels of the relative labour productivity level						
Relative labour productivity domestic/foreign sector:				coef.		
0.50				0.66		
0.60				0.79		
0.70				0.91		
0.80				1.04		
0.90				1.16		
1.00				1.29		

Note: ***, ** and * denote significance at the 1 percent, 5 percent and 10 percent level. Sector and country dummy variables are included but not reported. t-values of the OLS estimates are based on heteroskedasticity consistent standard errors. FORCUST measures the backward linkage from foreign owned firms to domestically owned firms. This table is based on yet unpublished results from the EU funded project INNO Grips ENTR-09-11-LOT2.

Source: Inward FATS and National Accounts, Eurostat.

Table A.7 - Productivity effects of foreign presence in the same and customer industries at the firm level (EU-12 countries)

	Total sample			Firms with 25 and more employee			Firms with 24 and less employees		
	coef		**t**	**coef**		**t**	**coef**		**T**
foreign employment share in the same industry, '03	-0.76	***	-2.82	-0.55	**	-2.32	-1.01	***	-3.68
foreign employment share in the customer industries, '03	0.83	***	2.85	0.62	**	2.54	1.13	***	3.49
relative productivity level, 2003	-0.13	***	-4.77	-0.11	***	-5.37	-0.14	***	-3.98
growth rate of fixed assets in const. Prices	0.06	***	9.81	0.10	***	7.46	0.03	***	3.39
country and industry dummies	yes			yes			yes		
Constant	-0.02		.	0.26	***	2.50	0.66	***	4.77
R^2	0.31			0.25			0.33		
number of observations	32959			18035			14924		
	Newly founded firms (2001 & older)			**Mature firms (2000 & younger)**					
	coef		**t**	**coef**		**t**			
foreign employment share in the same industry, '03	-0.50	**	-2.22	-0.88	*	-1.80			
foreign employment share in the customer industries, '03	0.26		1.41	4.90	***	4.29			
relative productivity level, 2003	-0.08	***	-6.33	-0.16	***	-3.84			
growth rate of fixed assets in const. Prices	0.06	***	7.74	0.06	***	6.25			
country and industry dummies	yes			yes					
Constant	0.07		1.29	0.59	***	5.27			
R^2	0.17			0.38					
number of observations	12854			21303					
	low productivity growth (Q1)			**low medium prod. Growth (Q2)**					
	coef		**t**	**coef**		**t**			
foreign employment share in the same industry, '03	0.03		1.37	0.00		0.53			
foreign employment share in the customer industries, '03	0.02		0.93	0.01		1.59			
relative productivity level, 2003	-0.01	***	-2.92	0.00		-0.86			
growth rate of fixed assets in const. Prices	-0.02	***	-5.69	0.00	***	4.07			
country and industry dummies	yes			yes					
Constant	-0.13	***	-12.96	0.06	***	14.66			
R^2	0.14			.0.03					
number of observations	8227			7963					
	med-high productivity growth (Q3)			**very high productivity growth (Q4)**					
	coef		**t**	**coef**		**t**			
foreign employment share in the same industry, 2003	-0.03		-1.60	-0.51	***	-3.07			
foreign employment share in the customer industries,'03	0.06	***	2.81	0.70	***	2.76			
relative productivity level, 2003	0.00		-1.15	-0.22	***	-2.92			
growth rate of fixed assets in const. Prices	0.01	***	3.74	0.03	**	2.15			
country and industry dummies	yes			yes					
Constant	0.17	***	20.22	0.66	***	4.63			
R^2	0.05			0.13					
number of observations	8474			8295					

Note: The dependent variable is average annual real labour productivity growth between 2004 and 2007. ***, ** and * denote significance at the 1 percent, 5 percent and 10 percent level. t-values are based on cluster-robust standard errors with 219 clusters (by industry and country). Sector and country dummy variables are included but not reported.

Source: AMADEUS firm-level database.

Table A.8: OLS estimates of the impact of FDI on average employment growth 2004-2006, 8 EU-10 countries

	Foreign presence based on inward FATS					
	Horizontal			**Backward**		
	coeff		**t**	**coeff**		**t**
foreign presence in the same industry in 2003 (FOR03)	0.08	***	2.68	0.04		1.62
foreign presence in customer industries in 2003 (FORCUST03)	0.03		0.90	0.10	**	2.41
employment growth of foreign affiliates 2004-2006	0.10	***	5.72	0.11	***	5.69
ln sales per employee of local firms to that of foreign firms, 2004	0.03	***	7.02	0.03	***	8.68
ln sales per employee of local firms to that of foreign firms, 2004 X (FOR03)	0.07	***	3.62			
ln sales per employee of local firms to that of foreign firms, 2004 X (FORCUST03)				0.09	**	2.40
ln employment in 2004	-0.46	***	-21.67	-0.46	***	-21.71
ln employment squared in 2004	0.04	***	16.61	0.04	***	16.58
country and industry dummies	yes			yes		
Constant	0.94		7.83	0.95	***	7.48
R^2	0.447			0.45		
number of observations	37,893			37,893		
average effect of FOR2004	0.12	***				
average effect of FORCUST2004				0.15	***	
	Foreign presence based on CIS 2006					
	coeff		**t**	**coeff**		**t**
	Horizontal			**Backward**		
foreign presence in the same industry in 2004 (FOR04)	0.08	***	2.70	0.05	**	2.09
foreign presence in customer industries in 2004 (FORCUST04)	0.04		1.55	0.08	***	2.70
employment growth of foreign affiliates 2004-2006	0.11	**	5.85	0.11	***	6.02
ln employment in 2004	-0.46	**	-21.68	-0.46	***	-21.71
ln employment squared in 2004	0.04	***	16.59	0.04	***	16.59
ln sales per employee of local firms to that of foreign firms, 2004	0.03	***	8.38	0.03	***	7.00
ln sales per employee of local firms to that of foreign firms, 2004 X (FOR03)	0.04	**	2.37			
ln sales per employee of local firms to that of foreign firms, 2004 X (FORCUST03)				0.06	**	2.40
country and industry dummies	yes			yes		
Constant	0.93		8.27	0.94	***	8.28
R^2	0.446			0.45		
number of observations	37,8966			37,8966		
average effect of FOR2004	0.09	***				
average effect of FORCUST2004				0.11	***	

Note: ***, **, * denote statistical significance at the 1 percent, 5 percent, and 10 percent level. Standard errors are computed using robust standard errors clustered on industry-country pairs. FORCUST03 and FORCUST04 measure the backward linkage from foreign-owned firms to domestically owned firms.

Source: Inward FATS, CIS (2006).

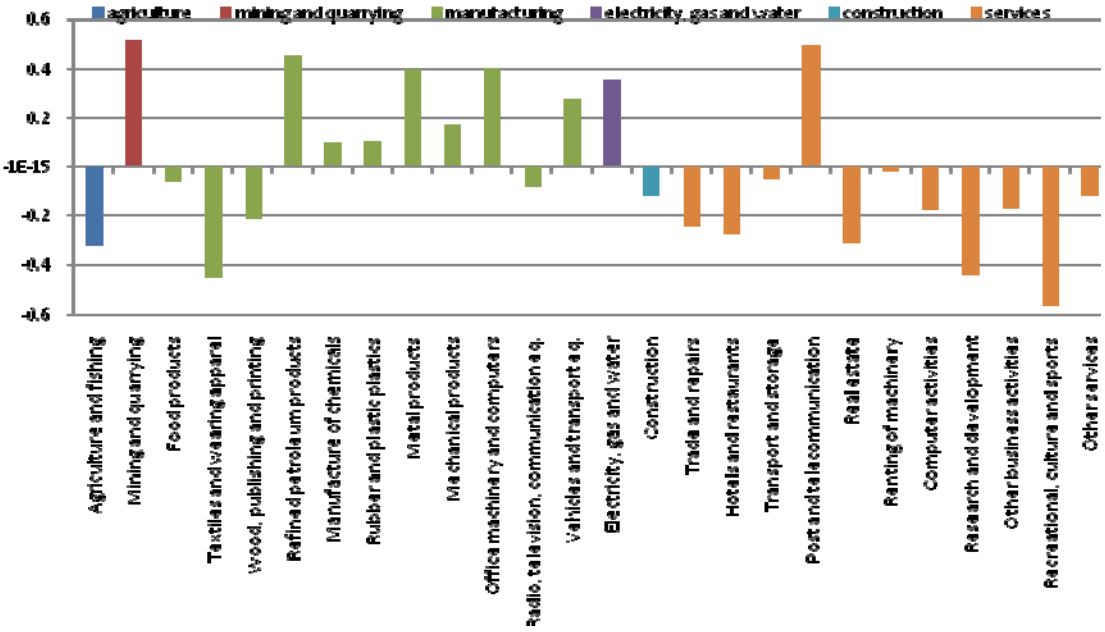
Table A.9: Probit estimates of the impact of FDI on technological innovations of local firms 2004-2006, 8 EU-10 countries (marginal effects)

	(i)			(ii)			(iii)		
	marg eff		**z**	**marg eff**		**z**	**marg eff**		**z**
	Dependent variable: probability of introduction of new market products of local firms								
introduction of new market products of foreign firms	0.04	**	3.13	0.04	***	3.37	0.04	***	3.11
foreign presence in the same industry 2004 (FOR04)	-0.01		-0.80	-0.02		-0.95	0.00		-0.06
foreign presence in customers industries in 2004 (FORCUST04)	**0.04**		**1.53**	**0.06**	***	**2.56**	**0.04**		**1.52**
ln RELPROD04	0.01	***	4.99	0.00		0.47	0.01	**	2.34
ln RELPROD04 X (FOR04)							0.02	*	1.94
ln RELPROD04 X (FORCUST04)				0.04	**	2.34			
ln employment	0.00		-0.07	0.00		-0.07	0.00		-0.07
ln employment squared	0.00	**	4.92	0.00	***	4.91	0.00	***	4.93
country and industry dummies	yes			yes			yes		
number of observations	37866			37866			37866		
Pseudo R^2	0.12			0.12			0.12		
	Dependent variable: probability of introduction of new product innovations of local firms								
	marg eff			**marg eff**		**z**	**marg eff**		**Z**
introduction of product innovations of foreign firms	0.05	*	1.75	0.05	*	1.90	0.05	*	1.74
foreign presence in the same industry 2004 (FOR04)	-0.03		-1.00	-0.04		-1.12	0.00		0.04
foreign presence in customers industries in 2004 (FORCUST04)	0.08	*	1.73	0.13	***	2.68	0.08	*	1.71
ln RELPROD04	0.02	***	5.49	0.00		0.06	0.01	*	1.83
ln RELPROD04 X (FOR04)							0.05	***	3.47
ln RELPROD04 X (FORCUST04)				0.08	***	3.08			
ln employment	-0.01		-1.13	-0.01		-1.16	-0.01		-1.15
ln employment squared	0.01	**	7.70	0.01	***	7.74	0.01	***	7.75
number of observations	37866			37866			37866		
Pseudo R^2	0.10			0.10			0.10		
	Dependent variable: probability of introduction of new production processes of local firms								
	marg eff		**z**	**marg eff**		**z**	**marg eff**		**Z**
introduction of new production process of foreign firms	0.05	**	2.26	0.05	**	2.37	0.05	**	2.25
foreign presence in the same industry 2004 (FOR04)	-0.02		-0.91	-0.03		-1.05	0.01		0.24
foreign presence in customers industries in 2004 (FORCUST04)	0.05		1.26	0.11	**	2.49	0.05		1.24
ln RELPROD04	0.02	***	6.61	0.00		0.23	0.01	***	2.72
ln RELPROD04 X (FOR04)							0.05	***	2.69
ln RELPROD04 X (FORCUST04)				0.10	***	4.10			
ln employment	-0.02	**	-2.32	-0.02	**	-2.33	-0.02	**	-2.32
ln employment squared	0.01	***	9.13	0.01	***	9.07	0.01	***	9.11
country and industry dummies	yes			yes			yes		
number of observations	37866			37866			37866		
Pseudo R^2	0.09			0.10			0.10		

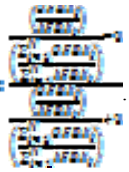
Note: ***, **, * denote statistical significance at the 1 percent, 5 percent, and 10 percent level. Standard errors are computed using robust standard errors clustered on industry country pairs. FORCUST04 measures the backward linkage from foreign owned firms to domestically owned firms.

Source: Inward FATS, CIS (2006).

Figure A.1 - Revealed comparative advantages in EU-27 FDI relations with the rest of the world



EU stocks are stocks of the EU-27 Aggregate. Total inward stocks exclude the inward stocks of the finance industry (EU nomenclature: 6895, financial intermediation). RCAs in industry *i* is calculated as

$RCA_i =$  . OFDI are EU outward stocks and IFDI are EU inward stocks.

Source: Eurostat, wiiw-calculations.

CHAPTER 5. CLUSTERS AND NETWORKS

5.1. INTRODUCTION

Academics and policy makers have been interested for a long time in linkages between companies that go beyond market interactions, but that fall short of vertical. Thus, the issue of clusters and networks of firms is not recent. What has changed, however, is that globalisation and new types of innovation processes have over the last few decades reshaped in new ways the organisation of value chains. Activities that were traditionally provided within a firm are now provided in a different type of institutional setting, somewhere between hierarchy and market.

In the global economy, there is a growing interest in new organisational structures, which are flexible enough to respond to market changes and at the same time solid enough to take on cooperative projects. In this sense, the increasing amount of statistical evidence indicating a positive relationship between the presence of clusters and the prosperity of regional economies[102] has brought to the fore the positive role that clusters and networks could play. Clusters and networks are increasingly seen as catalysts for accelerating industrial transformation and for developing new regional competitive advantages, speeding up the creation of firms and jobs and thereby contributing to growth and prosperity.

Because of these characteristics, clusters and networks have been identified as crucial instruments for implementing the EU's Europe 2020 strategy. The EU 2020 flagship initiatives 'Innovation Union' and 'An integrated industrial policy for the globalisation era' specifically refer to clusters and networks as critical tools.

Over the last few years, the European Commission has supported a range of research and joint learning efforts. It has also set up specific advisory bodies that have analysed in detail the presence of clusters across Europe and the potential for policy, especially policy at EU level, to leverage them and strengthen their growth. Many of these activities, including the European Cluster Observatory, the European Cluster Alliance, the European Cluster Excellence initiative, the TACTICS group and the European Cluster Policy Group, have been organised under the Competitiveness and Innovation Programme (CIP). These activities have informed a number of Commission communications, policy documents, and action agendas on clusters.

While it is relatively easy to detect and assess the presence of clusters and their economic impact, networks are more elusive. On the one hand, the theoretical literature on networks is less developed than in the case of clusters, leading to many conceptual misunderstandings. On the other hand, there is a relative scarcity of empirical evidence, since a company that decides to participate in a network may be extremely reluctant to disclose any information for fear of exposing its competitive advantage to its rivals.

This chapter is specifically focused on the presence and role of firm networks and their potential as a tool or platform for EU programmes to enhance competitiveness. It aims to inform the debate as to whether network-oriented policies are a substitute, a complement or an instrument in relation to cluster-based economic policies and to clarify the role of the European Commission in this this.

To this end, the chapter is structured as follows. The first section contains operational definitions to distinguish clusters from networks. The next section discusses the presence of networks in the EU, as well as the public programmes and tools, which support networks. Then, the following section deals with the rationale, objectives and design of network-support programmes. Finally, the last section sums up the policy implications.

5.2 CONCEPTS OF CLUSTERS, CLUSTER ORGANIZATIONS AND NETWORKS

The term 'cluster' has a long tradition in economics. At the end of the nineteenth century Alfred Marshall had already observed the 'concentration of specialised industries in particular

[102] See, for example, Delgado/Porter/Stern (2011), DG Enterprise and Industry (2007), and the overview in Ketels (forthcoming 2012).

localities'. For policy-makers, too, the phenomenon of industries moving into the same geographical area has not gone unnoticed. In fact, a number of countries have viewed the investment of state aid into specific territories as a means of embedding an industry into a targeted region with a view to fostering growth and development.

Over the last decades, the literature on firm networks has grown alongside cluster studies, with a similar emphasis on linkages among companies. However, the networks literature is not so much concerned with the concentration of firms in particular areas, but rather with the process that leads individual firms to establish cooperative links with each other, even if they operate in different regions.[103]

Clusters and networks share some common features. Conceptually, both are located between the atomistic structure of an uncoordinated market and the organic structure of a vertical hierarchy. Firms within networks and clusters are linked by something more than the price mechanism of the market. However, they are not branches of a larger company, since they continue to be independent.

In spite of these similarities, it is very important to draw a line between them, all the more so since focusing on clusters or networks has very different policy implications. In the case of clusters, the rationale for state intervention is clearly derived from the presence of externalities. Regardless of managers´ intentions, externalities create knowledge spillovers, affect the dynamics of rivalry, and encourage the development of a more specialised labour market and supplier base. Hence, governments can help cluster organisations internalise some of the externalities in clusters by promoting joint decision-making and action and can also organise funding programmes around clusters to compensate for externalities.

On the other hand, the presence of externalities in networks that spread across different regions is not so obvious. The crucial point is the activity in which firms are engaged. If a group of firms is working on innovation projects or entering new fields or new markets, companies could be encouraged to join a network structure for the purpose of sharing information and creating synergies.

Therefore, conceptual categorisation is required. This chapter employs the following operational definitions in order to clarify the conceptual relations and differences between clusters, cluster organisations and networks.

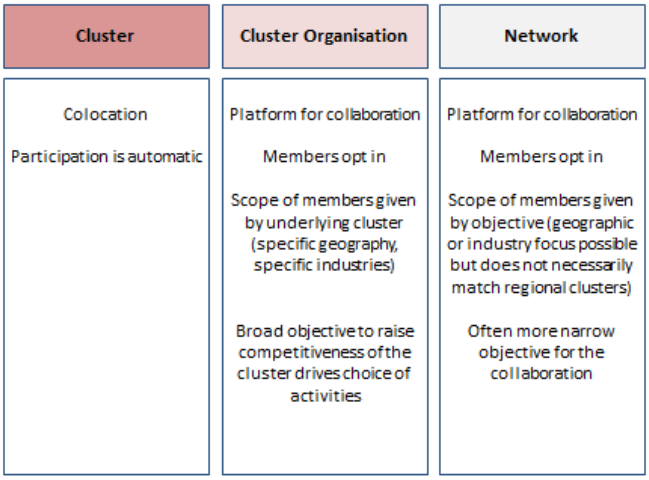
Clusters are geographically co-located firms and other institutions engaged in economic activities in a set of related industries, connected through externalities and other types of linkages. Collaboration may or may not take place, and could focus either on broader competitiveness upgrading or on specific projects.

Cluster organisations are organisations focused on a specific geographical area, oriented towards a set of related industries (also called a 'cluster' category), and they provide a structure for actual collaboration.

Networks of firms are structures specifically created for active collaboration. This collaboration could be open-ended or focused on a specific project task. They may or may not be confined to a specific geographical location and set of industries. Cluster organisations are a specific type of network that is concentrated in a particular geographical area.

[103] For a review on the literature on clusters and networks, see Frank Lerch and Gordon Müller-Seitz (2012).

Figure 5.1: Key characteristics of clusters, cluster organisations, and networks



5.3. Presence and Policy of Networks

5.3.1. Types of Firm Networks

While the presence of clusters is quite easy to detect, the presence of networks is more problematic. As mentioned in the previous section, networks are created on a voluntary basis, because firms expect it to be more advantageous to stay in the network than to stay outside it. Thus, it is in firms' interests to be discreet about their participation in a network for fear of revealing sensitive information from which their rivals might benefit.

Nevertheless, useful information about networks can be found in the organizational database of the European Cluster Observatory (ECO), a site developed with financial support from the European Commission. This database covers more than 2000 organizations[104] in total with a focus on economic development through collaboration between firms and other entities and has been created partly through internet search and partly through self-registration by organisations.

Of all the organisations covered by the ECO database the percentage of organisations that could be defined as networks in the terms specified above is between 4-6%. If the analysis is restricted to particular categories of activities, it turns out that in areas such as 'general technology', 'design' or 'human resources', the network share is even higher and reaches 10-12% in life sciences (biotech/pharmaceuticals).

On the basis of these findings, two criteria (geographic scope and industry scope), can be put forward for the purpose of classifying networks.

Since networks are not constrained to a specific geographical area and can involve firms operating in regions which are quite far apart, **geographic scope** could be an instrument for classifying and systematising networks. Thus, in terms of their geographical extension, networks could be classified from the most locally concentrated to the most geographically scattered.

- The first type of networks takes place at regional level. They aim at favouring the exchanges of information and experiences. An example is the Romagna Creative District in Italy (see Annex Box 5.2) that aims at creating synergies between twelve different creative sectors.
- The second type of networks are those open to membership from a *broad set of regions within a country*. These networks tend to be set up to overcome a lack of critical mass at regional level. The networks of the German Kompetenznetze.de,[105] a federally funded network of clusters or networks, are a good example.

[104] The organisations are clusters that have been identified in 32 countries.

[105] For a profile of this and other networks specifically mentioned in this chapter, see Ketels (2012).

- The third type refers to networks operating in a set of similar industries and that organize themselves explicitly at the *national level*. In general, they are set up by government to compensate for a lack of critical mass at the regional level and create a cost-efficient central platform to provide services for firms in the same industrial activity. Such networks exist, for example, in Ireland (Irish Software Innovation Network), the Netherlands (Dutch Maritime Network), and Slovenia (Technology Network ICT).
- The fourth type of networks *extends beyond national boundaries* and connects firms that work in a set of related industries, in most cases through participation in cluster organisations. This happens either across smaller countries or in response to EU-funded projects driving the emergence of European networks. One such network is Scanbalt, which focuses on life sciences in the Baltic Sea Region, is such a network (see Annex Box 5.1).
- Finally, the last type of network is formed by firms which pursue one specific issue and find that it is in their interest to try to operate at *EU level*. This is the case of Social Firms Europe CEFEC (see Annex, Box 5.4), a network of social firms and cooperatives across Europe, whose goal is to create paid work for disabled and disadvantaged people and help individuals who face discrimination in their bid to overcome their social and economic exclusion through employment. CEFEC is open to all industries that can help people with disabilities or disadvantages find employment.

In addition to geographic coverage, **industry scope** could provide other useful criteria for classifying networks.

- The first type of network focuses on new *emerging patterns of relatedness across industries*. Networks in this category are often strongly driven by government action to explore the potential of new fields. One such effort is the Romagna Creative District in Italy (see Annex, Box 5.2) whose aim is to connect and share the creative resources of individuals and companies in the hope of sparking off creativity and boosting the economy of the Romagna region. The network covers creative sectors such as communications, art, design, architecture, theatre, music and photography.
- The second type of network covers a *broader set of industries*, often in wider traditional sectors such as manufacturing. Those networks have a broader industry-scope than one cluster category. An example is the Network Industry RuhrOst (NIRO), which aims to enhance the competitiveness of firms in mechanical engineering and industrial electronics located in the RuhrOst region around the cities of Dortmund and Unna. This type of network is in response to a lack of critical mass for firms working within similar industries within a region.
- The third type of network aims to enhance the competitiveness of the *entire regional economy*. The Cambridge Network in the UK falls into this category. Its purpose is to connect people from business and academia in the Cambridge region in order to share ideas, thereby encouraging collaboration and partnership that can contribute to the overall economic success of the region. Although some activities are often directed towards a cluster-orientation, others aim to improve the general business environment.

5.3.2. Public Policy Support to Networks

For several reasons, regional administrations, national governments and supra-national institutions have designed programmes aimed at strengthening clusters and networks. Although the scope, ambition and achievements of these programmes depend on their political, geographical and administrative context, public authorities have a common interest in fostering cooperative links between firms. These programmes do not target networks or clusters *per se,* but tend rather to focus on activities with a positive impact on a wider community. Since clusters are easier to identify and there is a longer policy tradition of working through

them, in most cases network programmes are a part of **existing cluster programmes**. Policy makers who decide to give a special boost to networking, do so because regions lack critical mass or because there is a case for supporting collaborative projects, such as joint research or education.

In the previous subsections networks were classified according to their geographic or industrial focus and these two criteria continue to be relevant for the purpose of classifying public network programmes.

5.3.2.1. Geographic focus.

Programmes for networks that have a **different geographic focus** have been launched by some larger regions, national governments, and as part of cross-national collaboration.

A number of larger German states have organised *region-wide cluster efforts* ('Bayern Innovative', 'bwcon', 'bw-automotive', 'Landescluster NRW'). All clusters belonging to the same industry are served through one network organisation, either driven directly by government or through a company that drives it on behalf of government. This seems to be partly a reflection of limited critical mass in smaller regions and partly a matter of political and organisational expedience in aligning the organisation with the way the public sector is organised.

Countries like France ('Action Collective'), Germany ('ZIM-NEMO'), and the Netherlands ('Innovation Performance Contract') have launched *programmes at national level* that invite groups of companies to apply for funding to set up a network. All these programmes are focused on enhancing the performance of groups of small- and medium-sized enterprises (SMEs), mostly by encouraging joint innovation activities but sometimes also joint exporting efforts. Co-location in one specific region is not a criterion for funding. Unlike traditional cluster programmes, the motivation for these networks is, at least initially, a specific task or objective that can best (or only) be achieved collectively. Over time, however, these programmes hope to encourage more stable patterns of collaboration that are then motivated by a broad common interest in upgrading the competitiveness of the firms in the network.

The Italian programme in support of contract-based business networks ('Contratto di Rete d'Impresa') is similar to this approach but is also open to large companies and seems to be less restrictive in terms of the type of joint activities that qualify for support. It provides tax incentives for collaboration, often among small groups of around five companies that frame some of their activities within a specific legal structure.

Countries like the UK ('Knowledge Transfer Networks'), Ireland ('Irish Software Innovation Network'), the Netherlands ('Dutch Maritime Network') and Slovenia ('Technology Network ICT') have set up *national platforms* serving specific cluster categories. In some ways, these platforms are natural extensions of traditional industry- or sector-oriented programmes in research and innovation policy. The platforms, largely financed by government, provide companies with information on how to access project funding from other parts of government. While this funding might be based on collaboration, the networks also provide information about more traditional firm-based programmes. In addition, the networks aim to encourage linkages between firms and research institutions carrying out a set of similar industrial activities to increase the effectiveness of the research funding. The networks also provide additional information on industry and technology trends to enhance companies' overall sophistication.

National networks in Denmark ('Innovation Networks Denmark') and Finland ('OSKE Centre of Expertise Programme') have been strengthened thanks to a base of regional cluster efforts. As these efforts proved to have insufficient critical mass, the national government consolidated them under a country-wide umbrella. Where robust regional clusters exist, they continue to play an important role. The national approach explicitly aims to connect firms which are active within these cluster categories but located in other regions within the country.

The EU and groups of EU neighbouring countries have also set up several programmes to encourage the emergence of *networks across larger geographical areas*. In almost all cases, these networks are facilitated through regional cluster organisations. The Knowledge and Innovation Communities (KICs) are one such example at EU

level. The available funding combines networking and actual research activities. In the Baltic Sea Region, the StarDust programme has been launched as part of the EU Baltic Sea Region Strategy to connect regional clusters across the wider Region in five cluster categories. Funding is available for network management between the cluster organisations, while collaborative actions, including networking between firms in the regional clusters, have to be covered through the existing budgets of the cluster organisations.

5.3.2.2. Industry focus.

Support for network organisations that have a **different industry focus** from traditional cluster categories is to a large degree organised through the same type of network programmes discussed above. While the general toolkit is the same, in these cases government agencies decide to change the scope of the network.

A number of governments have set up specific network programmes in areas considered to be *emerging*, where activity boundaries are porous. In the UK, the Creative Industries Network, part of the Knowledge Transfer Networks, focuses on the broad range of industries designated as 'creative' in the academic literature and increasingly also in policy programmes. In Austria, the regional economic development agency supports networks in nanotechnology, nanosciences, and creative industries as part of its overall cluster and network programme. In Denmark, Environmental Network South (See Annex, Box 5.3) focuses on the collaboration between public authorities and companies in the area of the environment.

A number of governments at the local and regional level, especially in Germany, support SME networks that reach out to local companies in *broad sectors* such as manufacturing. In such cases the main motivation is to create cost-effective tools, to have large numbers of companies improve their operational sophistication and to establish platforms for communication between local government and the local business community.

When the goal is to support the *overall competitiveness of a region*, networks are usually not funded by government. This task tends to be undertaken by regional economic development agencies set up by regional authorities, working in dialogue with the business community they serve. In Germany, economic development organisations such as HannoverImpuls and the Dortmund-Project arose from specific projects that aimed to reframe the way local government pursued its economic development efforts.

5.3.3. Public Tools

Many programmes use financial incentives to encourage collaboration. Some pay only for network management activities. Others make funding for, say, joint innovation activities, conditional on the presence of a network. Compared to traditional cluster programmes, the funds in network programmes tend to be much smaller. There is more focus on networking activities, joint activities are often smaller in scale, and the number of participants also tends to be significantly lower than in cluster programmes. An interesting new effort currently being tested in France is 'Territoires et innovation', a programme that supports regional networks 'in kind', through consulting services and by providing access to bank credit, the aim being to support the export activities of SMEs. There is no direct financial support for the SMEs involved.

One group of programmes provides funding and then invites prospective networks to submit their proposals. This approach is used when there is no clear information or political target in terms of the type of networks to support, and when collaboration between firms is the prime objective. A different group of programmes defines the network scope and then sets up an organisation to mobilise, serve, and manage the network of firms. This organisation can be part of government, or it can be run by another organisation on behalf of government. This second approach is more interventionist, with the focus areas selected by government. However, in setting up an intermediary linked to both firms and government, the available policy tools and programmes of government are also more likely to be linked to the needs of a set of companies.

An interesting development is the emergence of national support mechanisms for all clusters and networks within a country. In Denmark, RegX, RegLab, and netmatch provide different types of training and information services to the country's innovation networks. In Austria, the national cluster platform has been created to enable collaboration

between the clusters and networks that have developed through the initiative of regional governments. In Germany, Kompetenznetze.de provides a national platform bringing networks together to collaborate and learn about best practices. In the German state of North Rhine – Westphalia, a central cluster secretariat supports all the clusters and networks in the state.

In terms of **impact**, the evidence relating to network programmes is limited. Available evidence does suggest that companies participating in collaborative research efforts, i.e. those facilitated by network programmes, record better results on a number of key indicators than peers that do not belong to such networks.[106] Evaluating the effect of these programmes raises difficult questions. Particularly difficult to disentangle is whether the superior performance of network-participating companies is due to the programme itself or to unobservable individual characteristics. While evaluations of such programmes tend to provide fairly positive assessments, there is hardly any hard impact data available.

5.4. THE ROLE OF PUBLIC POLICY

Since economic resources are scarce, public policies must be carefully designed to avoid wasting time and money. Likewise, it is crucial that design programmes are not taken over by special interest groups to the detriment of the public good. Hence, every proposal relating to a public policy programme must address three issues: first, its rationale; second, its objectives; and third, its operational design.

5.4.1. Justification of network programmes.

The first question to ask is whether there is a good **case for public policy**. Public policy interventions should be based on a clear social welfare argument. In the case of cluster organisations, such an argument is founded in the existence of local externalities that give rise to the emergence of a cluster and drive cluster dynamics. There is a market failure that government intervention can address.

One way of doing this is to internalise the externality by creating an organisational structure that allows members of the cluster to share information and coordinate action. Government can play a role in initiating and supporting this organisational structure, i.e. a cluster organisation. Interestingly, if the argument for government support is an externality, some government engagement is reasonable as long as the externality exists. In this case, there is no fundamental reason for governments to finance cluster organisations only in the start-up phase. Expanding the range of activities, however, should be driven by private sector contributions.

Another way of doing this is for government to compensate for the externalities by providing government funds to support the specific activities that create them. This can be done by organising public policies in areas such as innovation, workforce development, and investment attraction around clusters. This approach also has key operational advantages in comparison with programmes that target individual companies or, conversely, the entire economy. On the one hand, they are more effective because they reach a larger group of companies than firm-level support but are more targeted than economy-wide programmes. On the other hand, they create less distortion than firm-level support, because they include all industries that are active along a value chain and compete for the same specific inputs.

The welfare argument for public support to networks is more complex. There is no inherent externality, and thus no generic argument, for funding networks. There are, however, two arguments that can support public network programmes. First, the externalities might occur at the level of the activity that the network is engaged in. If, for example, networks work on collaborative innovation projects, collaborate in projects that explore the potential of emerging new fields, or collaborate on export efforts towards a new market, there could be knowledge spill-overs that justify public support. Second, the network might be a more efficient delivery tool for public investments in knowledge provision, largely because a large number of companies can be reached through a common platform. In both cases, then, the argument for networks rests on what they do, not on the network per se.

[106] See, for example, the Danish Agency for Science, Technology, and Innovation (2011).

One example of a network activity that can provide significant positive externalities is that of exports towards a new market. The statistical evidence shows that entering a new market is a risky endeavour and that most such attempts fail.[107] As the information needed to evaluate the potential of a new market is often dispersed, this is where a network can help. Once an attempt has been made to enter a new market, the revealed evidence of success or failure provides valuable information to other companies considering a similar move. This is why public support to cover some of the risk can be justified. The same logic might apply to emerging industries, where new combinations of technologies and operational practices are used to meet (potentially new or changing) customer needs. Rather than just subsidising the search activity, that is the entry into a new market, public support for networks can lower the search costs and make the search activity more efficient.

Network programmes that support collaboration between companies but impose little conditionality on the actual activities within the network are hard to justify. They provide public subsidies to a small group of companies to conduct activities that mainly generate private benefits for them.

5.4.2. Objectives of network programmes.

Thus, the second question to be addressed relates to which **objectives** network programmes should have, in other words, in which situations are network programmes useful additions to the public policy toolkit. This discussion will focus on network programmes that are separate from the networking activities supported as part of traditional cluster programmes.

In the light of experience there are four types of network programmes that seem to complement existing cluster programmes particularly well. First, networks with a broader geographic and industry scope than established regional clusters can play a useful role in the *early stages of cluster development*, including work with emerging industries. Networks can then be an important element in an integrated cluster policy that recognises the different needs of clusters throughout the cluster life cycle.[108] In existing cluster categories, new regional clusters might not have reached critical mass. Networks can then be a flexible tool to help companies collaborate and explore growth opportunities. They allow firms to tap more easily into complementary capabilities of companies located elsewhere. In emerging cluster categories, networks can be a tool for companies to explore opportunities for new markets to emerge by recombining technologies and capabilities from traditionally different cluster categories. They allow them to act more easily across cluster boundaries.

Second, networks can *provide shared services and connect individual firms from weaker regional clusters* across a larger region or nation. This amounts to a more efficient use of public support infrastructure in terms of knowledge provision and sharing. Moreover, it helps to overcome the challenges of limited critical mass in individual regions. However, this is always a second-best solution compared to allowing companies to agglomerate and regions to specialise more strongly. Given the considerable barriers to mobility that still exist in Europe, some of them policy-made but others related to culture and behaviour patterns, these national networks can play a useful role, even if cluster dynamics will inherently be more limited than in the case of a strong regional cluster.

Third, networks can be a useful tool for organising activities specifically directed towards SMEs. The importance of SMEs is increasing in both exports and innovation processes. Nevertheless, their needs for public support in these activities are different from those of large companies that have been the traditional focus of policy in these areas (and that continue to play a dominant role in them). Network programmes can be an efficient tool for reaching out to a larger number of SMEs without creating unmanageable process costs. In some cases these networks will be separate from clusters. Here the network is a mechanism to improve the general sophistication of SMEs in activities that have significant fixed costs or create positive externalities. In other cases, the SME network will

[107] See Hausmann/Rodrik (2002).

[108] This idea fits well into the structure of an integrated cluster programme with dedicated tools and services for immature clusters, mature clusters, and clusters in transition. See NGP Excellence (2012).

be part of a cluster.[109] Here the network can be connected to large companies that in turn provide connections to global value chains and distribution channels.

Fourth, networks can be a useful tool for more comprehensive efforts to enhance *regional competitiveness*. The focus on these networks might be on clusters, where there is sufficient critical mass. If this is not the case, networks can focus on cross-cutting framework conditions that are relevant across a broader range of industries and clusters. The network is then an efficient platform for information exchange and dialogue, providing a connection to local and regional authorities to companies that otherwise would not have access.

5.4.3. Operational design of network programmes.

The third question concerns the **operational design** of network programmes. Here the evidence is still limited but the analysis suggests a number of issues for consideration.

First, network programmes should set out *clear objectives* for the actual activities of the network. Collaboration does not happen automatically, even if some funding is provided. Without clear targets there is a danger that network programmes attract what have become known as 'hunting parties', i.e. small groups of companies, often facilitated by a consultant, that tap into available funding without creating any meaningful public value. Given the modest budgets required for network programmes, there is a danger of wasting money on numerous small efforts without any clear impact.

Second, network programmes should be managed on the basis of *clear milestones with a transparent exit strategy* for networks that do not meet expectations. For cluster organisations supporting established clusters there is a case for providing predictable long-term funding for connections to emerge. For networks operating in more fluid environments with a much higher likelihood of failure, it is more important to keep reviewing and pruning the portfolio of supported networks. It should be easier to obtain support but also easier to lose it.

Third, network programmes should make significant use of in-kind services rather than direct financial support. What is missing in networks is the structure to collaborate and the knowledge to provide through these structures, rather than capital (that in clusters is designed to compensate for externalities). Providing funds to buy these services rather than having the services provided directly by government may have a negative impact on incentives and can in some cases be less efficient. In this context the national support units for networks and clusters are an interesting recent innovation.

Fourth, network programmes designed for emerging clusters should be integrated into an *overall programme for cluster support*. There needs to be a clear transition to the next stage of the programme, reflecting the changing needs of clusters as they evolve and providing incentives to be assertive in pursuing the development from a network to a cluster organisation.

5.5. POLICY IMPLICATIONS

The analysis of existing public policy programmes to support or leverage firm networks reflects a wide range of approaches, driven to a large degree by the significant differences in size, government structure, and economic profile across European countries. Some network programmes are closely connected to clusters and cluster organisations, focusing on clusters that have only regional importance, or connecting regional clusters within a national structure. Others are less like clusters, especially those that support networks of SMEs in specific activities such as innovation or exports. In particular, they have a different geographic and industry scope.

Public support for network programmes can be motivated by the activities that the network organises and by the efficiency of the network as a policy delivery channel. Unlike clusters, the nature of the network itself is not a reason for intervention. There are three types of network programmes that have the highest potential to add useful instruments to the policy toolkit for economic development:

- support for networks in emerging industries and clusters;

[109] One example is Hanse-Aerospace, a network of SMEs that is part of the larger Hamburg Aerospace Cluster. See http://www.hanse-aerospace.net/home.html.

- establishment of national cluster platforms to provide shared services and connect firms across regions;
- support for networks of SMEs active in areas with positive externalities, such as innovation and exporting to new markets.

Many networks are market driven and hardly require any policy intervention. Nonetheless, proper framework conditions are essential if private organisations are to have the incentives to invest in networks. Europe-wide network programmes are a useful complement to cluster-based programmes.

Moreover, if intervention is to take place, in-kind services should be preferred to direct financial support. The objectives and operational design of network programmes are to be carefully thought through and implemented to reap the expected benefits. If clear milestones are identified early on, the network programmes can be monitored. It should be possible to discontinue unsuccessful programmes.

REFERENCES

Bathelt, Harald, Anders Malmberg, Peter Maskell (2002), *Clusters and Knowledge: Local Buzz, Global Pipelines and the Process of Knowledge Creation*, DRUID Working paper 02-12, DRUID: Copenhagen.

Danish Agency for Science, Technology, and Innovation (2011), *Innovation Network Denmark Performance Accounts 2011*, DASTI: Copenhagen.

Delgado, Mercedes, Michael E. Porter, Scott Stern (2011), *Clusters, Convergence, and Economic Performance*, Census Working Paper available at www.isc.hbs.edu

DG Enterprise and Industry (2007), *Innovation Clusters in Europe*, DG Enterprise and Industry: Brussels.

Hausmann, Ricardo, Dani Rodrik (2002), *Economic Development as Self-Discovery*, NBER working paper 8952, NBER: Cambridge.

Ketels, Christian (2012), *The impact of clusters and networks of firms on EU competitiveness – Background Report*, DG Enterprise and Industry: Brussels.

Ketels, Christian (forthcoming 2012), Cluster Policy: A guide to the state of the debate, in: *Knowledge and Economy*, Springer Publishing.

Frank Learch and Gordon Müller-Seitz (2012), *Literature review: Interorganizational (firm) networks* in Ketels (2012).

Lindqvist, Göran, Örjan Sölvell (2011*), Organising Clusters for Innovation: Lessons from City Regions in Europe*, Europe Innova: Brussels.

NGP Excellence (2012), *The Perfect Cluster Programme*, VDI-VDE, draft version, Berlin: May 2012.

Sölvell, Örjan, Christian Ketels, Göran Lindqvist (2003), *The Cluster Initiative Greenbook*, Ivory Tower: Stockholm.

ANNEXES

Box 5.1 Case-study on cross-national network based on regional clusters: Scanbalt, Baltic Sea Region

Scanbalt (http://www.scanbalt.org) promotes the development of ScanBalt BioRegion as a globally competitive macro-region and innovation market within health and life sciences. ScanBalt promotes projects, business and research, visibility and branding, policy issues, regional innovation and cluster development. The network is active in the Baltic Sea Region comprising Denmark, Estonia, Finland, Iceland, Latvia, Lithuania, Norway, Poland, Sweden, the northern part of Germany and the north-western part of Russia. ScanBalt BioRegion also collaborates with neighbouring regions of particular interest, e.g. northern Netherlands. It includes the health and life science community and related industries.

Scanbalt has two co-opted founding members (Nordic Innovation Centre, Nordforsk), 26 founding members, 19 institutional members, and two affiliated members. Any public or private organisation involved in life sciences can apply for membership (if located in the ScanBalt BioRegion) or affiliated membership (if located outside the ScanBalt BioRegion). The cost of membership fees depends on the membership type (here 2011 prices). Founding members (FOU) pay EUR 5,500 per annum and have five votes in the General Assembly and one vote in the Executive Committee (ExCo). Institutional members (INS) pay 1,100 EUR per annum and have one vote in the General Assembly; if elected to ExCo, INS also have one vote there. Affiliated members (AFF) pay 1,100 EUR per annum and have similar voting rights as institutional members. Affiliated members may apply for founding membership if they receive a corresponding invitation from ExCo.

The Scanbalt secretariat is located in Copenhagen with liaison offices in Tartu, Gdansk, Groningen and Copenhagen. There is one person working full-time in the secretariat in Copenhagen, who is the only person financed directly by ScanBalt. Other secretariat members work in the liaison offices and are regionally financed. The General Assembly (GA) is the network's highest body; it decides upon the change of statutes or membership fees and advises ExCo on the association's strategy. The Executive Committee (ExCo) decides on all relevant matters that do not require GA's approval. ExCo comprises of Founding Members, up to 6 Institutional Members and up to 5 Co-Opted Members of strategic interest. Scanbalt's Chairmanship w is responsible for representing of the organisation and overseeing the management. The Chairmanship comprises a Chairman elected by ExCo and up to 4 Vice Chairmen proposed by the Chairman and approved by ExCo. The term of Chairmanship is 2 years with the possibility of being re-elected twice. Scanbalt's annual budget is about DKK 1,500,000 or EUR 200,000. However, this only covers the budget of the CPH secretariat; there is much more financing for regional liaison offices and actual activities. The budget is made up of 50 % fees and 50 % external resources (CPH secretariat only). Over the last decade about EUR 20 M of EU funds were used for specific activities in research and education.

The ScanBalt BioRegion project was piloted and then initiated in full in 2002 by the Nordic Innovation Centre and the Nordic Council of Ministers. In 2004 ScanBalt became an independent legal entity, a non-profit membership association (ScanBalt fma). The year 2005 saw the establishment of the ScanBalt Academy which started organising ScanBalt Summer Schools in 2008 and became an independent non-profit association in 2011. In 2006 ScanBalt became a strategic partner of the Council of the Baltic Sea States (CBSS). In 2009 the option of Affiliated Membership was introduced for organisations, institutions and regions outside the ScanBalt BioRegion. In 2009 ScanBalt published the Innovation Agenda "Smart Growth: Bridging Academia and SME's in the Baltic Sea Region" proposing an EU Baltic Sea Region strategy flagship project ScanBalt Health Region which was officially approved the same year. In 2012 ScanBalt was responsible for developing and promoting 'Submariner – Sustainable uses of Baltic Marine resources' to a new flagship in the EU Baltic Sea Region strategy. ScanBalt acts as a mediating, coordinating and communicating umbrella and platform for the Baltic and Nordic regions and the regional networks. ScanBalt attracts or helps its members attract funding to promote coordinated private-public cross-border project activities. These focus mainly on creating regional cross-border infrastructure or to develop private-public cross-border collaboration within specific thematic areas. Up to 2012 ScanBalt has attracted or helped to attract approximately EUR 20 M for the members in project funding. ScanBalt has been involved in many EU-funded projects, including ScanBalt Competence Region (EU FP 6), Boosting Baltic FP 6 (EU FP 6), Boost Biosystems (EU FP 6), Trayss Prime (EU FP 6), ScanBalt IPKN (EU FP 6), ScanBalt Campus (InterregIIIB), Bridge-BSR (EU FP 7 – Coordinator), BSHR HealthPort (Interreg IV – Coordinator), Eco4Life (South Baltic Programme), ScanBalt Health Region (EU BSR Flagship – Coordinator).

Box 5.2 Example of a regional network focused on a broad, emerging cluster: The Romagna Creative District, Italy

The Romagna Creative District (RCD; http://romagnacreativedistrict.com/) aims to connect and share the creative resources of individuals and companies to spark off creativity and boost the economy of the region. RCD is active in the Romagna region in Italy. The network covers twelve creative sectors as identified by the European Union, including communications, art, design, architecture, theatre, music and photography.

RCD has about 1200 members. Standard membership is free, but RCD is planning to create a sort of premium membership including access advantages and special services; the fee will probably be different for companies and individuals. RCD operates as an open platform where new members can always come and participate. The board consists of 6 members who at the moment, and until the next renewal, are the 6 founders of the RCD Association. The current president and vice-president of the Association also participate.

The RCD secretariat has two full-time and two part-time employees. The cumulative budget over the last four years has been close to EUR 450 000, i.e. about EUR 125 000 annually. Roughly 45 % of the necessary funds have been provided by private companies, 35 % by an EU-funded regional project, 10 % by foundations, and the remainder by the Chamber of Commerce and a local municipality.

The idea for RCD was developed in 2008 and the first formal event to launch the network took place in May 2009. Barbara Longiardi from Matite Giovanotte, a design and communication studio based in Forlì, played a central role in initiating the endeavour. RCD aims to foster creative networking and advertise the region's inherent talent and its local assets. The network organises events to foster networking, such as Ortofabbrica. It also organises international missions, such as a mission to China in May 2011 where 3 companies from RCD networks represented Italy at the Shenzen Festival of Creative Industries, and a joint presence at international conferences such as the 2011 London Design Festival. RCD is currently not involved in any EU-funded projects.

Box 5.3 An example of a regional network focused on a cross-cutting theme: Environment Network South (Miljønetværk Syd), Denmark

The Environment Network South (ENS - http://www.milsyd.dk/) aims to establish and support cooperation between public authorities and companies in the environmental field, increase knowledge of the environment, and promote sustainable environmental development for the benefit of citizens and businesses in the region. The ENS covers the former Ribe County in Denmark, which includes the municipalities of Fanø, Billund, Varde, Vejen and Esbjerg. It is open to all industries; the focus is on the environmental impact of the network members from a variety of industries.

The ENS has a total of 152 members, 76 of whom are V-members (businesses), 56 I-members (interested parties), 13 F-members (stores endorsing the Green Shop concept) and 7 O-members (public authorities). Members pay an annual fee depending on the type of membership. In 2011 Companies (V-members) pay DKK 4 300 per annum if they have less than 50 employees and DKK 6 000 per annum if they have 50 or more employees. V-members have the right to vote at the general meeting and they receive support in preparing their environmental reviews. Interested parties (I-members) pay DKK 4 300 per annum. They have the right to speak at the general meeting and they receive newsletters and invitations to events that are open to network members. Stores (F-members) pay a registration fee of up to DKK 3 000, depending on the municipality they are located in, and an annual fee of DKK 500. They may speak at the general meeting, and they receive the network's newsletter and the environmental diploma (the Green Shop concept). Public authorities (O-members) pay DKK 3 per inhabitant in corresponding municipalities and they have the right to vote at the network's annual general meeting.

The ENS secretariat employs three regular staff, one trainee and two student workers. Of the three employees in the secretariat, two are working full-time (37 hours/week) and the third is working only part-time (7 hours/week). The general assembly is the network's highest authority; it takes place every spring and all members have the right to attend and speak. The Board consists of 10 members: 4 members are chosen from among the enterprises undertaking to prepare an environmental statement which at minimum fulfils the network's requirements (the Chairman also comes from among these 4 representatives), 5 mayors or committee chairmen from the public authorities and a representative of the Environmental Centre of Odense. The ENS has an annual budget of about DKK 1.8 million, covered largely by membership fees. For special events the ENS seeks project funding. For the moment the ENS does not have any source of funding apart from membership fees. However, 2 applications for funding along with partners are currently in progress. Additionally, for the last 4 years the network has had a joint programme with other environmental networks in the region. The ENS does not receive any EU funding at present, but it has previously participated in 2 projects, one of which ended in 2009 and another in 2011. The network also has several applications for further funding currently in progress.

The ENS was founded in June 1998 by a group of companies in the former Ribe county. Over the last 14 years, the profile of activities has remained more or less the same. The Network's activities aim to have individual members undertake their own environmental management tasks and attain tangible goals in the environmental sphere. The network offers practical support to ensure an overview of the company and provide guidance to the company in its environmental work. The ENS's environmental diploma is awarded for a two-year period and the diploma is renewed when a new environmental statement has been prepared. In addition, the network organises theme days, lectures and seminars on environmental topics and gives an annual Environmental Award to a company in the network that has shown extraordinary commitment to the environment. The network organises groups where members meet 4-5 times per year to talk about specified topics. Over time the ENS has increased its focus on education; it now offers a number of one-day courses on environmental topics. For the time being the ENS is not participating in any EU-funded projects but has taken part in one project in the past.

Box 5.4 Case-study of a European network with a topical focus: Social Firms Europe CEFEC

Social Firms Europe CEFEC (http://socialfirmseurope.org/) aims to create paid work for disabled and disadvantaged people and help individuals who face discrimination to overcome their social and economic exclusion through employment. Social Firms Network CEFEC wishes to raise awareness and enhance the profile of social firms and social cooperatives across Europe, to increase and serve the membership and to become more financially sustainable and influential as a European Network. CEFEC is active across Europe and organisations from outside Europe may also join. Recently the network has taken in an increasing number of members from Eastern Europe (such as Hungary, Romania). CEFEC is open to all industries that could help people with disabilities or disadvantages to find employment.

CEFEC has 43 members and its annual conference attracts around 150-200 participants. There are 3 types of members: full members (EUR 150 per year for organisations employing less than 20 people and EUR 300 per year for organisations with 20 or more employees); supporting organisation members (EUR 150 per year regardless of size); and individual members (EUR 25 per year). The secretariat has one employee, working 20%. The network is run by an Executive Committee, responsible for managing the association. It consists of member representatives, with a minimum of 3 members and a maximum equal to the number of countries represented in the network. Each member has to be from a different country. Currently, the Executive Committee has 15 members, including a treasurer, a secretary and a chairperson. A General Assembly brings together all the network's members and supporters, although only full and individual members have the right to vote. The Assembly decides on the following issues: changing the articles, appointing and letting go of members of the Executive Committee, dissolving the association and excluding members. CEFEC has an annual budget of approximately EUR 10 000. The bulk of the funding (EUR 8 500) comes from membership fees. About EUR 1 000 comes from projects, and around EUR 1 000 from conference donations. CEFEC has not used EU funding directly and nor is not planning to do so in the near term. However, they have had partnerships with other organisations that use EU funding for joint projects.

CEFEC was founded in 1987 by Mr Patrick Daunt, who was in charge of the EU office of Handicapped Affairs at the time. Initially the network focused on the mentally handicapped, but in 1989 the Social Firms' movement was widened in scope to include all disadvantaged people. In 1990 CEFEC became a legal body. In 2007 CEFEC issued the first LINZ-document, the 'LINZ APPEAL' which gives recommendations on Social Firms to the European Union and presents CEFEC's research in the area. The network collects data and evidence about the impact of Social Firms, facilitates networking and sharing of best practice among members, shares the skills and expertise of its members and encourages and explores opportunities for further research into the Social Firm model as it operates in various EU countries. Furthermore, where possible the network facilitates inter-trading opportunities between Social Firm businesses, organises annual conferences for its members and hands out the European Social Firm of the Year Award. The aims and activities are achieved mainly through annual conferences, but CEFEC's representatives have also attended other conferences to introduce the Social Firm model. So far CEFEC has not had direct participation because the network is very small and not very robust financially, as the majority of its income comes from membership fees. Although they cannot have EU-funded projects directly they partner with other organisations that can. For example, last year CEFEC partnered with ENSIE on their Progress Project, (funded by the EU) and hopes to continue the cooperation this year

CHAPTER 6. COMPETITIVENESS DEVELOPMENTS ALONG THE EXTERNAL BORDERS OF THE EUROPEAN UNION

Since the end of the Cold War, most countries sharing a border with the EU have gone through change on an unprecedented scale. In many ways the European Union has been an important factor behind this change: successive waves of EU enlargement have extended its external borders outwards from the borders of the founding Member States, turning former neighbours into current Member States while creating new neighbours along its new external borders. Enlargement has had an impact on the regional economy mainly via improved rule-of-law and business environment, new trade opportunities, foreign direct investment, cross-border purchases, commuter and migration flows, and through the acceleration of structural change (Smallbone et al. 2007). Moreover, the EU has acted as a driver of change outside its external borders by virtue of its economic and commercial importance for neighbouring states, as well as its insistence on respect for democratic principles and human rights.

Table 6.1 illustrates some of the changes over time, starting at a time when the EEC consisted of its six founding Member States, the combined population of which was around 200 million. Those six countries were surrounded by 15 countries with a combined population of some 170 million and a combined GDP of more than half the GDP of the EEC. Since then the number of Member States has more than quadrupled, the EU population has risen to half a billion citizens, and many of the 15 countries that surrounded the EEC in 1970 have themselves become Member States. With the expansion of its external borders at each stage of enlargement, the EU has gradually gained new neighbours and the number of countries surrounding the EU has increased from 15 to more than 20. In parallel with the increasing number of surrounding countries, their combined population has more than doubled, from 200 million in 1970 to 435 million today. In terms of output, however, the combined GDP of the countries surrounding the EU today is just a fraction of the latter's GDP. This is a reflection not only of the economic success of the EU, but mainly the fact that many of the countries surrounding it today are relatively poor and underdeveloped (whereas many of the countries surrounding it in 1970 were at an economic level comparable to that of the founding Member States).

Table 6.1. Member States and neighbouring states 1970–2010

Year	1970	1980	1990	2000	2010
Number of Member States	6	9	12	15	27
Number of neighbouring states	15	17	17	24	23
Member States' population in relation to population of neighbouring states	20% higher	70% higher	50% higher	15% lower	15% higher
Member States' total GDP in relation to total GDP of neighbouring states	60% higher	150% higher	330% higher	180% higher	340% higher

Source: Own calculations. Percentages are approximations.

The focus of this chapter is on the current and future economic and competitiveness situation in the countries surrounding the EU, with an eye to future-oriented implications. The following aspects will be specifically addressed:

- Description of the economic situation and competitiveness around the external borders of the EU.
- Existing agreements with the EU or with Member States; economic impact in terms of foreign direct investment (FDI) and trade of the agreements.
- Migration and remittances across the external borders of the EU; economic impact and impact on competitiveness.

On the basis of the analysis, conclusions will be drawn and policy implications formulated covering the challenges and opportunities arising for EU entrepreneurs and companies operating, or wishing to operate, on the other side of the external border.

6.1. THE RIM

The countries covered in this chapter are (shorthand names in brackets, used in the remainder of the chapter): Republic of Albania (**Albania**); People's Democratic Republic of Algeria (**Algeria**); Republic of Armenia (**Armenia**); Republic of Azerbaijan (**Azerbaijan**); Bosnia and Herzegovina (**BiH**); Arab Republic of Egypt (**Egypt**); **Georgia**; State of Israel (**Israel**); Hashemite Kingdom of Jordan (**Jordan**); Kosovo under UN Security Council Resolution 1244 (**Kosovo**)[110]; Lebanese Republic (**Lebanon**); **Libya**; Principality of Liechtenstein (**Liechtenstein**); Republic of Moldova (**Moldova**); Kingdom of Morocco (**Morocco**); Kingdom of Norway (**Norway**); Occupied Palestinian Territory (**Palestine**); Russian Federation (**Russia**); Republic of Serbia (**Serbia**); Swiss Confederation (**Switzerland**); Syrian Arab Republic (**Syria**); Republic of Tunisia (**Tunisia**); and **Ukraine**.[111]

In this chapter, these countries are referred to collectively as 'the Rim' – a concept borrowed from the European Rim Policy and Investment Council (ERPIC) but used here in a slightly different meaning. Within the Rim, the following four broad groupings of countries with similar characteristics can be identified:

- Advanced: Norway, Switzerland, Liechtenstein, Israel.
- Eastern Rim: Armenia, Azerbaijan, Georgia, Moldova, Russia, Ukraine.
- Western Balkans: Albania, BiH, Kosovo, Serbia.
- Southern Rim: Algeria, Egypt, Jordan, Lebanon, Libya, Morocco, Palestine, Syria, Tunisia.

The countries in the Advanced group are affluent, highly developed and competitive democracies. Through commercial links as well as agreements and programmes such as the European Economic Area (EEA)[112], the Schengen Agreement, and the Framework Programme for Research and Technological Development, these countries are linked to the EU and some can be considered Member States in all but name and institutions.

The Eastern Rim countries are all former Soviet republics and share the corresponding post-communist legacy. More than 20 years after gaining independence, most of them are still politically unstable and suffer from democratic deficits (to varying degrees). The majority of them are low-income to medium-income economies with a strong adverse legacy in their economic structures. Despite their relatively low per capita income level, they are highly industrialised and have an educated population and a relatively well-qualified labour force. Most Eastern Rim countries also have close ties with the EU in terms of culture, history and values. Russia (the EU's strategic partner) does not aspire to EU membership but is leading alternative integration processes in the region which, if based on WTO rules, could be compatible with and complementary to the work of the EU in the region, but which also give rise to speculation about geopolitical motives. Parts of the Eastern Rim are potentially competitive, in particular in selected high-technology niche sectors (related to space and military technology; metals, chemicals and food industries; tourism) and many of them are important for the supply and transit of energy to the EU. The negotiation of Deep and Comprehensive Free Trade Areas (DCFTAs) as part of (also currently negotiated) Association Agreements, has either started (Armenia, Georgia, Moldova) or has been completed but not signed for political reasons (Ukraine). Russian is a widely understood language in the Eastern Rim, an important asset for entrepreneurship and a factor facilitating regional integration. On the other hand, several 'frozen conflicts' (Armenia/Azerbaijan over Nagorno-Karabakh; Georgia over South Ossetia and Abkhazia, Moldova/Transnistria) remain unresolved and represent serious obstacles to deeper economic integration in the region.

110 Without prejudice to any positions on the status of Kosovo.

111 Croatia and most candidate countries (Iceland, Turkey, Montenegro, the Former Yugoslav Republic of Macedonia) are excluded from the analysis. Belarus, Andorra, Monaco, San Marino, and the Vatican State are also not included in this chapter.

112 Israel and Switzerland are not members of the EEA.

The Western Balkans share many of the characteristics of the Eastern Rim, but are already candidate countries or potential candidates for EU membership and therefore institutionally closer to the EU than the Eastern Rim. The region is fragmented and plagued by serious labour market problems (extremely high unemployment, migration). Despite persisting tensions and unresolved conflicts, the shared past has left a lasting positive legacy in the form of negligible language barriers (except for Albania and Kosovo). There is also a lasting commercial legacy in the form of the Central European Free Trade Agreement (CEFTA).

The Southern Rim economies enjoyed strong economic growth in the 1990s and early 2000s, following a series of economic reforms. Impressive though the reforms were, they proved unbalanced and unsustainable, giving rise to tensions and regional imbalances within countries that contributed to their current instability. The whole region is now in transition and has witnessed revolutions and outbreaks of violence (in Egypt, Tunisia, Libya, Syria, Palestine and Lebanon). Democratic processes, free and fair elections, and viable civil societies are key to sustainable and inclusive growth in the region and are welcomed by the EU. In the short term though, doing business remains a challenge in the Southern Rim and EU investment dropped sharply in 2011. The start of DCFTA negotiations with Egypt, Tunisia, Morocco and Jordan was approved by the Council in December 2011, marking a step forward in relations between the EU and those four countries as well as within the Agadir Agreement Free Trade Zone; the intraregional trade in the Southern Rim is among the smallest in the world.[113] Because of their demographic features, the majority of countries in the region face serious labour market challenges, even if official unemployment is lower than in the Western Balkans.

6.2. ECONOMIC SITUATION AND COMPETITIVENESS OF THE RIM COUNTRIES

Apart from Switzerland and Norway, the Rim is dominated by three large economies: Russia and Ukraine on the Eastern Rim; and Egypt in the South. The economic size of the Rim would be much smaller without these three big countries, which together account for more than half of the Rim's population and about half its GDP. In terms of the structure of the Rim economies, it is only in some energy-exporting countries – Algeria, Azerbaijan and Libya – that industry gross value added accounts for more than 50% of GDP.[114] Elsewhere, the majority of Rim countries are service-based economies (the share of services is very high in Albania, Armenia, Georgia, BiH, Moldova, Morocco and Syria), in many cases also with a relatively large agricultural sector.

In terms of their share of goods exports in relation to GDP, most Rim countries are not very open economies and, from that point of view, not very competitive. In the Southern Rim the lack of openness is clearly linked to the political obstacles to trade with neighbours in the region (closed frontiers between Morocco and Algeria, for instance). Several Rim countries specialise in services exports, the share of which in relation to GDP is higher than for the EU. Services exports from Rim countries are a mix of transport, tourism and financial services. Financial services are important in Lebanon and Switzerland, while tourism plays a decisive role in a number of Southern Rim countries (Egypt, Morocco and Tunisia). Transport services are fairly important in Georgia and Ukraine (mainly oil and gas pipelines).

Historically, more rapid GDP growth or industrial growth has not necessarily been associated with high export openness. In a number of Rim countries, especially in the East, relatively rapid GDP or industrial growth from 2000 to 2010 occurred without particularly high openness. In contrast to most 2004/2007 accession states and other emerging economies, any economic catching-up in Rim countries has been the result not of export-led growth but of expanding domestic demand, frequently financed from remittances or other transfers (Armenia, Georgia and Kosovo). In the Southern Rim, already existing regional imbalances and exclusion have been exacerbated by

[113] The 2004 Agadir Agreement between Morocco, Tunisia, Egypt and Jordan aimed at establishing a free trade area (FTA).

[114] The share of industry in another energy-exporting country, Norway, is also fairly high – more than 40% of GDP. By way of comparison, on average in the EU industry accounts for less than 17% of GDP; and in the 2004/2007 accession states it accounts for 23% of GDP.

the economic impact of free or special export zones. This has contributed to the recent revolutions.

Another common feature is the fairly high external imbalance of many Rim countries. Energy exporters (Azerbaijan, Russia, Algeria, Libya and Norway) run considerable trade and current account surpluses – close to 30% of GDP in the case of Azerbaijan – whereas the majority of resource-poor Rim countries report high or even very high (and unsustainable) external deficits (Armenia, Georgia, Albania, Kosovo, Lebanon and Palestine). Countries that fail to build up a viable export sector are particularly vulnerable to the kind of effects felt during the current economic crisis and have to adjust their economic policies accordingly (Gligorov et al. 2012).[115]

[115] A more comprehensive discussion of the different ways in which the economic crisis affected neighbouring economies can be found in European Commission (2010d, 2011b).

Table 6.2. Rim countries: overview of economic fundamentals, 2010

Country	Alb	Alg	Arm	Aze	BiH	Egy	Geo	Isr	Jord	Kos	Leb	Liby	Liec	Mol	Mor	Nor	Pale	Rus	Serb	Swit	Syri	Tuni	Ukr	EU
GDP at exch. rates, EUR bn	8.85	119	7.06	39.2	12.5	165	8.79	164	19.9	4.26	29.6	53.8	3.58	4.46	68.7	312	5.57	1115	29	399	44.7	33.4	104	**12k**
GDP at PPP, EUR bn	21.7	194	12.8	69.3	24.9	385	17.1	170	27.2	9.31	45.9	70.1	2.57	8.40	118	214	n/a	1808	62	286	83.1	76.9	249	**12k**
GDP at PPP, EU=100	0.18	1.58	0.10	0.57	0.20	3.14	0.14	1.38	0.22	0.08	0.37	0.57	0.02	0.07	0.96	1.74	n/a	15	0.51	2.34	0.68	0.63	2.03	**100**
GDP at PPP per cap, EUR=100	28	22	16	32	27	20	16	93	18	17	48	44	293	10	15	179	n/a	52	35	146	16	30	22	**100**
GDP volume, 1990=100	197	170	146	237	n/a	248	68.8	238	292	n/a	331	149	n/a	57.2	205	168	n/a	107	n/a	131	247	245	65.8	**143**
GDP volume, 2000=100	171	145	216	402	143	162	183	136	184	178	166	147	n/a	165	162	116	n/a	159	150	118	155	155	152	**116**
Industrial output, 2000=100	234	108	161	326	187	133	130	119	146	120	110	140	n/a	136	137	85	107	149	106	118	120	123	155	**103**
Share of industry in GDP %	8.9	54.5	14.8	52.6	17.8	37.5	12.1	27.0	34.3	20	17.7	78.2	36	13.2	37.3	40.1	24.3	26.7	18.4	26.8	33.7	30.0	24.4	**16.8**
Share of agriculture in GDP	16.8	11.7	17.4	5.4	7.1	14.0	7.3	3.0	2.8	12	4.8	1.9	6	11.9	19.9	1.2	21.6	3.5	8.0	1.2	21.0	7.8	7.2	**1.5**
Share of services in GDP %	74.3	33.7	67.8	42.0	75.1	48.5	80.6	70.0	62.9	68	77.6	19.9	58	74.8	52.8	58.7	54.1	69.8	73.6	72.0	45.3	62.3	68.4	**81.7**
Population (million)	3.21	36.1	3.25	9.05	3.84	77.8	4.45	7.43	6.11	2.21	3.91	6.56	0.04	3.56	31.9	4.89	4	143	7.30	7.79	21.0	10.5	45.9	**501**
Population, 1990=100	99.9	144	90.0	124	n/a	152	81	165	176	n/a	138	150	n/a	92	132	115	n/a	96.6	n/a	116	165	129	88.4	**n/a**
Population, 2000=100	105	119	101	113	102	123	100	122	126	n/a	110	123	n/a	98	112	108	n/a	97.5	97.1	108	127	110	93.3	**n/a**
Unemployment rate (LFS) %	15.0	10.0	7.0	5.6	27.2	9.0	16.3	6.7	12.5	45	6.4	n/a	3.2	7.4	9.1	3.6	24.0	7.5	19.2	4.6	8.4	13.0	8.1	**9.7**
Public debt, % of GDP	61.0	11.1	39.4	7.4	39.1	78	36.7	74.7	67	6.1	145	2.5	n/a	26.3	26.1	49.7	n/a	8.6	36.0	20.2	28.5	43.5	39.5	**80.2**
Price level, EU=100	41	61	55	57	50	43	51	97	73	46	64	77	n/a	53	58	146	n/a	62	47	139	54	43	42	**100**
Average wages, EU=100	8.9	n/a	7.9	11.0	22.4	n/a	9.3	n/a	n/a	n/a	n/a	n/a	151	7.0	n/a	210	n/a	18.9	16.6	182	n/a	n/a	7.7	**100**
Exports of goods, % of GDP	13.2	32.3	12.2	51.1	29.8	12.2	21.1	25.6	26.6	7.2	13.9	63.0	n/a	35.7	19.3	32.1	13.1	27.2	25.5	49.0	20.2	37.1	37.8	**30.4**
Imports of goods, % of GDP	36.8	26.8	33.7	13.0	55.7	21.2	43.2	26.7	51.7	47.6	45.2	37.4	n/a	85.4	35.8	18.0	65.4	16.9	42.0	46.6	25.8	47.4	44.2	**30.9**
Export of services, % of GDP	19.2	2.1	8.1	4.0	7.8	11.4	13.7	11.4	19.5	12.2	38.9	0.7	n/a	15.5	13.8	9.6	n/a	3.0	9.2	15.8	8.9	13.1	12.4	**9.7**
Import of services, % of GDP	17.2	8.4	10.7	7.3	3.6	7.4	9.2	8.3	16.1	11.1	33.2	8.6	n/a	17.3	8.2	10.4	n/a	5.0	9.2	7.5	5.3	7.6	8.8	**8.4**
Current account, % of GDP	–12	+7.9	–15	+29	–5.6	–2.0	–9.6	+2.9	–4.9	–15	–11	+14	+25	–12	–4.3	+12	–8.9	+4.8	–7.2	+16	–3.9	–4.8	–2.1	**–0.2**
Exports to EU, % of exports	70.1	52.0	49.6	47.6	54.5	35.5	18.7	26.0	4.2	44.7	15.3	75.7	62.4	51.9	59.3	80.9	2.1	52.6	57.3	58.7	35.6	72.1	25.4	**65.0**
Imports fr. EU, % of imports	64.6	52.9	23.0	25.3	45.9	27.1	28.3	35.0	20.9	38.3	36.5	48.3	89.0	43.4	51.8	63.3	8.1	41.6	56.0	77.5	25.0	57.3	31.4	**61.9**
Share of EU total exports, %	0.05	0.54	0.01	0.06	0.08	0.19	0.03	0.31	0.01	0.02	0.01	0.74	n/a	0.04	0.22	2.04	0.00	2.23	0.19	2.18	0.09	0.26	0.45	
Share of EU total imports, %	0.02	0.41	0.01	0.25	0.05	0.39	0.01	0.38	0.07	0.00	0.12	0.18	n/a	0.02	0.36	1.09	0.00	3.92	0.10	2.76	0.10	0.29	0.29	
Doing Business rank (2012)	82	148	55	66	125	110	16	34	95	117	104	n/a	n/a	81	94	6	131	120	92	26	134	46	152	**n/a**
Institutional arrangement	S	F	E	E	S	F	E	F	F	–	F	F	eea	E	F	eea	F	P	S	efta	F	F	E	**n/a**
FDI stock per capita, EUR	960	364	1000	400	1500	650	1300	8060	2341	n/a	6226	2138	n/a	600	967	27k	n/a	1750	2164	53k	272	2285	954	**10k**

PPP: purchasing power parity. LFS: labour force survey. S: stability and association agreement. F: free trade agreement. E: Eastern partnership. P: partnership and cooperation agreement. eea: European economic area. efta: European free trade association. k = thousand

Sources: Eurostat, national statistics, AMECO, IMF, UNCTAD, UN Comtrade, OECD, World Bank, Coface, European Commission and High Representative (2012c).

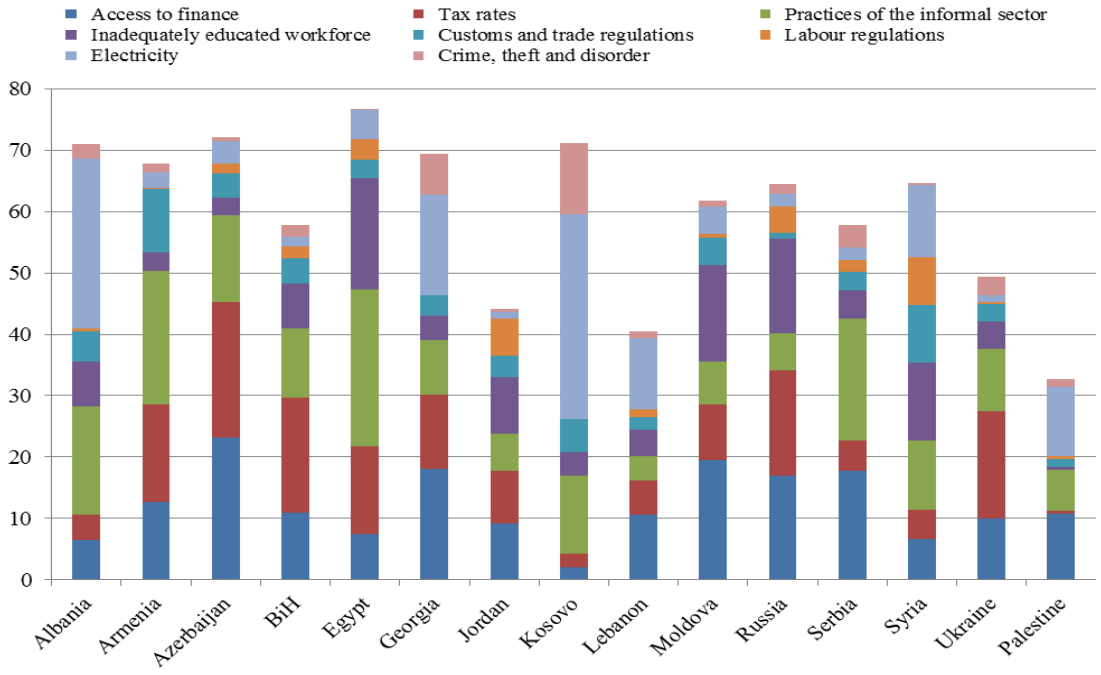
In absolute terms, the Rim countries are relatively minor EU trading partners. Less than 10% of total EU exports and less than 11% of total EU imports were accounted for by trade with the Rim countries in 2010. At the same time there is an asymmetry in the relative importance of EU-Rim trade. For most Rim countries, the EU is by far their most important export and import partner. This is especially true for the Eastern Rim (with the possible exception of Georgia). Distinct geographical trading patterns exist at the sub-regional level as well. Conversely, the competitiveness and trade balances of EU Member States such as France, Spain, Italy and Greece are significantly affected by their trade with Rim countries.

This trade asymmetry has important consequences for the competitiveness of the Rim. Any EU policy or measure that affects trade relations with the Rim countries, in particular a free trade agreement, has a disproportionately large impact on the latter countries. This also applies to individual EU Member States if they maintain particularly close trading links with certain Rim countries (cases in point include Poland and Ukraine, France and Tunisia, Spain and Morocco, and Romania and Moldova) or are trading in a particular sector.

Similarly, from an EU point of view the assessment of the competitiveness of Rim economies depends on the political situation, their investment climate and other conditions for doing business. Here again, the Rim countries differ widely (cf. Figure 6.1). Several Rim countries have improved the conditions for doing business in recent years, notably Morocco, Moldova and Armenia. According to the World Bank (2011a), SMEs that benefit most from these improvements are the key engines for job creation. In this context it is useful to note that SMEs employ 25% of the active work force in the Southern Mediterranean (European Parliament 2012).

Financial intermediation is generally underdeveloped in Rim countries, as demonstrated, for instance, by the relatively low percentage of firms that operate with a bank loan or a credit line. Lending practices thus pose a serious obstacle; a fact of particular relevance to the development of SMEs (Alvarez de la Campa 2011). The practices of the informal economy (crime and corruption) are frequently mentioned as important obstacles, especially in Eastern Rim countries. The Southern Rim has also long been faced with certain corrupt practices, for instance when obtaining an import licence, a construction permit, a mains electricity connection, or a government contract. It is too early to tell whether this will change in the wake of the Arab Spring and subsequent elections. Whereas only a small proportion of Rim firms possess an internationally recognised quality certificate, a relatively high proportion of firms use internet (slightly more in the East than in the South). By contrast, only a small percentage of firms use technologies licensed from abroad (again, more firms in the East than in the South).

Figure 6.1. Main obstacles to doing business (2009), shares (%) of firms surveyed



Source: Enterprise Surveys, World Bank.

In addition to overall rankings, the World Bank Enterprise Surveys provide a number of additional results which are relevant for assessing the business environment and competitiveness, particularly of SMEs. These indicators assess several areas with an impact on entrepreneurship and firm competitiveness (such as regulations and taxes, access to finance, corruption, crime, infrastructure, various characteristics of firms and labour, innovation and technology). In each country covered by the survey, several hundred firms – usually domestically-owned SMEs operating in the non-agricultural, formal, private economy – are surveyed. Figure 6.1 illustrates the eight most important obstacles to doing business in the Rim, as identified by respondents (usually the owners or managers of SMEs) in the individual Rim countries. These eight obstacles account for 60% to 70% of all obstacles surveyed in most Rim countries covered (except for Jordan, Lebanon, Ukraine and Palestine, where other obstacles were more important). The Euro-Mediterranean Charter for Enterprise was adopted by ministers in 2004 to address some of the obstacles. Inspired by EU policies to promote SMEs, it includes guidelines for spurring entrepreneurship and improving the business climate. Since its adoption, it has been a key document for guiding reforms in Mediterranean neighbouring countries. It has also been used as a platform for exchanging good practice across the Euro-Mediterranean area.

Labour regulations are not perceived as a major constraint by the majority of firms, especially in the more market-oriented and liberal Eastern Rim. An inadequately educated workforce is seen as a constraint by a substantial percentage of firms in the Southern Rim, in particular in Algeria, Egypt, Lebanon and Syria. In Eastern Rim countries, lack of education is perceived to be much less of a constraint: firms in those countries also employ fewer unskilled workers and – crucially important for competitiveness – a higher proportion of Eastern Rim firms offer their workers formal training (46% of firms in Armenia, and about 50% in BiH, Moldova, Russia and Ukraine). The fairly high level of qualification of the labour force also represents one of the key competitive advantages of Eastern Rim firms, despite a decline in the quality of education since the fall of the Soviet Union (OECD 2011).

6.3. Trade relations between the EU and the Rim

Most Rim economies are small and, with the exception of Russia, Norway, Switzerland and

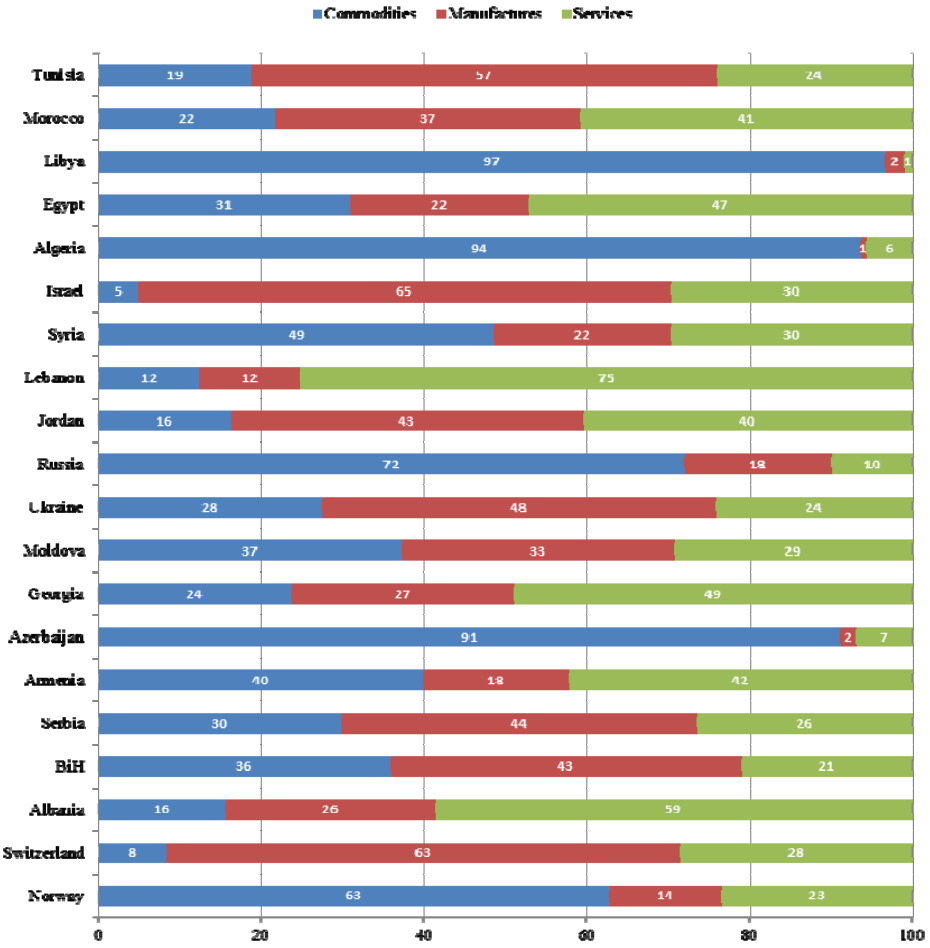
Israel, play a limited role in global trade. With the exception of Russia and Switzerland, none of these countries account for more than 1% of world import demand.

Grouping the Rim countries regionally, the Southern Rim and the Western Balkans each account for no more than 1.2% to 1.5% of global exports (WTO 2011). Were it not for the exports of Russia, the figure for the Eastern Rim would be of a similar magnitude.

Notwithstanding considerable liberalisation efforts in Eastern Rim and Southern Rim countries, overall Rim countries do not have successfully implemented the kind of extensive and export-led growth strategy that would diversify and upgrade their export base and integrate their economies into global trade networks. In terms of exports by broad economic sector, manufacturing is the least developed in Russia (where manufacturing accounts for 18% of total exports) and the Southern Rim. Switzerland is at the opposite end, as its export structure is geared towards manufactured goods (63% of total exports). Algeria, Libya, Azerbaijan and Russia, which depend mainly on commodity exports, are caught in a type of resource trap, where rents from natural resources turn out to be detrimental to export diversification and structural upgrading. The share of manufactured goods in total exports is also below the global average in Norway, due to its high share of energy exports.

Turning to services, in many countries the bulk of export revenues comes from 'traditional' service sectors such as travel (tourism) and, to a lesser extent, logistics and transport services. A disproportionately high share of services in overall exports can be observed in Albania, Armenia, Georgia, Lebanon, Egypt, Morocco and Tunisia. The lack of any significant manufacturing export base makes tourism (travel services) the single most valuable export item in resource-scarce, less-developed countries. Most of the resource-poor Rim countries – which should be more inclined to develop manufacturing capacities because they cannot rely on rents from natural resources – have not managed to diversify their exports enough and move into manufacturing (see Masood 2010; Eurochambres 2011, López-Cálix et al. 2010).

Figure 6.2. Export structure of Rim countries by broad sector (2010), shares (%)



Note: Commodity exports are calculated as merchandise exports less manufacturing exports. Data for Kosovo, Liechtenstein and Palestine are not available. For Syria and Libya, data refer to 2009.

Source: WTO database; background study.

As a consequence of the lack of an export manufacturing base some Rim countries, particularly in the South and the East, are forced to compete mainly on price in areas with static comparative advantages from natural resource endowments. Hence, their competitiveness in international markets remains based on the abundance of resources and, with the possible exceptions of Tunisia and Morocco, these countries are still in transition from 'factor-driven' to 'efficiency-driven' economies (Porter et al. 2002). While in developed economies such as the EU, Norway, Switzerland, Liechtenstein and Israel, innovation and technological leadership in products and services are key to success in international markets (cf. European Commission (2010c) for a discussion of Swiss and EU competitiveness in key enabling technologies), such factors are so little developed in most Rim countries that they offer no basis for export success. Hence the importance attached to the neighbourhood in the EU framework programme for RTD, and its support to science, technology and innovation through ENP programmes.

On aggregate, Rim countries account for some 27% of extra-EU merchandise exports and 29% of extra-EU merchandise imports. Of the 27% of extra-EU exports, more than a third (11%) are exported to EEA/EFTA countries, followed by Russia (6%) and North Africa (5%). The 29% of extra-EU imports come mainly from EEA/EFTA countries (11%) and Russia (also 11%), the latter largely due to energy imports.

Table 6.3. EU merchandise exports to Rim countries/groups of Rim countries (2010)

Exporter		Destination region: EEA-EFTA	Potential candidate countries	Eastern Partnership countries	Russia	North Africa	Mediterra-nean Middle East (excl. Israel)	Israel	Extra-EU total
EU27	value, million €	148198 (100%)	13253 (100%)	22936 (100%)	86131 (100%)	61882 (100%)	11236 (100%)	14405 (100%)	1349610 (100%)
	share of exports	10.98%	0.98%	1.70%	6.38%	4.59%	0.83%	1.07%	100%
	export growth	4.03%	8.97%	12.48%	14.25%	6.68%	5.44%	–1.22%	4.74%
DE, AT, Benelux	value, million €	70976 (47.9%)	3790 (28.6%)	8595 (37.5%)	38705 (44.9%)	15084 (24.4%)	3782 (33.7%)	6559 (45.5%)	596105 (44.2%)
	share of exports	11.91%	0.64%	1.44%	6.49%	2.53%	0.63%	1.10%	100%
	export growth	4.61%	9.40%	12.31%	14.34%	7.33%	5.64%	–1.85%	6.25%
Northern EU	value, million €	20038 (13.5%)	158 (1.2%)	934 (4.1%)	8179 (9.5%)	2677 (4.3%)	547 (4.9%)	636 (4.4%)	100352 (7.4%)
	share of exports	19.97%	0.16%	0.93%	8.15%	2.67%	0.54%	0.63%	100%
	export growth	3.66%	–0.48%	9.1%	9.45%	5.09%	3.60%	–1.95%	3.34%
Western EU	value, million €	13918 (9.4%)	216 (1.6%)	1154 (5.0%)	3960 (4.6%)	3171 (5.1%)	1008 (9.0%)	1692 (11.7%)	178043 (13.2%)
	share of exports	7.82%	0.12%	0.65%	2.22%	1.78%	0.57%	0.95%	100%
	export growth	1.98%	7.79%	11.78%	12.27%	2.40%	4.51%	–5.10%	1.39%
Southern EU	value, million €	34884 (23.5%)	3759 (28.4%)	3304 (14.4%)	16639 (19.3%)	38151 (61.7%)	4961 (44.2%)	4190 (29.1%)	375763 (27.8%)
	share of exports	9.28%	1%	0.88%	4.43%	10.15%	1.32%	1.11%	100%
	export growth	2.68%	6.80%	9.65%	12.27%	6.68%	5.00%	–0.31%	3.35%
Eastern EU	value, million €	8382 (5.7%)	5330 (40.2%)	8949 (39.0%)	18649 (21.7%)	2800 (4.5%)	938 (8.4%)	1328 (9.2%)	99347 (7.4%)
	share of exports	8.44%	5.36%	9.01%	18.77%	2.82%	0.94%	1.34%	100%
	export growth	18.84%	11.82%	22.68%	26.65%	16.94%	11.75%	17.38%	17.81%

Source: Eurostat Comext; background study.

Table 6.4. EU merchandise imports to Rim countries/groups of Rim countries (2010)

Importer		Source region: EEA-EFTA	Potential candidate countries	Eastern Partnership countries	Russia	North Africa	Mediterra-nean Middle East (excl. Israel)	Israel	Extra-EU total
EU27	value, million €	163687 (100%)	7152 (100%)	22587 (100%)	160058 (100.0)	74801 (100%)	4213 (100%)	11087 (100%)	1509090 (100%)
	share of imports	10.85%	0.47%	1.50	10.61	4.96%	0.28%	0.73%	100%
	import growth	3.99%	13.77%	13.37	9.64	5.22%	0.46%	0.45%	4.28%
DE, AT, Benelux	value, million €	76196 (46.5%)	2038 (28.5%)	4411 (19.5%)	60028 (37.5)	14324 (19.1%)	1998 (47.4%)	4969 (44.8%)	622667 (41.3%)
	share of imports	12.24%	0.33%	0.71	9.64	2.3%	0.32%	0.80%	100%
	import growth	5.73%	14.81%	8.82	11.11	3.06%	0.99%	–0.56%	5%
Northern EU	value, million €	16467 (10.1%)	53 (0.7%)	219 (1.0%)	15247 (9.5)	400 (0.5%)	23 (0.5%)	232 (2.1%)	74488 (4.9%)
	share of imports	22.11%	0.07%	0.29	20.47	0.54%	0.03%	0.31%	100%
	import growth	2.24%	2.00%	13.56	12.14	9.46%	2.86%	–3.17%	3.86%
Western EU	value, million €	30688 (18.7%)	118 (1.7%)	524 (2.3%)	5888 (3.7)	4327 (5.8%)	91 (2.2%)	1661 (15.0%)	220122 (14.6%)
	share of imports	13.94%	0.05%	0.24	2.67	1.97%	0.04%	0.75%	100%
	import growth	4.96%	12.51%	10.41	6.07	4.79%	–5.66%	–1.38%	0.87%
Southern EU	value, million €	35056 (21.4%)	2586 (36.2%)	11016 (48.8%)	37630 (23.5)	54833 (73.3%)	2002 (47.5%)	3338 (30.1%)	453528 (30.1%)
	share of imports	7.73%	0.57%	2.43	8.30	12.09%	0.44%	0.74%	100%
	import growth	1.13%	9.64%	16.59	8.36	5.86%	0.03%	2.52%	4.18%
Eastern EU	value, million €	5280 (3.2%)	2357 (33.0%)	6417 (28.4%)	41265 (25.8)	916 (1.2%)	99 (2.3%)	887 (8.0%)	138288 (9.2%)
	share of imports	3.82%	1.70%	4.64	29.84	0.66%	0.07%	0.64%	100%
	import growth	9.08%	22.82%	18.43	14.65	9.95%	11.82%	10.39%	14.39%

Source: Eurostat Comext; background study.

Tables 6.3 and 6.4 show bilateral trade relations between parts of the EU and individual Rim countries or groups of countries and provide a clear illustration of the heterogeneity of EU Member States in this respect. It is clear that the Rim is not necessarily a focus area for core EU Member States such as Germany, Austria and the Benelux countries. The same is true for Northern EU, albeit with the qualification that it is clearly overrepresented in trade with the EEA/EFTA (because of Norway) and strongly underrepresented in trade with Israel. Western EU is underrepresented in exports to all Rim regions, as its trade is more concentrated on the USA and Japan. By contrast, parts of the Rim are important export destinations for Southern EU countries and also for Eastern EU – Southern EU accounts for 62% of total EU exports to North Africa. Two obvious reasons for this are their geographical proximity and colonial heritage. Another clearly discernible pattern is the export orientation of Eastern EU towards the Eastern Rim, a legacy of previous economic relations within Central and Eastern Europe. The share of Eastern EU exports to total EU exports to the potential candidates in the Western Balkans is also high (40%), again explained by their geographical proximity and the close trade relations that used to exist within Yugoslavia and now prevail in the Central European Free Trade Agreement (CEFTA).

Primary commodity exports (apart from oil) account for a significant share of exports to the EU from a number of Rim countries, including Armenia, Georgia and Ukraine (Table 6.5). Countries such as Tunisia and Morocco, Moldova, Ukraine, Georgia and the Mediterranean Middle East tend to export a proportionally higher share of agricultural sector output to the EU. However, agricultural exports from these countries to the EU are sometimes hampered by non-conformity with EU legislation on food safety and animal feed (Eurochambres 2011). Turning to manufacturing,

bilateral trade relations between the EU and resource-rich Rim countries mirror the general export structure of the latter, characterised by a lack of manufactured goods (with the notable exception of Switzerland and Israel). Rim countries generally have industrial export capacities in 'early stages' manufacturing industries with low technology intensity, such as agricultural products and textiles. The textile industry, for example, constitutes 45% of Albania's total exports to the EU; the share is similar for Moldova and somewhat lower, around 34%, for Morocco and Tunisia. The food industry is a strong export sector in Serbia (13% of total exports) and Lebanon (11%); it is also important for Ukraine and Kosovo.

Table 6.5. EU exports to and imports from EaP countries by product category

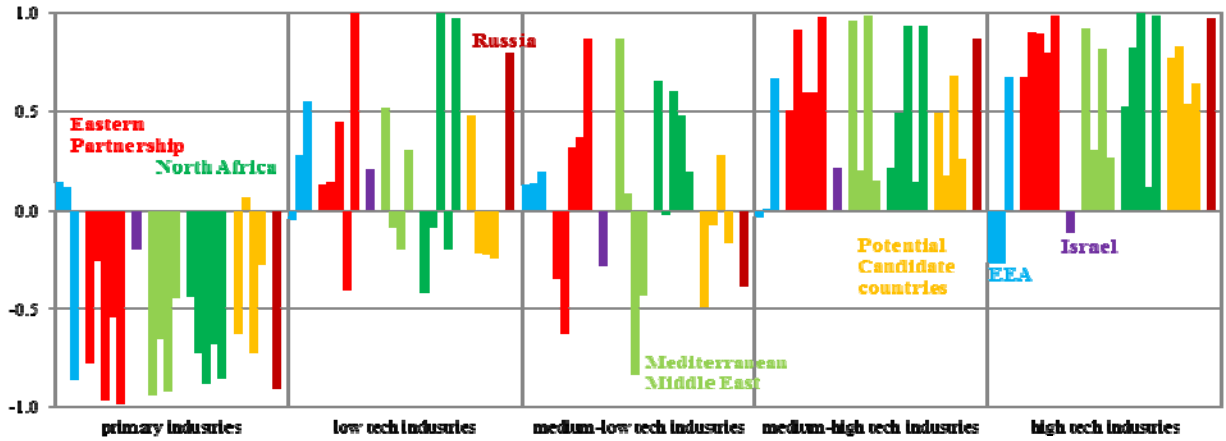
	Exports to EaP countries		Imports from EaP countries	
(EUR million)	January-June 2010	January-June 2011	January-June 2010	January-June 2011
Manufactured goods	**10625**	**13672**	**3784**	**5733**
– chemicals	2360	2807	413	776
– machinery and vehicles	4757	6781	676	842
– other manufactures	3509	4083	2695	4114
Primary goods	**1983**	**2543**	**7662**	**11732**
– food and drink	1058	1287	285	720
– raw materials	288	385	1525	2025
– energy	638	871	5852	8988
Other	198	274	207	284
Total	**12807**	**16489**	**11652**	**17749**

Source: Eurostat.

Countries wishing to build up manufacturing often start by developing their export capacities in the textile, leather and first processing food industries, as these sectors depend more on cheap labour than on technology. However, increasingly globalised supply chains and greater opportunities for multinational firms to relocate production processes to other countries have made it possible for countries to attract the foreign direct investment associated with such offshoring activities and move straight into more technology-intensive industries. This has happened, for example, in some 2004/2007 accession states now integrated in the European automotive industry network. Outside Europe it has taken place in China, Malaysia and Thailand, which have become part of the Asian electronics cluster originally formed around Japan and South Korea. However, in the current economic climate such developments can be observed only on a small scale and in a small group of Rim countries such as Serbia and BiH among the Western Balkan countries, and Tunisia and Morocco in the South.

While imports from the Rim countries tend to be concentrated to certain goods, mainly primary commodities, EU exports to the Rim are well diversified and reflect the overall export structure of the EU, with a focus on manufactured goods related to transport equipment, chemicals and machinery, as well as electronics. Taking the revealed comparative advantages (RCAs) of the trade of the EU as a proxy for sectoral competitiveness, the EU has a pronounced comparative disadvantage in primary industries, including agriculture, fishing, mining and quarrying (cf. Figure 6.3). By contrast, the EU has a strong revealed comparative advantage in high-technology and medium-high-technology industries such as chemicals (except pharmaceuticals), machinery and automotives. Its revealed comparative disadvantage in low-technology industries is mainly due to the fact that several Rim countries (Albania, BiH, Moldova, Morocco, Tunisia and Egypt) have substantial textile industries. In the medium-low-technology industries, the metals and mineral industries explain the positive RCAs of Armenia and Ukraine. In the case of Russia, it is mainly the petroleum-refining industry that explains the revealed comparative disadvantage of the EU. As regards the EEA/EFTA countries as well as Israel, the EU is in almost the opposite position – at least in its trade with Switzerland, Liechtenstein and Israel – since it has positive RCAs in low-technology and medium-low-technology industries, but a comparative disadvantage in high-technology industries.

Figure 6.3. Revealed comparative advantages (RCAs) in EU trade with the Rim; industries classified by technology content (2010)



Note: Industry groupings according to OECD technology classification (OECD 2003).
Source: Eurostat Comext; background study.

Box 6.1. Effects of EU trade liberalisation

Almost all Rim countries have signed free trade agreements (FTAs) with the EU; where such agreements do not exist there tend to be EU autonomous trade measures (ATMs) or a generalised system of preferences (GSP) in their place. As a consequence, the average EU tariff rate vis-à-vis the Rim was no more than 1.4% in 2010. By contrast, EU exporters face an average weighted tariff rate of 5% when exporting to the Rim countries, with some rates reaching as high as 19%. As a core component of the Europe 2020 strategy for growth, EU trade policy pursues 'deep and comprehensive FTAs' (DCFTAs) as part of future Association Agreements within the framework of the Eastern Partnership and the Euro-Mediterranean Partnership. The aim is to bring all its neighbours gradually closer to the single market through regulatory convergence. As a result, the average tariff faced by EU exports of industrial products is expected to fall from 5% to about 1.7%. The combined growth effects of its different FTAs would be to add up to 1.5% to EU GDP in the long term (European Commission 2010a; European Commission 2011b).

6.4. Foreign direct investment effects

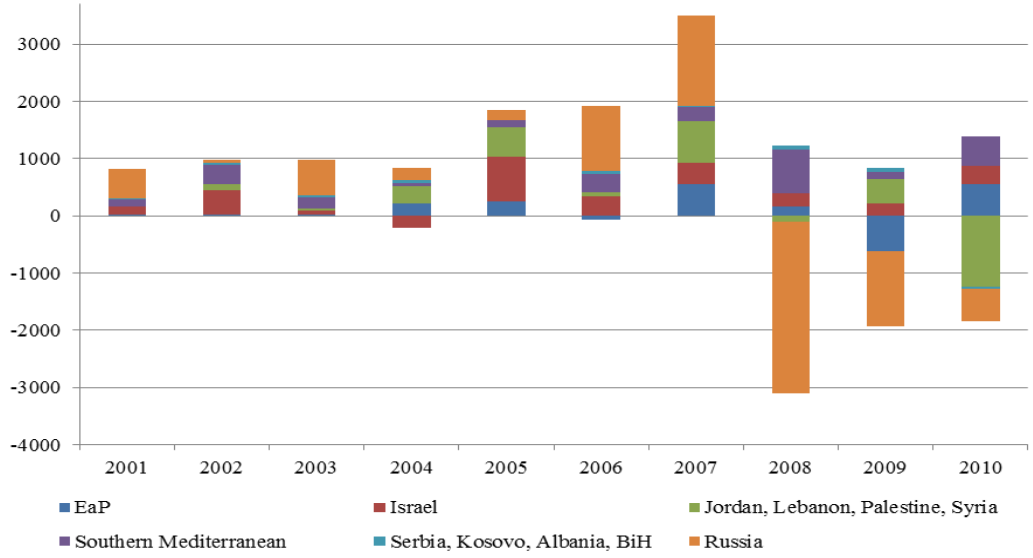
Foreign direct investment (FDI) – discussed in a previous chapter of this report – illustrates the intensity at firm level of integration between countries. The ability to attract inward FDI flows confirms the competitiveness of a host country location for production and services. The intensity of outward FDI flows, on the other hand, indicates the competitiveness of home country multinational corporations (MNCs) in capturing foreign markets. Companies expand abroad either to capture new markets (horizontal or market-seeking FDI) or in order to optimise their production by allocating stages of production to the most efficient location (vertical or efficiency-seeking FDI). Both types of FDI have important growth effects at firm level by increasing production, expanding into new markets and reducing production costs. FDI also has productivity effects as a result of economies of scale and lower production costs. In addition, FDI may provide access to scarce natural, human and R&D resources (resource-seeking FDI). Globally, outsourcing activity has declined during the current crisis, and in future 'near-shoring' may be preferred to 'far-shoring' FDI. This provides an opportunity for the Rim countries to benefit from EU offshoring. The aims of analysing the size of FDI flows between the EU and the Rim countries are to determine the existing intensity of direct investment links, explore the impact of these links on the competitive position of Member States, and look for location advantages in the region that could be exploited by EU firms in years to come.

In recent years, the EU has intensified its FDI exchanges with countries outside the EU. Inward FDI flows from the Rim have fluctuated around their average of EUR 16.9 billion over the last ten years (24.4% of total extra-EU inward flows). In 2007, inward FDI from the Rim peaked at EUR 38.4 billion, followed however by almost no inward flow in the subsequent year. In 2010, firms in Rim countries invested EUR 14.5 billion in the EU. The last three years point to lower-than-average inward flows from the Rim, indicating a

possible loss of competitiveness of this region on EU markets.

In terms of outward FDI flows from the EU, the share of the Rim was 42% (EUR 84.6 billion) in 2009 and 28% (EUR 55.2 billion) of total extra-EU FDI in 2010, far above the ten-year average of 17%. The Rim countries have thus benefited from the shift of FDI to extra-EU countries (cf. Chapter 4.3). Among the Rim countries, Norway and in particular Switzerland naturally account for the bulk of outward FDI from the EU to the Rim and of inward FDI to the EU from the Rim. Inward FDI flows from the rest of the Rim are on a much smaller scale and have been characterised by divestment in 2008–2010 (Figure 6.4), whereas the same countries have received significant FDI flows from the EU (Figure 6.5). Particularly large outward flows from the EU to the region were recorded in the run-up to the current economic crisis. This reflects the global trend towards a peak in international FDI in 2008, followed by much smaller FDI flows subsequently, as a result of the crisis.

Figure 6.4. Inward FDI flows to the EU from the Rim (excl. EEA/EFTA), EUR million



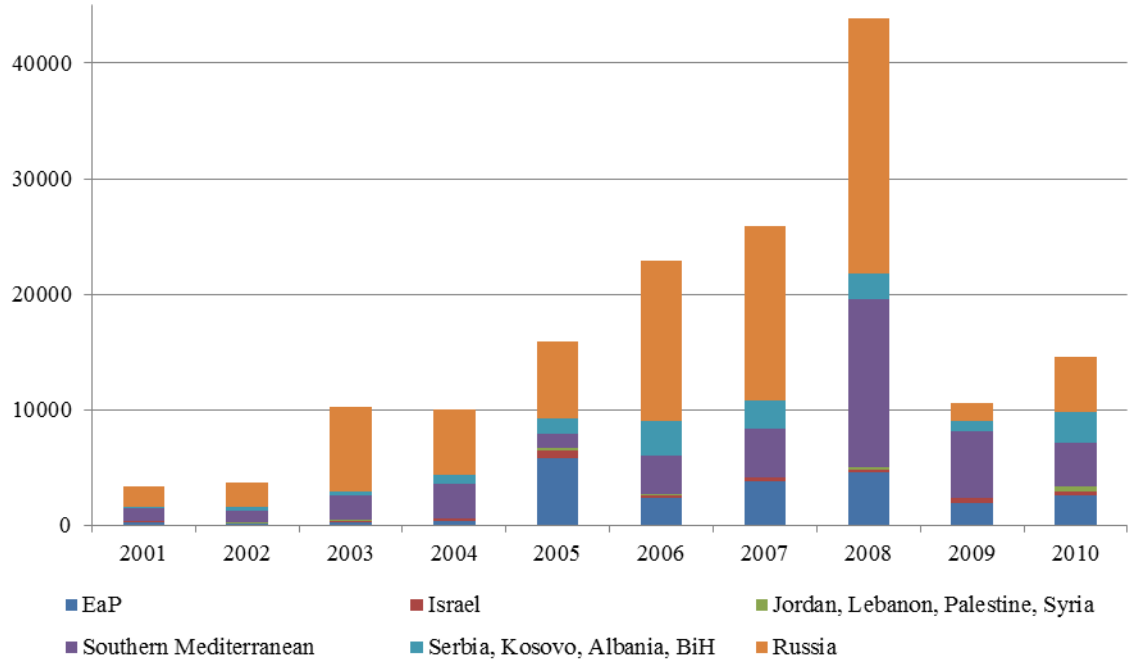
Note: EU is EU25 for 2001–2003, EU27 for 2004–2010. EU flows calculated as the sum of flows to Member States. Intra-EU flows to Luxembourg are adjusted downwards by 90% in order to exclude activities of special purpose enterprises (SPEs). Extra-EU flows exclude offshore centres (Guernsey, Jersey, Isle of Man, Gibraltar, Bahamas, Bermuda, British Virgin Islands, Cayman Islands, Netherlands Antilles).

Source: Eurostat; background study.

A closer look at inward FDI to the EU from non-EFTA Rim countries reveals Russia to be the main investor. Russian firms accounted for most inward non-EFTA FDI in 2006 and 2007 (Figure 6.4) but were also responsible for the massive capital withdrawals afterwards.

Until 2008, Russia was also the prime destination for outward non-EFTA FDI, often with more than half of total non-EFTA flows (Figure 6.5). As a result, EU companies account for an overwhelming share (83%) of the total FDI stock in Russia. It should however be noted that no less than a third of the EU stock of FDI in Russia is owned by Cypriot firms, making Cyprus the largest investor country in Russia. The large Cypriot stock is mainly the result of flows of Russian capital being channelled through Cyprus for tax purposes, so-called round-tripping (Hunya and Stöllinger 2009). Proper EU investments in the Russian real economy may therefore be overstated by as much as a third.

Figure 6.5. Outward FDI flows from the EU to the Rim (excl. EEA/EFTA), EUR million



Note: EU is EU25 for 2001–2003, EU27 for 2004–2010. EU flows calculated as the sum of flows to Member States. Intra-EU flows to Luxembourg are adjusted downwards by 90% in order to exclude activities of special purpose enterprises (SPEs). Extra-EU flows exclude offshore centres (Guernsey, Jersey, Isle of Man, Gibraltar, Bahamas, Bermuda, British Virgin Islands, Cayman Islands, Netherlands Antilles).

Source: Eurostat; background study.

Another important destination for EU investments in the non-EFTA part of the Rim is the Southern Rim, in particular Egypt and Morocco. Over the last ten years, both countries have received about EUR 1 billion each per year in FDI from the EU, while Morocco has increased its share of total EU FDI, from 6% in 2000 to about 16% in 2009 (Zachmann et al. 2012). Host country statistics reveal that in Algeria, Egypt and Libya, most FDI went into the petroleum industry, while FDI flows to the manufacturing sector were much smaller (between 4% and 8% of the total). The EU is the leading investor (based on announced projects listed at www.animaweb.org) in the Southern Rim, followed by the Gulf countries. The strong role of the EU can be attributed to its geographical proximity and historical ties with the Southern Rim: France, Italy and Spain have retained strong links with North African countries, while British firms are in a strong position in Egypt (Zachmann et al. 2012). Significant FDI liberalisation measures since the mid-2000s have given a boost to FDI, in particular in 2006–2008. Nonetheless, the upswing was followed by setbacks, first in the form of the global crisis and then, in 2011, the events of the Arab Spring. The revolutions interrupted a period of rapid economic growth and had a negative impact on both trade and FDI.

Economic reforms to make Southern Rim countries more attractive to FDI have included privatisations in the telecommunication and banking sectors, in particular around 2005/2006. In addition, the influx of petrodollars from the Gulf States has pushed up prices and activity in the real estate sector. In Egypt for example, increasing FDI in the energy and service sectors followed a policy change in 2006, when some state-owned assets were privatised and foreign investors gained more access. Similar policy changes took place in Tunisia, triggering a rise in FDI in 2006. But even in those two countries, several business sectors remain largely off-limits to foreign investors, mainly media, air transportation and natural resources.

Another way to look at the development of foreign investment is to see when and where new greenfield

projects have been announced. The number of greenfield FDI projects undertaken by EU-based MNCs reached a high in 2008, when it was higher than in any of the three years before or since. Whilst the impact of the current crisis has so far been limited, the number of new projects has declined in each of the past three years. With a fifth of all projects, Germany is the Member State investing the most in the Rim, followed by France and the UK. Over the last eleven years, the main focus of investments by EU MNCs has been Russia (47% of all EU projects and 51% of total EU pledged investment). Ukraine attracted much less FDI from MNCs in the EU: 11% of the projects and 6% of the investment capital, which is relatively little considering the size of the economy. In the Western Balkan countries, especially Serbia, there have been a remarkably high number of projects relative to their size. Among the Southern Rim countries, Morocco and Tunisia also have relatively numerous projects in different industries, confirming that these countries have a comparatively liberal attitude to FDI. EU Member States have been involved in more than 70% of the greenfield investment projects in Serbia, Tunisia, Morocco and BiH. While Germany, Austria and Italy were the main investors in the Western Balkan countries, France and Spain were important investors in Morocco, and France by far the most frequent investor in Tunisia. Egypt is a special case, as it combines a late opening of a large market with an important oil sector. The other big oil producers in the European neighbourhood – Azerbaijan, Algeria and Libya – attracted a small number of high-capital projects. The other Rim countries are either too small or provide a less liberal environment to attract FDI from EU MNCs on a big scale; most of their new FDI projects tend to come from historical and geographical allies.

Difficult local business conditions (cf. Section 6.2 above) are the main obstacle to FDI. However, reforms undertaken since the early 2000s have made it easier to do business in several countries and have contributed to an upswing in FDI. Morocco, Tunisia and Serbia, but also the other Western Balkan countries, have been successful in this regard and have attracted FDI in the manufacturing sector as well as a relatively high number of greenfield investment projects, often involving SMEs. EU policies fostering trade and FDI and supporting the liberalisation process have been beneficial for both parties, and for MNCs and SMEs alike. Supporting open and fair competition and shaping a transparent and predictable business environment could provide more opportunities for further FDI and SME development in Rim countries.

Apart from the business environment, the investment risk of the destination country is also a factor to consider and has to be weighed against the expected return on the investment. According to the latest country risk assessment published by Coface, only two Rim countries, Norway and Switzerland, are in the lowest risk category (A1). Israel is rated third in terms of risk, marginally ahead of Morocco and Tunisia. Libya is the Rim country where it is most risky to invest. BiH, Moldova, Syria and Ukraine are also rated as high-risk countries for investment, but slightly less risky than Libya (Coface 2012).

6.5. Southern Rim: fostering North-South and South-South economic integration

The Euro-Mediterranean Partnership gained momentum in 1995 with the Barcelona Declaration and the established goal of a common area of peace, stability and shared prosperity around the Mediterranean. The current goal is the creation of a deep Euro-Mediterranean free trade area, aimed at substantial trade liberalisation both between the EU and Southern Rim countries (North-South) and between Southern Rim countries (South-South). Relations between the EU and the Southern Mediterranean are currently organised mainly through bilateral Euro-Mediterranean association agreements (apart from Syria and Libya). The Association Agreements with Jordan, Egypt, Israel and Morocco have been revised based on the 2005 Rabat Roadmap for Agriculture and the Euro-Mediterranean ministerial mandate to proceed with further trade liberalisation in the areas of agriculture, processed agriculture and fisheries. In these areas, the new trade arrangements negotiated in 2008–2011 have led, or will lead, to a significant opening of agro-food markets on both sides of the Mediterranean. A further leap forward in Euro-Mediterranean cooperation took place on 14 December 2011, when a fresh round of trade negotiations was launched with Egypt, Jordan, Morocco and Tunisia with the aim to establish deep

and comprehensive free trade agreements (DCFTAs) which will go beyond the mere removal of tariffs and cover all regulatory issues relevant to trade, e.g. investment protection, intellectual property rights, competition and public procurement. Moreover, in 2012 Jordan and Tunisia joined the European Bank for Reconstruction and Development (EBRD). The Bank will be able to invest up to EUR 2.5 billion a year across the Southern Rim, following the recent decision to extend its activities to the Southern and Eastern Mediterranean. At the same time, loans from the European Investment Bank (EIB) are guaranteed by the EU to all Southern Rim countries except Syria.

The EU will also support capacity building and intends to pay particular attention to measures to enhance regional economic integration, in particular the process launched within the framework of the Agadir Agreement (FTA between Egypt, Jordan, Morocco and Tunisia). Since 1996, the Commission has coordinated the Euro-Mediterranean industrial cooperation process, with the aim to spur entrepreneurship and improve the business environment in the Mediterranean neighbouring countries. This process strengthens Euro-Mediterranean economic integration and helps companies, in particular SMEs, on both sides of the Mediterranean to start, grow, export and do business together in a safe, predictable, transparent environment. The Commission has stated its intention to upgrade the existing Euro-Mediterranean Charter for Enterprise (European Commission et al. 2008) into a Euro-Mediterranean Small Business Act and to extend EU cross-sector and sector-specific networks and actions to Southern Mediterranean partner countries (European Commission and High Representative 2012a).

Fostering regional (South-South) economic integration is one of the key objectives of the Euro-Mediterranean industrial cooperation and trade partnership, and an essential element in the move towards establishing a fully-fledged Euro-Mediterranean free trade area. However, regional economic integration between Southern Mediterranean countries is still limited: intra-regional trade accounts for a small fraction of the total trade of Southern Rim countries (6% of exports, 5% of imports); many of the borders are either closed or subject to burdensome procedures, and there is little infrastructure in place for South-South logistics. In spite of progress and reforms made (cf. European Commission et al. 2008), SMEs still face extraordinary challenges both in access to finance, starting up new businesses and in maintaining or extending existing businesses. At the same time SMEs are of fundamental importance in the Southern Rim region in at least two specific areas: job creation and economic diversification. Appropriate financing of SMEs is a precondition for a more dynamic development of the region. To that end the European Commission has established a special instrument to foster financing of the private sector, including SMEs. Both the EIB and the EBRD intend to intensify their activities in Southern Rim countries.

6.6. EASTERN RIM: HESITANT INTEGRATION

At present, the main institutional arrangements underlying relations between the EU and Eastern Rim countries are bilateral partnership and cooperation agreements (PCAs). As regards the economy, PCAs aim at fostering trade, ensuring a level playing field for investments through the principle of 'national treatment' (non-discrimination of foreign investments), and promoting cooperation in a number of priority areas. Most PCAs do not envisage a free trade regime between Eastern Rim countries and the EU but offer a 'most favoured nation' (MFN) treatment of exports from Eastern Rim countries to the EU.

Except for Russia, all Eastern Rim countries are also party to the Eastern Partnership (EaP) initiative launched in May 2009. The EaP aims to 'create necessary conditions to accelerate political association and further economic integration' of Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine with the EU. Cooperation within the EaP framework has concentrated on four broad areas: democracy and governance, economic integration, energy security, and contacts between people (including visa liberalisation). Within these four areas, a number of flagship initiatives have been launched: on integrated border management, support for SMEs, energy efficiency, civil protection, and the environment. The task now is to press ahead with the negotiation of AAs with four of the six EaP partners, including DCFTAs where appropriate, and to enhance the mobility of people through visa facilitation and re-admission

agreements, as well as gradual steps towards visa liberalisation..

The current EU strategy towards EaP countries is to negotiate DCFTAs, as part of broader Association Agreements. The purpose is to integrate EaP countries into the EU single market in trade-related areas, to the extent justified by their economic profile and level of development. In December 2011, DCFTA negotiations were completed with Ukraine and opened with two other EaP countries: Georgia and Moldova (European Commission and High Representative 2012a). Armenia followed suit in 2012. As regards Azerbaijan, its WTO accession is a precondition for any future tightening of relations, therefore current negotiations on an Association Agreement merely include an update on the trade part of the PCA (European Commission and High Representative 2012b). As regards Russia, an agreement on greater compatibility in the updated PCA is a precondition for further deepening of EU-Russia trade relations on a preferential basis. A free trade agreement (rather than a DCFTA) is a long-stated common objective but has become more difficult to pursue in the short to medium term in the light of the customs union between Russia, Kazakhstan and Belarus.

The aims of the DCFTAs are to liberalise trade in goods and services and ensure an approximation of legislation to EU standards in areas that have an impact on trade, such as competition policy, public procurement, customs and trade facilitation, technical barriers to trade, sanitary and phytosanitary rules, sustainable development, and intellectual property rights. The idea is to create, through the adoption of these reforms, a favourable business climate in order to accelerate the flow of EU FDI into the country, as well as to boost exports to the EU of products that do not currently meet essential EU safety requirements (De Gucht 2011).

DCFTAs are expected to have significant and positive effects on EaP economies because of the potential benefits of the structural reforms that they require. Francois and Manchin (2009) found that a simple FTA with the EU would lead to a decline in the GDP of the Commonwealth of Independent States of between 1.1% and 1.4%, depending on whether or not trade in agricultural and food products is liberalised. In contrast, a DCFTA with the EU would boost their GDP by 1.2%. Maliszewska et al. (2009) also expected deep integration with the EU to have positive effects on the EaP countries, with the greatest benefits for Ukraine, whose GDP would be 5.8% higher in the long term, followed by Armenia (3.1% higher), Azerbaijan (1.8%) and Georgia (1.7%). These overall gains would, however, be accompanied by profound structural changes and the output of some sectors would go down drastically. The Institute for Economic Research and Policy Consulting has found that a DCFTA with the EU would increase welfare in Ukraine by nearly 12% in the long term – more than twice the figure to be expected in the case of a simple FTA with the EU (Movchan and Giucci 2011). In a similar vein, the experience of Turkey, whose entry into a customs union with the EU in 1995 was accompanied by the approximation of various policies to EU standards, also suggests strongly positive effects (Togan 2011).

Failure to conclude DCFTAs would have negative consequences for both sides: the EaP countries would find themselves stuck in the current trap of low competitiveness and instability, while at the same time the competitiveness of EU businesses in the EaP countries would suffer. For instance, the unreformed (and in many cases corrupt) system of public procurement in EaP countries would continue to disadvantage foreign suppliers (including those from the EU) and hamper the development of SMEs.

6.7. LABOUR MARKETS AND MIGRATION

The impact of increased labour migration from Rim countries is of particular interest to EU policymakers. The Southern Mediterranean region is recognised as a region of emigration, with the total number of first-generation emigrants somewhere between 10 million and 13 million (World Bank 2011b). Increasing differences in economy, demography, politics and security matters, together with its geographical proximity, make the EU the main destination for migrants from the region. Immigrants from Mediterranean neighbouring countries represent 20% of the 30 million immigrants in the EU and 1.2% of the total EU population. Following the Arab Spring, the flow of migrants from the region is expected to rise. Moreover, the region is a transit route for migrants from other, more distant and even less developed

regions. Consequently, EU migration policy towards this region can be expected to evolve significantly and gain even greater prominence.

The promotion of the mobility of EaP citizens represents one of the main commitments made by the EU in the Prague Declaration of the Eastern Partnership Summit (May 2009) as well as in the Joint Communication on a new response to a changing Neighbourhood (European Commission and High Representative 2011) and the subsequent Joint package on delivering a new European Neighbourhood Policy (European Commission and High Representative 2012a). As a contribution to a more ambitious partnership with its Eastern neighbours, this commitment builds on the four pillars of the global approach to migration of the EU: better organising legal migration and fostering well-managed mobility; preventing and combating irregular migration/eradicating trafficking in human beings; maximising the development impact of migration and mobility; and promoting international protection, and enhancing the external dimension of asylum. The Western Balkan countries, some of which are candidates or potential candidates for EU membership and most of which (apart from Kosovo) have recently benefited from visa liberalisation, are experiencing a new migration development, since their citizens no longer need a visa to travel to the EU (except for Kosovo citizens).

The development of migration management systems has been uneven across regions, not least because of differences in available resources and in the general development of the quality of public institutions. The links between migration and employment or education policies remain vague in all countries of the region (European Training Foundation 2011) but these links are none the less relevant for their competitiveness. In particular, the high level of migration is linked to economic hardship and unemployment. Labour migration represents an alternative mechanism to gain employment and is a reaction on the part of the population to social and economic crisis and internal conflict.

6.7.1 The Eastern Rim

The population structure in the Eastern Rim countries is very heterogeneous: Armenia and Azerbaijan have very young populations, with the age group up to 14 years accounting for around 30%, while this age group represents only 14% in Ukraine and Russia. Ageing of the population in these economies will pose a serious risk to welfare systems. With the exception of Russia, the economic activity rates are below the EU average of 71%. A salient feature of the labour market in the Eastern Rim countries is the high activity rate of females, which in most cases is comparable to the EU level (and distinctly higher than the Southern Rim).

With the exception of Russia (and to a lesser extent Ukraine), agriculture is an important source of income in the Eastern Rim countries, although its share has been declining everywhere. Agriculture in Moldova, Azerbaijan and Armenia can barely be considered to be an economic sector (in the sense used in more developed economies) as the '*preponderance of subsistence farming on small scale plots has made this activity a buffer for employment lost during restructuring of industrial enterprises and small scale farms*' (European Training Foundation 2011). The relevance of industry is highest in Ukraine and Russia (cf. European Commission (2009a, 2011a) for discussions of Russian industry), whereas the industrial base is very small in Georgia and Azerbaijan, accounting for only 10-13% of total employment. The share of employment in the service sector has been rising steadily in Moldova, Ukraine and Russia. In the latter two countries, the service sector accounts for about 60% of total employment. The fragility of the labour markets is highlighted by the high proportion of self-employment – 64% in Georgia, 58% in Azerbaijan, 39% in Armenia and around 30% in Moldova. Unemployment has been relatively low in most Eastern Rim countries. However, given the high proportion of self-employment (subsistence agriculture) in these countries, unemployment is probably much higher than official figures suggest (European Commission 2011b).

The latest data available on migrants from the EaP region show that the number of migrants reached almost 11 million in 2010 – a figure only slightly below the total stock of migrants from Russia. Among the EaP countries, more than 6 million people emigrated from Ukraine, more than 1 million each from Azerbaijan and Georgia, and less than 1 million each from Armenia and Moldova. The preferred destinations for Eastern

Rim migrants are Russia and the EaP region itself, which hosts more than half of all EaP migrants.

Migrants from Eastern Rim countries make up 12% of all migrants in the EU (in absolute numbers, the EU hosts around 1.4 million migrants from the EaP region and 1.1 million from Russia). The EaP country with the largest share of immigrants in the EU is Moldova. The EU Member States with the largest number of Eastern Rim migrants are Germany, Poland, Spain, Greece, Italy, Estonia and Latvia.

Mobility Partnerships aiming at enhancing and promoting mobility of people have been concluded between the EU and Moldova, Georgia and Armenia. Negotiations with Azerbaijan are ongoing.

6.7.2 The Southern Rim

A prominent feature of the Mediterranean neighbouring countries is the high share of young people in their populations: almost a third of them are younger than 14. As a consequence, and notwithstanding rapidly declining birth rates, the working-age population in the region will continue growing in coming decades. The large influx of new labour market entrants, combined with lower rates of workers retiring and low job creation, has put enormous pressure on Southern Rim labour markets and will continue to do so. Thus, job creation will remain a top priority in the coming years if the countries are to retain or reduce their current unemployment levels. Estimates made by international organisations of the need for additional jobs in the next decade range from 25 million jobs (MENA-OECD Investment Programme) to 50-75 million jobs (World Bank 2011c). Such high rates of job creation would require annual GDP growth rates of 6.5% or more, which is hardly realistic given the structure and poor competitiveness of the economies.

Activity rates are very low in the region and have grown only modestly (if at all). This is mainly because of low rates among females, ranging from only 14% in Syria to 32% in Libya (OECD and International Development Research Centre 2012). Israel is the only country in the region where female labour force participation (61 %) is comparable to EU levels. Employment patterns by broad economic sector differ substantially across the region, but agriculture is still an important employer almost everywhere. Industrial employment is highest in Tunisia (35 %) and Syria (32 %), while Israel, Jordan and Morocco have the lowest shares (around 20 % each). A breakdown of service-sector employment shows that administration (government services) accounts for more than half of the sectoral employment in Jordan, Algeria, Syria and Egypt, while its share is relatively small in Morocco. As regards market services, the major sectoral employers are trade, tourism and communications (World Bank 2011c). Together with construction and, in some cases, agriculture, these sectors have also been the major drivers of employment creation in recent years. The public sector – including government agencies, military and state-owned enterprises – is the preferred source of employment for graduate (female) workers in the Mediterranean neighbouring countries, accounting for up to 35% of total employment. Employment in the public sector offers higher wages, employment protection, shorter working hours and other social benefits. In the past, the rise of public sector employment was driven by social contract obligations guaranteeing all graduates a state job; this led to a concentration of highly skilled people in the state sector. Consequently, '*guaranteed employment without concern for productivity led to the prevalent rent-seeking behaviour among graduates and created strong disincentives for work in the productive sectors*' (European Commission 2010b). Governments have therefore had to terminate the system of guarantees. Despite the reforms, however, the public sector wage bill still accounts for 8–10% of GDP in most countries (European Commission 2011b).

In 2010, the unemployment rate in the Mediterranean neighbouring countries was around 10%. However, unemployment among people with a university or secondary education is considerably higher than among people with little or no education, and in some Southern Mediterranean countries the time between completing university education and finding employment can be as long as eight years. This represents a particular challenge, even though the number of university graduates remains very low in the region. Youth unemployment is considered to be a major challenge and is highest in Palestine (39 %) and Tunisia (31 %). It is lower (14-18 %) in Israel,

Lebanon and Morocco and around 20% in other Southern Rim countries. The labour markets of the Southern Rim countries have been less affected by the euro area crisis than most EU Member States or the Western Balkan countries (European Commission 2011b). The crisis mainly affected export-oriented firms in certain Southern Rim countries (Egypt, Libya, Syria and Tunisia) as well as migrant workers. On top of the enormous pressure of young cohorts entering the labour market, the revolutions of the Arab Spring have brought about additional increases in unemployment as numerous migrants have returned (e.g. from Libya) and the private sector has laid off temporary workers (Galal and Reiffers 2011).

Southern Rim countries have very dynamic populations and high migrant numbers, with several of them serving not only as sending and receiving countries, but also as transit countries. Before the Arab Spring, there were over 12 million Southern Rim migrants, more than from any other Rim region, with Egypt and Morocco receiving the greatest numbers of migrants. The EU is the main destination region, hosting more than 40% of migrants from the Southern Rim, particularly from Morocco, Algeria and Tunisia. Moreover, almost a third of migrants from Lebanon and Libya have moved to the EU, while only 7% or less of migrants from Egypt, Israel and Jordan find their way to the EU. The main destination countries for Moroccan migrants are France, Italy, Belgium, Germany and the Netherlands, while more than 80% of Algerian and Tunisian migrants are in France.

The flow of migrants from the Southern Rim countries to the EU was on the increase until 2008, when it reached 180.000. However, as in the case of Eastern Rim migrants, the flow from the Southern Rim countries has declined significantly in the wake of the recent financial crisis. The turmoil of the Arab Spring generated a fresh wave of irregular migration, particularly from Tunisia, where attempts to reach Italy and France increased significantly in late 2010 and early 2011. Fears over sizeable movements of irregular immigrants induced EU governments to sign bilateral agreements with potential migration countries, with a view to halting the irregular crossing of coastal borders. Moreover, climate change and environmental disasters have generated another flow of migrants from outside the Rim who have been forced to migrate because of unsustainable conditions at home.

Cooperation on migration and mobility related issues between the EU and Southern Rim is very intense, in particular with Morocco and Tunisia with which the EU is negotiating Mobility Partnerships in order to enhance mobility and strengthen cooperation on migration related issues. Cooperation with Egypt and Libya will intensify in the future, leading to possible Mobility Partnerships, once the internal situation of those countries so allows.

6.7.3 Western Balkans

Almost the entire Western Balkans region is characterised by demographic contraction, high outward migration and ageing populations. Only Albania and Kosovo have a large share of the population in the age group up to 14 years. The entire region also has low activity rates, with extremely low levels in Kosovo (below 50 %) and in BiH, while in Albania and Serbia the rate is about 60 %. Female participation in the labour force is particularly low in specific ethnic groups across the region, and in particular in Kosovo and BiH. The region has a high share of agricultural employment (Albania, with 55% of its total workforce employed in agriculture, is an extreme case in this respect and is similar to Georgia and Morocco). Employment in industry is highest in BiH (31 %) and about 25% in Serbia and Kosovo. The service sector is less developed in the Western Balkan countries, accounting for about half of total employment in Serbia and BiH, and only 37% in Albania. By contrast, the service sector represents a very high proportion of the labour force in Kosovo.

Unemployment in the Western Balkans is very high – in fact higher than in any other Rim region. Kosovo and BiH have the highest rates of unemployment in the region. Albania is the only country where unemployment has remained flat in recent years, possibly helped by a long tradition of outward migration in combination with relatively stable employment in agriculture. Unemployment has a disproportionate impact on young people. Like in some Eastern Rim countries, there is a sizeable and persistent regional imbalance in unemployment, which suggests that there are major barriers to regional labour mobility. In many cases

young people lack the skills and professional experience for employment, so their options are to emigrate or enter the informal economy (Vidovic 2011). Long-term unemployment has become a persistent and salient feature of the Western Balkan labour markets and is much more severe than in other transition economies. However, it can be assumed that the high reported rates of long-term unemployment are distorted and hide large flows between the formal and informal sector.

There is a long history of migration in the Western Balkans as most Balkan countries share common borders and cultural ties with EU Member States. More recently, wars have created additional migration by forcing refugees to flee to other countries. The total number of migrants from the Western Balkans is around 4.5 million, mainly from BiH and Albania, each with more than 1.4 million migrants. While 85 % of all Albanian migrants have migrated to the EU, only half of the migrants from BiH have chosen the EU as their destination. Visa liberalisation in 2011 contributed to an intensification of circular migration and to a reduction in illegal migration to the EU. There have been fewer cases of Albanian migrants illegally crossing the EU border or overstaying their visas in Member States. However, there has been an increase in the number of applications for international protection (asylum) submitted in the EU, particularly from Serbia and Albania. The difficult economic situation in Greece has forced many Albanians to return home, for good or temporarily and will continue to exert pressure on Western Balkan labour markets.

6.7.4 Norway, Switzerland and Liechtenstein

All three countries have experienced population growth over the past decade. Their labour markets are characterised by low unemployment and high activity and employment rates, the latter reaching over 75 %. In all three countries, unemployment is very low compared with the EU – another example of the diversity of the Rim.

6.8. REMITTANCES

6.8.1 The Eastern Rim

Migration and remittances both show an increasing trend over the last 20 years, generating significant welfare gains either for the home country of the migrants or for the migrants themselves. In 2000, remittances sent to the EaP group of countries amounted to around USD 769 million, while in 2011 the estimated amount was 16 times higher, at around USD 12.3 billion. Moldova has the highest share of remittances to GDP (23 %), and remittances are among the main contributors to developments on its labour market.

6.8.2 The Southern Rim

In 2011, the overall amount of remittances was around USD 33 billion, three times higher than in 2001. The main receiving countries were Lebanon and Egypt. In the light of persistent unemployment in Europe and precarious employment prospects for existing migrants, as well as rigid immigration policies, there is a risk that remittances will decrease in future years (Mohapatra et al. 2011a, b). In Libya, Tunisia and Egypt, numerous migrants returned home or were deported back to their country of origin during the Arab Spring. Such developments might also negatively affect the future flow of remittances to the country of origin, holding back growth in the region (Ben Mim and Ben Ali 2012).

6.8.3 Western Balkans

Remittances strongly affect the economic development in the Western Balkans, in particular in Kosovo and BiH, where the share of remittances to GDP is 18 % and 13 % (World Bank 2011b). In 2011, the flow of remittances to the Western Balkan countries reached nearly USD 10 billion, three times more than in 2002. As in other regions, most of the Western Balkan countries recorded a decline in the flow of remittances from 2008 to 2009, but from 2010 to 2011 there was again an increase (+6 %). The difficult economic situation in the euro area (particularly in Greece, Spain and Italy) raises concerns that there will be less demand for migrant workers, which might trigger a massive return migration and depress flows of remittances accordingly. Remittances to Albania may keep falling if migrants continue returning from Italy and Greece. At the same time, the positive effects in terms of migrants returning to their country of origin with new skills, knowledge and capital, must not be ignored.

6.9. LABOUR MIGRATION AND EU COMPETITIVENESS

One of the policy objectives of the Europe 2020 strategy is to reinforce EU competitiveness in the international arena. In view of recent developments in the EU, in particular its ageing population and shrinking labour force, potential labour market shortages – in terms of numbers as well as skills – put the competitiveness of the EU at risk. In this context, labour migration has gained higher attention in the policy debate as it could contribute to meeting the objectives of sustaining employment growth, reducing unemployment, satisfying labour demand for highly skilled workers and filling sectoral labour market shortages with migrant workers (European Commission 2009a). The 3rd EU Annual Report on Immigration and Asylum underlines the positive contributions that migration makes and will need to bring in order for the EU to grow and continue to thrive (European Commission 2012b).

The economic crisis and increase in unemployment in the EU have forced several Member States to introduce severe austerity measures. At the same time, despite the sharp rise in unemployment in several Member States, labour shortages persist for various reasons, for instance unattractive working conditions, lower wages offered by employers, and limited geographical mobility (EMN 2011). Meanwhile, qualitative shortages are the result of insufficient numbers of workers with appropriate qualifications and skills. Moreover, migration within the EU, particularly migration from and between the 2004/2007 accession states, has generated labour market shortages also in several of these Member States.

In contrast, demographic trends indicate that the Southern Rim countries will experience a significant increase in the working-age population, which will exceed demand on the domestic labour market. It is highly likely that a considerable number of young, and particularly well-educated, people will not find a place on the domestic labour market and will be forced to migrate. Several Member States have adopted national strategies to mitigate the demand for labour through the migration of third-country nationals, and in particular migrant workers from Rim countries. Available data on third-country workers in the EU suggest that Rim countries account for a large share of migrants and that the contribution of migrant workers from the Rim countries, especially from the Western Balkans, Russia and Ukraine, is very important for a number of Member States.

6.10. POLICY IMPLICATIONS

Countries belonging to the Rim are extremely diverse. Their diversity is multidimensional (geographical, socio-economic, political, cultural and religious) and each individual dimension has important implications for EU policies towards the region, for EU institutional relations with individual Rim countries, and for Rim countries themselves – including their competitiveness.

More specifically, with respect to the institutional relations between the EU and the Rim, the key question is whether the current EU approach – aiming at the conclusion of bilateral DCFTAs with the countries in the Rim able and willing to do so – is optimal and sufficient (or even appropriate) for every country and society in such a diverse group. Evidence suggests that for sustainable development, there is no alternative to domestic policy reform as outlined in the DCFTAs, to boost domestic competitiveness and external trade. Apart from policies aimed at bilateral trade liberalisation and measures to support the investment climate in the countries concerned, the DCFTAs and the industrial cooperation process will also contribute to promoting regional integration and intra-regional cooperation, in particular as and when the pan-EuroMediterranean rules of origin allow diagonal cumulation. If duly implemented by the partner countries, these initiatives would be particularly helpful in the Eastern and Southern parts of the Rim, where regional fragmentation is particularly detrimental to further growth.

Regarding the economic development model, except for in the Advanced Rim, the economic growth of Rim countries and their progress in catching up have been the result not of increased exports, but in most cases – apart from energy exporters and tourist destinations – stem from increasing domestic demand, frequently financed from transfers (aid and remittances to resource-poor countries). The growth of industry in the majority of Rim countries, and in the Southern Rim in particular, has been slower than the growth of GDP.

Recent experience in the EU shows that any pre-crisis neglect in building up a viable trade sector and sufficiently competitive export capacities tends to aggravate the crisis. Policies leading to an expansion of the export sector have to take priority, and the use of different policy instruments (e.g. labour market, investment promotion, institutional development, entrepreneurial promotion) needs to be strengthened (Gligorov et al. 2012).

Competitiveness in the Rim needs to be improved (again, except for the Advanced Rim). This is reflected in the low intensity of manufacturing exports and insufficient inward FDI flows. The reasons for this are manifold and related to the political context, the economic sluggishness (and dependence on slow-growing EU economies) in general, low employment skills and also the poor business climate, adversely affecting SMEs in particular. The Eastern Rim has been doing somewhat better in this respect than both the Western Balkans and the Southern Rim in a number of business-relevant areas (such as access to finance, use of foreign technology, labour market regulations and worker skills). Southern Rim countries are highly heterogeneous; some have made impressive progress while others are held back by poor competitiveness in industry and technology. Improving investments in education is key; there is a lack of high-quality, technology-based teaching and a severe mismatch between the orientation of students and the needs of the economy, as well as poorly performing secondary education students. In several countries there can be up to eight years between completion of university education and taking up employment (European Commission et al. 2008).

Though important for the trade surpluses of some EU Member States, the Rim countries are relatively minor trading partners for the EU as a whole and do not pose any serious challenge to EU competitiveness. However, the trade asymmetry – the EU being the main trading partner of Rim countries in most cases – is challenging, not least for the formulation of EU policies, since any bilateral agreement will impact more on the Rim than the EU. Trade asymmetry and the underexploitation of the trade potential arising from geographical proximity should be overcome. In particular, the proximity of the huge EU market can be thought of as a locational competitive advantage of the Rim, so far largely unexploited. Each of the four Rim regions is a focal area in terms of trade flows for at least one part of the EU. The varying regional specialisation (and interests) of individual Member States represents another challenge for the formulation of a uniform and effective EU policy or policies towards the Rim.

Limited diversification of exports (except for the Advanced Rim) is one of the greatest stumbling blocks for competitiveness. In spite of attempts to improve the international competitiveness of the Rim countries – product and labour market reforms, but also liberalisation efforts and improvements in the business climate in general – the Rim economies still need to develop the industrial capacity and the necessary structural flexibility to respond successfully to external competitive pressures. These drawbacks result in high adjustment costs and low gains from liberalisation in terms of an increased emergence of new firms and new export products.

European FDI plays a crucial role in the Rim region. FDI by European companies, including SMEs, can exploit locational benefits, even though the poor business environment in the Rim limits FDI flows. Improved conditions for doing business benefit local SMEs and EU investors alike. SMEs have benefited in countries like Serbia, Morocco and Tunisia, all of which have managed to attract a number of greenfield FDI projects in different industries. Further policy reforms should take place in order to open the remaining restricted sectors in the Rim countries. Open and fair competition, breaking local (often state-supported) monopolies, could increase opportunities for further FDI flows and the development of SMEs (European Commission 2011c).

A major impediment to the competitiveness of the Rim is regional fragmentation. Even within the four Rim regions there are many barriers to trade and business in general (the persisting frozen or open conflicts are obviously unhelpful as well). Numerous trade barriers exist in both the Eastern and Southern parts of the Rim. In the Southern Rim, the limited intra-regional integration is viewed as the key obstacle to FDI, trade diversification and growth. In the Eastern Rim, attempts at a revival of Russian-led regional integration (the customs union between Russia, Belarus and Kazakhstan) have had

the effect that the prospects of a free trade agreement between the EU and Russia – a long-stated objective on both sides – should now be seen in a long-term perspective. The continuing bilateral 'hub-and-spoke' trade arrangements between the EU and the Rim resemble the pre-accession arrangements which the EU concluded with accession countries from Central and Eastern Europe during the 1990s (Baldwin 1994). However, without a strong anchor in the form of future EU membership, it is important to maintain a high level of ambition in EU trade agreements with the neighbourhood countries to foster reforms, regional integration and a sustainable development of the Rim (Dreyer 2012).

Demography and labour market developments are among the crucial areas affecting competitiveness, yet frequently neglected in this context. The Rim is characterised by large informal sectors, labour market segmentation, high unemployment and large-scale migration. A number of differences and common features can be identified:

- Because Armenia, Azerbaijan, Albania, Kosovo and the Mediterranean neighbouring countries all have a high share of young people in their populations, large cohorts are entering the labour market each year. All other countries are faced with ageing (and often shrinking) populations, exerting serious pressure on the welfare systems and potentially holding back competitiveness (as it is in the EU).
- Activity rates are below 50% in all Southern Rim countries and Kosovo. In Eastern Rim countries, labour force participation is similar to the 2004/2007 accession states and can even exceed the EU average.
- The employment gap between males and females is substantial in some Western Balkan countries and in the Mediterranean neighbouring countries. On the other hand, female labour force participation in the Eastern Rim countries is traditionally high, on a par with that in the EU.
- With the exception of Russia and Ukraine, Eastern Rim countries have a high share of persons in vulnerable employment. Among Southern Rim countries, Morocco stands out as about half of its workforce have vulnerable jobs. There is also an important north/east/south divide in the educational attainment and qualification structure of employment, with more highly educated workers in the north and east than in the south.

Given the irreversible nature of the ageing workforce in the EU, the potential of human resources in the Southern Rim represents an opportunity for sustaining employment growth and international economic competitiveness in the EU as well as in the Southern Rim in coming decades. The promotion of circular migration and various programmes that induce temporary migration is a challenging way of satisfying labour shortages in the EU. It should not be neglected.

REFERENCES

Alvarez de la Campa, A. (2011), *Increasing access to credit through reforming secured transactions in the MENA region*, Policy Research Working Paper No. 5613. Washington, D.C.: World Bank.

Baldwin, R. (1994), *Towards an integrated Europe*. London: CEPR.

Ben Mim, S. and Ben Ali, M.S. (2012), *Through which channels can remittances spur economic growth in MENA countries*, Economics Discussion Paper 2012–8.

Coface (2012), *Carte de l'évaluation des risques pays par Coface*, April 2012. Paris: Coface.

De Gucht, K. (2011), ´EU-Ukraine trade negotiations: a pathway to prosperity´, INTA Committee Workshop, Brussels, 20 October 2011.

Dreyer, I. (2012), ´Trade policy in the EU's neighbourhood. Ways forward for the deep and comprehensive free trade agreements´. Paris: Notre Europe.

Emerson, M. (2011), ´Review of the review – of the European Neighbourhood Policy´, *CEPS European Neighbourhood Watch*, 71. Brussels: CEPS.

EMN (2011), *Satisfying labour demand through migration.* Brussels: European Migration Network.

Eurochambres (2011), *Assessing the trade consequences of a failed EU-Mediterranean Free Trade Area*, Study by the European Centre for International Political Economy (ECIPE) prepared for Eurochambres, March 2011, Brussels, Eurochambres.

European Commission, OECD and European Training Foundation (2008), *Report on the implementation of the Euro-Mediterranean Charter for Enterprise*, Luxembourg, Office for Official Publications of the European Communities.

European Commission (2009a), *European Competitiveness Report 2009*, Luxembourg: Publications Office of the European Union.

European Commission (2009 b), *Impact of the global crisis on neighbouring countries of the EU*, European Economy Occasional Papers 48, Luxembourg, Publications Office of the European Union.

European Commission (2010a), COM(2010) 612 final, *Trade, growth and world affairs. Trade policy as a core component of the EU's 2020 strategy*, Brussels, European Commission.

European Commission (2010b), *Labour markets performance and migration flows in Arab Mediterranean countries: Determinants and effects,* Brussels, Directorate-General for Economic and Financial Affairs.

European Commission (2010c), *European Competitiveness Report 2010*, Luxembourg: Publications Office of the European Union.

European Commission (2010d), *The EU's neighbouring economies: emerging from the global crisis*, European Economy 59, Luxembourg, Publications Office of the European Union.

European Commission (2011a), *European Competitiveness Report 2011*, Luxembourg: Publications Office of the European Union.

European Commission (2011b), *The EU's neighbouring economies: Coping with new challenges*, European Economy Occasional Papers 86, Luxembourg: Publications Office of the European Union.

European Commission (2011c), COM(2011) 702 final, *Small business, big world – a new partnership to help SMEs seize global opportunities*, Brussels, European Commission.

European Commission (2012a), SWD(2012) 219 final, *External sources of growth. Progress report on EU trade and investment relationships with key economic partners*, Brussels, European Commission.

European Commission (2012 b), COM(2012) 250 final, *3rd annual report on immigration and asylum (2011)*, Brussels, European Commission.

European Commission and High Representative (2011), COM(2011) 303 final, *A new response to a changing neighbourhood*, Brussels: European Commission and the High Representative of the European Union for Foreign Affairs and Security Policy.

European Commission and High Representative (2012a), JOIN(2012) 14 final: *Delivering on a new European Neighbourhood Policy*, Brussels, European Commission and the High Representative of the European Union for Foreign Affairs and Security Policy.

European Commission and High Representative (2012b), SWD(2012) 111 final, *Implementation of the European Neighbourhood Policy in Azerbaijan, Progress in 2011 and recommendations for action*, Brussels, European Commission and the High Representative of the European Union for Foreign Affairs and Security Policy.

European Commission and High Representative (2012c), SWD(2012) 122 final, *Implementation of the European Neighbourhood Policy in 2011*, *Statistical Annex*. Brussels, European Commission and the High Representative of the European Union for Foreign Affairs and Security Policy.

European Parliament (2012), ´Small and Medium Sized Enterprises (SMEs) in the Southern Mediterranean´, Brussels: European Parliament.

European Training Foundation (2011), *Labour markets and employability, trends and challenges in Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine.*

European Union (2011), *A new and ambitious European Neighbourhood Policy*, Memo, Brussels.

Francois, J.F. and Hall, H.K. (2003), *Global simulation analysis of industry-level trade policy*, Technical Paper, Washington, D.C., World Bank.

Francois, J. and Manchin, M. (2009), *Economic impact of a potential free trade agreement (FTA) between the European Union and the Commonwealth of Independent States*, Institute for International and Development Economics Discussion Paper Nr. 200908-05, August 2009.

Galal, A. and Reiffers, J.L. (eds) (2011), *Towards a new MED region: Achieving fundamental transitions*, Femise Report on the Euro-Mediterranean Partnership, Marseille, Femise.

Gligorov, V., Holzner, M., Landesmann, M., Leitner, S., Pindyuk, O. and Vidovic, H. et al. (2012), *New divide(s) in Europe?,* Current Analyses and Forecasts No. 9, Vienna, Vienna Institute for International Economic Studies, wiiw.

Havrylyshyn, O. (2008), ´Structural change in transition 1990-2005: A comparison of New Member States and selected NIS countries´, in: R. Grinberg et al. (2008), *Economic restructuring and integration in Eastern Europe. Experiences and policy implications*. Baden Baden: Nomos, pp. 17–46.

Hunya, G. and Stöllinger, R. (2009), *Foreign direct investment flows between the EU and the BRICs*, wiiw Research Report No. 358, Vienna: Vienna Institute for International Economic Studies, wiiw.

Kuiper, M. (2006), ´An economy-wide perspective on Euro-Mediterranean trade agreements with a focus on Morocco and Tunisia´, Paper prepared for ENARPRI final conference "Trade Agreements and EU Agriculture", Brussels, 8 June.

López-Cálix, J., Walkenhorst, P. and Diop, N. (eds) (2010), *Trade competitiveness of the Middle East and North Africa. Policies for export diversification*, Washington, D.C.: World Bank.

Maliszewska, M., Orlova, I. and Taran, S. (2009), *Deep integration with the EU and its likely impact on selected ENP countries and Russia*, CASE Network report No. 88,Warsaw, CASE.

Masood, A. (2010) ´Trade competitiveness and growth in the MENA region´, *The Arab world competitiveness review 2010*, Geneva, World Economic Forum.

Mohapatra, S., Ratha, D. and Silwal, A. (2011a), *Outlook for remittance flows 2011–13*, Migration and Development Brief 16, Washington, D.C., World Bank.

Mohapatra, S., Ratha, D. and Silwal, A. (2011b), *Outlook for remittance flows 2012–14*, Migration and Development Brief 17, Washington, D.C., World Bank.

Movchan, V. and Giucci, R. (2011), *Quantitative assessment of Ukraine's regional integration options: DCFTA with European Union vs. customs union with Russia, Belarus and Kazakhstan*, IRPC Policy Paper Series (PP/05/2011), Berlin/Kiev, IRPC.

OECD (2003) Science, Technology and Industry Scoreboard 2003. Paris: OECD.

OECD (2011) *Development in Eastern Europe and the South Caucasus: Armenia, Azerbaijan, Georgia, Republic of Moldova and Ukraine*, Paris, OECD.

OECD (2012), Economic Outlook 2012, Paris, OECD.

OECD and International Development Research Centre (2012), *New entrepreneurs and high growth enterprises in the Middle East and North Africa*, Paris: OECD (forthcoming)

Porter, M.E., Sachs, J.D. and McArthur, J.W. (2002), ´Executive summary: Competitiveness and stages of economic development´, in: M.E. Porter, J.D. Sachs, P.K. Cornelius, J.W. McArthur and K. Schwab (eds), *The global competitiveness report 2001–2002*. New York: *Oxford University Press*.

Smallbone, D., Labrianidis, L., Venesaar, U., Welter, F. and Zashev, P. (2007), ´Challenges and prospects of cross border cooperation in the context of EU enlargement. Deliverable 7: state of the art literature review´, Sixth Framework Programme, Priority 7, Citizens and governance in a knowledge based society.

Togan, S. (2011), *On the European Union – Turkey customs union*, CASE Network Studies & Analyses No. 426/2011. Warsaw: CASE.

Vidovic, H. (2011), ´Trends in the Western Balkan labour markets´, in: D. Sternad and T. Döring (eds), *Doing business in South East Europe*, London: Palgrave Macmillan.

World Bank (2011a), *Doing business 2012: Doing business in a more transparent world*. Washington, D.C., World Bank.

World Bank (2011b), *Migration and remittances factbook.* Washington, D.C., World Bank.

World Bank (2011c), ´Investing for growth and jobs´, MENA Economic Developments and Prospects, September 2011.

WTO (2011), *World trade report 2011. The WTO and preferential trade agreements: From co-existence to coherence*, Geneva, WTO.

Zachmann, G., Tam, M. and Granelli, L. (2012), *How wide is the Mediterranean?*, Bruegel Policy Contribution 2012/08.

STATISTICAL ANNEX

SECTORAL COMPETITIVENESS INDICATORS

Explanatory notes

Geographical coverage: all indicators refer to EU-27

Production index.[116] The production index is actually an index of final production in volume terms.

Labour productivity: this indicator is calculated by combining the indexes of production and number of persons employed or number of hours worked.[117] Therefore, this indicator measures final production per person of final production per hour worked.

Unit Labour Cost: it is calculated from the production index and the index of wages and salaries and measures labour cost per unit of production. "Wages and salaries" is defined (Eurostat) as "the total remuneration, in cash or in kind, payable to all persons counted on the payroll (including homeworkers), in return for work done during the accounting period, regardless of whether it is paid on the basis of working time, output or piecework and whether it is paid regularly wages and salaries do not include social contributions payable by the employer".

Relative Trade Balance: it is calculated, for sector "i", as (Xi-Mi)/(Xi+Mi), where Xi and Mi are EU-27 exports and imports of products of sector "i" to and from the rest of the World.

Revealed Comparative Advantage (RCA):

The RCA indicator for product "i" is defined as follows:

$$RCA_i = \frac{\frac{X_{EU,i}}{\sum_i X_{EU,i}}}{\frac{X_{W,i}}{\sum_i X_{W,i}}}$$

where: X=value of exports; the reference group ('W') is the EU-27 plus 105 other countries (see list below); the source used is the UN COMTRADE database. In the calculation of RCA, X_{EU} stands for exports to the rest of the world (excluding intra-EU trade) and X_W measures exports to the rest of the world by the countries in the reference group. The latter consists of the EU-27 plus the following countries: Albania, Algeria, Azerbaijan, Argentina, Australia, Bahamas, Bahrain, Armenia, Bermuda, Bhutan, Bolivia (Plurinational State of), Bosnia Herzegovina, Brazil, Belize, Bulgaria, Myanmar, Burundi, Belarus, Cambodia, Canada, Cape Verde, Sri Lanka, Chile, China, Colombia, Costa Rica, Croatia, Dominica, Dominican Rep., Ecuador, El Salvador, Ethiopia, Fiji, French Polynesia, Georgia, Gambia, Occ. Palestinian Terr., Ghana, Guatemala, Guyana, China, Hong Kong SAR, Iceland, Indonesia, Israel, Côte d'Ivoire, Jamaica, Japan, Jordan, Kenya, Rep. of Korea, Kyrgyzstan, Lebanon, China, Macao SAR, Madagascar, Malawi, Malaysia, Maldives, Mali, Mauritius, Mexico, Other Asia, nes, Rep. of Moldova, Montenegro, Oman, Nepal, Aruba, New Caledonia, New Zealand, Nicaragua, Niger, Nigeria, Norway, Pakistan, Panama, Paraguay, Peru, Russian Federation, Rwanda, Saint Vincent and the Grenadines, Saudi Arabia, Senegal, Serbia, India, Singapore, Viet Nam, South Africa, Zimbabwe, Suriname, Switzerland, Syria, Thailand, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Uganda, Egypt, United Rep. of Tanzania, USA, Burkina Faso, Samoa, Zambia.

Statistical nomenclatures: the indicators in tables 7.1 to 7.6 are presented at the level of divisions of the statistical classification of economic activities in the European Community (NACE Rev.2[118]), while those in tables 7.7 and

---

116 The data are working-day adjusted for production.

117 The data are working-day adjusted for hours worked.

118 Compared to the statistical annexes of the previous publications, the new activity classification is used: NACE REV 2. The correspondance tables from NACE Rev. 2 – NACE Rev. 1.1 and from NACE Rev. 1.1 to NACE Rev. 2, are available on Eurostat: http://epp.eurostat.ec.europa.eu/portal/page/portal/nace_rev2/introduction

7.9 are presented in terms of divisions of the statistical classification of products by activity (CPA). Table 7.10 uses extended balance of payments services classification. In terms of data sources: tables 7.1 to 7.6 are based on Eurostat's short-term indicators data. Tables 7.7, 7.8 and 7.9 are based on United Nations' COMTRADE. Table 7.10 is based on IMF balance of Payments. Royalties and license fees were not included as it is not related to a special service activity.

Table 7.1 - EU-27 - Industry production index, annual growth rate (%)

Code (NACE Rev. 2)	Sector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average 2006-2011
B	MINING AND QUARRYING	-2.3	-2.7	0.5	-2.9	-2.2	-6.2	-3.9	-0.2	-3.6	-10.6	-0.5	-8.1	-4.7
C	MANUFACTURING	5.6	0.1	-0.7	0.4	2.7	1.6	4.8	4.3	-1.8	-14.7	7.4	4.6	-0.4
C10	Manufacture of food products	1.1	1.2	2.0	0.1	2.0	2.3	1.5	1.9	-0.5	-0.9	2.0	1.4	0.8
C11	Manufacture of beverages	-1.0	2.5	2.5	1.4	-2.5	1.0	3.9	1.3	-2.3	-2.4	-0.2	5.7	0.4
C12	Manufacture of tobacco products	-6.4	-2.0	-0.8	-5.4	-6.4	-4.5	-5.2	3.0	-16.8	-1.4	-5.8	-2.4	-4.9
C13	Manufacture of textiles	1.9	-3.0	-4.7	-3.4	-4.7	-5.6	-0.8	-1.3	-9.6	-17.7	8.1	-2.9	-5.1
C14	Manufacture of wearing apparel	-4.4	-3.9	-10.6	-6.1	-4.8	-9.0	2.4	2.4	-3.3	-11.4	0.7	-5.9	-3.6
C15	Manufacture of leather and related products	-1.8	-5.2	-7.5	-7.2	-11.6	-9.0	-1.8	-1.6	-7.5	-13.2	3.0	4.3	-3.2
C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	6.8	-3.9	0.7	2.2	3.3	0.1	4.3	1.1	-8.6	-13.9	3.4	-0.2	-3.9
C17	Manufacture of paper and paper products	2.8	-2.0	3.4	1.5	2.7	0.0	3.8	2.7	-3.0	-8.5	6.2	-0.8	-0.8
C18	Printing and reproduction of recorded media	1.8	-2.1	-0.3	-1.3	1.2	2.3	0.4	0.4	-2.1	-7.5	-0.4	-1.8	-2.3
C19	Manufacture of coke and refined petroleum products	5.3	0.2	-2.3	2.1	4.8	-0.8	1.6	-0.3	2.6	-7.9	-0.8	0.4	-1.3
C20	Manufacture of chemicals and chemical products	4.6	-1.5	1.9	0.0	3.2	1.8	3.5	3.3	-3.2	-11.9	10.3	1.4	-0.3
C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	4.9	10.8	9.0	5.2	-0.4	4.8	6.5	1.9	0.9	3.5	5.7	0.8	2.5
C22	Manufacture of rubber and plastic products	4.7	-0.5	0.1	1.9	1.7	0.8	4.1	4.5	-4.4	-13.7	7.6	4.2	-0.7
C23	Manufacture of other non-metallic mineral products	3.8	-0.5	-1.8	0.5	1.9	0.6	4.5	2.0	-6.5	-18.7	2.2	3.3	-3.9
C24	Manufacture of basic metals	7.1	-1.0	0.1	0.5	4.8	-0.5	6.3	1.2	-3.2	-26.7	18.6	4.8	-2.2
C25	Manufacture of fabricated metal products, except machinery and equipment	6.6	0.3	-0.6	1.1	2.7	1.5	5.0	6.2	-2.5	-22.1	7.1	6.7	-1.6
C26	Manufacture of computer, electronic and optical products	15.5	-5.9	-9.0	1.2	7.8	4.8	9.4	9.9	2.1	-16.6	8.4	6.7	1.6
C27	Manufacture of electrical equipment	9.7	0.0	-3.2	-2.4	2.8	1.4	8.5	4.8	-0.3	-20.2	11.6	4.1	-0.6
C28	Manufacture of machinery and equipment n.e.c.	6.0	1.3	-2.0	-0.6	4.1	3.9	8.4	8.4	1.5	-26.4	10.7	11.4	0.0
C29	Manufacture of motor vehicles, trailers and semi-trailers	7.7	2.2	1.0	1.9	5.0	1.9	2.9	6.1	-6.0	-24.2	21.5	12.8	0.7
C30	Manufacture of other transport equipment	2.1	1.7	-3.9	1.3	0.5	2.3	7.6	5.1	4.9	-4.9	1.1	4.7	2.1
C31	Manufacture of furniture	2.5	-1.8	-4.4	-2.5	0.4	0.6	3.2	3.3	-4.5	-16.3	-0.6	2.5	-3.4
C32	Other manufacturing	5.5	3.5	2.9	-1.2	1.5	1.2	4.9	2.5	-1.4	-5.8	7.7	3.2	1.1
C33	Repair and installation of machinery and equipment	5.9	-0.8	-4.9	-2.5	4.4	1.5	8.1	4.2	4.7	-9.2	2.6	5.6	1.4
D	ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	3.7	2.2	0.8	3.0	2.2	2.0	0.9	-0.7	-0.1	-4.7	4.2	-4.5	-1.2
E	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
F	CONSTRUCTION	4.0	0.7	0.6	2.0	0.9	2.5	3.3	2.5	-2.8	-7.7	-3.5	1.1	-2.1

N/A: data not available.
Source: Eurostat.

Table 7.2 - EU-27 - Number of persons employed, annual growth rate (%)

Code (NACE Rev. 2)	Sector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average 2006-2011
B	MINING AND QUARRYING	-8.2	-3.3	-4.7	-4.5	-4.6	-3.2	-3.9	-3.5	-1.4	-3.8	-4.1	-3.5	-3.3
C	MANUFACTURING	-0.5	0.0	-2.0	-2.0	-1.9	-1.4	-0.7	0.5	-0.3	-7.1	-3.6	0.6	-2.0
C10	Manufacture of food products	-0.7	-0.6	-0.9	-0.5	-1.2	0.0	-0.1	0.0	0.0	-1.9	-0.4	0.5	-0.4
C11	Manufacture of beverages	N/A	-1.8	-1.2	-1.8	-1.4	-1.5	-1.4	-0.1	-1.2	-6.3	-1.8	-1.5	-2.2
C12	Manufacture of tobacco products	-4.1	-3.4	-0.5	-5.1	-5.7	-2.4	-0.4	-10.1	-9.0	-5.7	-6.6	-3.0	-6.9
C13	Manufacture of textiles	-3.9	-3.3	-5.1	-7.2	-6.3	-4.5	-5.9	-5.3	-6.4	-12.8	-5.8	-2.8	-6.7
C14	Manufacture of wearing apparel	-5.7	-3.3	-3.7	-4.0	-6.2	-7.7	-5.7	-5.6	-6.5	-12.8	-8.5	-1.6	-7.1
C15	Manufacture of leather and related products	-3.3	-1.1	-1.0	-4.4	-6.9	-5.8	-2.7	-3.0	-5.2	-12.0	-3.0	4.0	-4.0
C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	-0.8	-1.2	-1.8	-1.3	-1.4	-0.8	-0.8	0.9	-2.2	-12.1	-2.9	-0.2	-3.4
C17	Manufacture of paper and paper products	-1.5	-1.7	-1.0	-2.9	-1.6	-2.6	-2.6	-2.7	-2.0	-5.1	-2.1	-0.7	-2.5
C18	Printing and reproduction of recorded media	-0.9	-0.3	-2.2	-4.0	-1.9	-3.3	-1.6	-0.1	-2.3	-7.0	-4.6	-3.4	-3.5
C19	Manufacture of coke and refined petroleum products	-1.4	-2.2	-3.1	-3.4	-2.1	-3.4	-3.4	1.2	-1.0	-3.0	-2.7	-2.2	-1.6
C20	Manufacture of chemicals and chemical products	-2.8	-0.9	-1.6	-2.6	-3.3	-2.1	-1.2	-0.5	-2.3	-4.5	-2.2	-0.1	-1.9
C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	1.3	2.0	2.5	-0.2	-2.5	-0.9	1.9	0.9	-2.2	-3.2	-0.2	-0.4	-1.1
C22	Manufacture of rubber and plastic products	2.5	0.9	-0.9	0.2	-0.2	-0.7	-0.8	1.5	0.5	-6.8	-2.5	1.2	-1.3
C23	Manufacture of other non-metallic mineral products	-0.5	-0.6	-2.3	-2.7	-2.1	-1.0	-0.6	1.4	-2.0	-10.3	-6.3	-1.8	-3.9
C24	Manufacture of basic metals	-4.2	-0.3	-4.0	-3.2	-3.9	-1.1	-1.0	-0.4	-0.4	-8.0	-5.3	1.1	-2.7
C25	Manufacture of fabricated metal products, except machinery and equipment	0.9	0.9	-1.1	-1.2	0.1	-0.3	1.3	3.3	2.6	-8.2	-5.3	1.5	-1.3
C26	Manufacture of computer, electronic and optical products	3.8	1.8	-5.7	-4.5	-3.0	-1.3	-0.8	1.2	-1.8	-8.6	-3.7	1.0	-2.5
C27	Manufacture of electrical equipment	1.6	0.5	-3.9	-4.1	-1.4	-0.6	1.0	2.4	1.2	-8.1	-2.1	3.2	-0.8
C28	Manufacture of machinery and equipment n.e.c.	-2.0	1.1	-1.5	-2.2	-2.4	-0.9	0.8	2.9	2.1	-5.7	-5.0	2.7	-0.7
C29	Manufacture of motor vehicles, trailers and semi-trailers	2.2	1.8	-1.0	-0.4	0.2	-0.8	-0.9	-0.2	0.9	-8.9	-2.7	2.9	-1.7
C30	Manufacture of other transport equipment	-2.3	-0.3	-1.6	-2.7	-1.7	0.3	0.6	2.8	2.1	-2.5	-4.8	-0.9	-0.7
C31	Manufacture of furniture	N/A	0.4	-3.3	0.0	-2.5	-2.5	-1.1	0.3	-2.1	-9.1	-8.2	-1.6	-4.2
C32	Other manufacturing	-4.6	1.0	-1.6	-0.2	-1.0	-1.8	-0.4	0.3	0.0	-3.0	-1.8	-1.2	-1.1
C33	Repair and installation of machinery and equipment	-4.7	-0.1	-2.9	-2.5	-1.0	-0.6	0.2	0.3	3.8	-2.0	-2.1	-1.3	-0.3
D	ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	-3.9	-2.9	-4.3	-4.3	-3.8	-2.5	-1.2	-1.5	-0.8	2.4	0.3	0.7	0.2
E	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES	0.9	-1.3	-0.5	0.4	-0.8	-1.7	1.4	0.5	-0.5	0.1	0.5	-0.1	0.1
F	CONSTRUCTION	-0.3	0.2	-0.5	0.6	1.4	2.5	4.1	4.9	-0.9	-7.7	-5.6	-3.3	-2.6

N/A: data not available.
Source: Eurostat.

Table 7.3: EU-27 - Number of hours worked, annual growth rate (%)

Code (NACE Rev. 2)	Sector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average 2006-2011
B	MINING AND QUARRYING	N/A	-3.0	-4.9	-5.6	-3.7	-3.2	-4.5	-3.4	-1.2	-4.9	-2.4	-2.5	-2.9
C	MANUFACTURING	N/A	-1.2	-2.4	-2.7	-1.1	-1.6	-0.1	0.2	-0.6	-9.3	-0.5	1.5	-1.8
C10	Manufacture of food products	N/A	-1.1	-2.2	-2.1	-0.2	-0.4	-0.1	-0.6	0.3	-2.5	0.5	0.5	-0.4
C11	Manufacture of beverages	N/A	-0.7	-3.5	-0.7	0.4	-2.4	-3.9	-1.3	-1.7	-4.6	-4.3	-0.2	-2.4
C12	Manufacture of tobacco products	N/A	2.3	-3.1	-9.7	-5.2	-4.0	-6.1	-3.5	-9.7	-5.4	-4.5	-4.6	-5.6
C13	Manufacture of textiles	N/A	-4.2	-5.1	-7.1	-5.7	-5.0	-5.5	-2.9	-5.4	-14.9	0.0	-0.3	-4.9
C14	Manufacture of wearing apparel	N/A	-4.1	-3.1	-3.5	-3.5	-3.8	-3.7	-5.4	-6.3	-14.7	-8.2	0.5	-6.9
C15	Manufacture of leather and related products	N/A	-2.2	-3.6	-4.0	-3.8	-4.3	-1.0	-3.7	-5.8	-11.0	0.1	3.7	-3.5
C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	N/A	-4.1	-1.9	-2.3	-0.8	-1.8	-0.1	-0.1	-2.6	-12.9	0.6	0.2	-3.1
C17	Manufacture of paper and paper products	N/A	-1.4	-0.8	-2.8	-1.7	-1.9	-1.0	-1.1	-3.9	-7.2	-0.2	0.3	-2.4
C18	Printing and reproduction of recorded media	N/A	0.0	-3.4	-4.2	-3.0	-2.3	0.1	0.1	-1.7	-5.9	-3.1	-1.7	-2.5
C19	Manufacture of coke and refined petroleum products	N/A	-2.5	-4.4	-1.6	-0.6	-0.6	-3.3	0.1	2.1	-8.3	-3.0	-3.4	-2.6
C20	Manufacture of chemicals and chemical products	N/A	-2.4	-2.1	-2.7	-2.0	-3.0	-1.0	-1.5	-1.7	-5.4	-1.2	1.2	-1.7
C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	N/A	0.3	2.1	0.0	-1.0	-1.5	-0.1	1.0	-0.2	-1.9	-0.3	-0.2	-0.3
C22	Manufacture of rubber and plastic products	N/A	-0.2	-1.8	-1.6	-0.3	-1.4	1.8	0.6	-0.4	-9.0	1.0	2.3	-1.2
C23	Manufacture of other non-metallic mineral products	N/A	-2.6	-3.1	-3.1	-1.0	-0.9	-0.3	0.6	-2.5	-12.0	-1.9	-0.3	-3.3
C24	Manufacture of basic metals	N/A	-1.9	-3.3	-4.8	-1.7	-2.4	0.2	-0.4	-0.9	-12.8	1.8	2.6	-2.1
C25	Manufacture of fabricated metal products, except machinery and equipment	N/A	-0.4	-1.4	-2.2	-0.4	-1.1	1.7	2.3	3.0	-11.4	-0.5	2.0	-1.1
C26	Manufacture of computer, electronic and optical products	2.8	0.1	-4.8	-4.5	-2.8	-1.6	-0.5	0.3	-1.0	-12.0	-2.0	-0.4	-3.1
C27	Manufacture of electrical equipment	N/A	-1.1	-3.0	-3.9	-1.4	-1.9	2.5	1.7	0.8	-12.6	3.1	3.3	-0.9
C28	Manufacture of machinery and equipment n.e.c.	N/A	-0.6	-2.3	-2.4	-1.3	-1.3	1.5	2.5	1.5	-10.6	-0.6	3.8	-0.8
C29	Manufacture of motor vehicles, trailers and semi-trailers	N/A	0.7	-1.5	-1.1	0.5	-0.5	-0.4	0.9	-1.4	-14.0	3.9	4.6	-1.4
C30	Manufacture of other transport equipment	N/A	-1.4	-2.1	-2.1	-2.3	-0.3	1.5	1.0	1.4	-3.5	-4.0	0.1	-1.0
C31	Manufacture of furniture	N/A	0.3	-4.2	-3.4	-1.0	-3.4	1.0	0.4	-2.9	-11.4	-4.8	-0.5	-3.9
C32	Other manufacturing	N/A	0.1	-3.0	-2.4	-0.2	-2.6	-0.5	0.8	0.3	-4.9	0.0	2.7	-0.3
C33	Repair and installation of machinery and equipment	N/A	-2.2	-3.5	-3.6	-2.7	-0.4	0.9	0.5	1.1	0.3	-2.9	0.2	-0.2
D	ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	N/A	-1.7	-4.8	-4.5	-2.4	0.2	-1.7	-1.2	-0.1	-0.5	-0.5	1.5	-0.2
E	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES	N/A	-2.0	-1.5	-0.8	0.8	-3.0	-0.5	0.4	0.9	-2.3	1.7	0.7	0.3
F	CONSTRUCTION	1.7	-1.6	-3.0	-1.2	0.0	5.9	3.2	2.8	-1.5	-9.1	-6.7	-0.6	-3.1

N/A: data not available.
Source: Eurostat.

Table 7.4: EU-27 - Labour productivity per person employed, annual growth rate (%)

Code (NACE Rev. 2)	Sector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average 2006-2011
B	MINING AND QUARRYING	6.4	0.6	5.5	1.6	2.5	-3.1	0.0	3.4	-2.3	-7.1	3.7	-4.8	-1.5
C	MANUFACTURING	6.1	0.1	1.3	2.4	4.7	3.0	5.6	3.8	-1.5	-8.2	11.4	3.9	1.7
C10	Manufacture of food products	1.8	1.8	3.0	0.6	3.2	2.3	1.7	1.9	-0.5	1.0	2.4	0.9	1.1
C11	Manufacture of beverages	N/A	4.4	3.8	3.3	-1.2	2.6	5.4	1.4	-1.1	4.2	1.7	7.3	2.6
C12	Manufacture of tobacco products	-2.4	1.4	-0.3	-0.3	-0.7	-2.2	-4.8	14.5	-8.6	4.6	0.8	0.6	2.1
C13	Manufacture of textiles	6.1	0.3	0.4	4.1	1.7	-1.2	5.4	4.2	-3.4	-5.7	14.7	-0.1	1.7
C14	Manufacture of wearing apparel	1.4	-0.6	-7.2	-2.2	1.5	-1.4	8.6	8.5	3.4	1.6	10.0	-4.3	3.7
C15	Manufacture of leather and related products	1.6	-4.2	-6.6	-3.0	-5.1	-3.4	1.0	1.5	-2.4	-1.3	6.2	0.3	0.8
C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	7.7	-2.8	2.6	3.6	4.7	0.9	5.2	0.2	-6.6	-2.1	6.5	0.0	-0.5
C17	Manufacture of paper and paper products	4.3	-0.3	4.4	4.5	4.3	2.7	6.5	5.5	-1.0	-3.6	8.5	-0.1	1.8
C18	Printing and reproduction of recorded media	2.7	-1.8	1.9	2.8	3.2	5.8	2.0	0.5	0.2	-0.6	4.4	1.6	1.2
C19	Manufacture of coke and refined petroleum products	6.8	2.5	0.9	5.7	7.1	2.6	5.1	-1.5	3.7	-5.1	1.9	2.6	0.3
C20	Manufacture of chemicals and chemical products	7.6	-0.6	3.6	2.7	6.8	4.0	4.8	3.9	-1.0	-7.8	12.8	1.5	1.7
C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	3.5	8.6	6.3	5.4	2.2	5.8	4.6	1.0	3.2	7.0	6.0	1.2	3.6
C22	Manufacture of rubber and plastic products	2.2	-1.4	1.0	1.7	1.9	1.5	5.0	3.0	-4.9	-7.4	10.4	3.0	0.6
C23	Manufacture of other non-metallic mineral products	4.4	0.1	0.5	3.2	4.0	1.6	5.1	0.6	-4.6	-9.3	9.1	5.2	0.0
C24	Manufacture of basic metals	11.8	-0.7	4.3	3.8	9.1	0.6	7.4	1.6	-2.9	-20.3	25.3	3.7	0.4
C25	Manufacture of fabricated metal products, except machinery and equipment	5.6	-0.6	0.5	2.3	2.6	1.8	3.6	2.8	-5.0	-15.2	13.1	5.1	-0.3
C26	Manufacture of computer, electronic and optical products	11.2	-7.5	-3.5	6.0	11.1	6.2	10.3	8.6	4.0	-8.8	12.6	5.6	4.1
C27	Manufacture of electrical equipment	8.0	-0.5	0.8	1.8	4.2	2.0	7.5	2.3	-1.4	-13.1	14.0	0.9	0.1
C28	Manufacture of machinery and equipment n.e.c.	8.1	0.2	-0.5	1.7	6.7	4.8	7.6	5.3	-0.6	-22.0	16.5	8.5	0.6
C29	Manufacture of motor vehicles, trailers and semi-trailers	5.4	0.4	2.0	2.3	4.8	2.8	3.9	6.3	-6.8	-16.8	24.9	9.7	2.5
C30	Manufacture of other transport equipment	4.5	2.0	-2.4	4.1	2.3	2.0	6.9	2.3	2.8	-2.4	6.2	5.6	2.8
C31	Manufacture of furniture	N/A	-2.2	-1.1	-2.5	3.0	3.2	4.4	3.0	-2.4	-8.0	8.2	4.2	0.8
C32	Other manufacturing	10.5	2.5	4.6	-1.0	2.6	3.1	5.3	2.2	-1.4	-2.9	9.7	4.5	2.3
C33	Repair and installation of machinery and equipment	11.1	-0.7	-2.1	0.0	5.5	2.1	7.8	3.9	0.9	-7.3	4.8	7.0	1.7
D	ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	7.9	5.2	5.4	7.7	6.2	4.6	2.2	0.8	0.7	-6.9	3.9	-5.2	-1.4
E	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
F	CONSTRUCTION	4.3	0.5	1.1	1.4	-0.5	0.0	-0.8	-2.3	-1.9	0.0	2.2	4.6	0.5

N/A: data not available.
Source: Eurostat.

Table 7.5: EU-27 - Labour productivity per hour worked, annual growth rate (%)

Code (NACE Rev. 2)	Sector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average 2006-2011
B	MINING AND QUARRYING	N/A	0.3	5.7	2.9	1.6	-3.1	0.6	3.3	-2.5	-6.0	1.9	-5.7	-1.9
C	MANUFACTURING	N/A	1.3	1.7	3.1	3.9	3.2	4.9	4.1	-1.2	-5.9	8.0	3.1	1.5
C10	Manufacture of food products	N/A	2.4	4.3	2.2	2.2	2.7	1.6	2.5	-0.8	1.7	1.5	0.9	1.1
C11	Manufacture of beverages	N/A	3.2	6.2	2.1	-2.9	3.5	8.1	2.6	-0.6	2.4	4.3	5.9	2.9
C12	Manufacture of tobacco products	N/A	-4.2	2.3	4.8	-1.3	-0.6	0.9	6.7	-7.9	4.2	-1.4	2.3	0.7
C13	Manufacture of textiles	N/A	1.2	0.5	4.0	1.1	-0.7	4.9	1.6	-4.4	-3.3	8.1	-2.6	-0.2
C14	Manufacture of wearing apparel	N/A	0.2	-7.8	-2.7	-1.3	-5.4	6.3	8.2	3.2	3.8	9.7	-6.4	3.6
C15	Manufacture of leather and related products	N/A	-3.1	-4.0	-3.4	-8.1	-4.9	-0.8	2.2	-1.8	-2.5	2.9	0.6	0.3
C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	N/A	0.3	2.6	4.6	4.1	1.9	4.4	1.2	-6.1	-1.1	2.8	-0.4	-0.8
C17	Manufacture of paper and paper products	N/A	-0.6	4.3	4.5	4.5	2.0	4.8	3.8	0.9	-1.4	6.4	-1.1	1.7
C18	Printing and reproduction of recorded media	N/A	-2.1	3.2	3.0	4.3	4.7	0.3	0.3	-0.4	-1.7	2.8	-0.1	0.2
C19	Manufacture of coke and refined petroleum products	N/A	2.8	2.2	3.8	5.4	-0.2	5.0	-0.4	0.5	0.5	2.3	3.9	1.4
C20	Manufacture of chemicals and chemical products	N/A	0.9	4.1	2.8	5.3	4.9	4.5	4.8	-1.5	-6.9	11.6	0.2	1.5
C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	N/A	10.5	6.7	5.2	0.6	6.4	6.6	0.9	1.1	5.5	6.0	1.0	2.9
C22	Manufacture of rubber and plastic products	N/A	-0.3	1.9	3.6	2.0	2.3	2.2	3.9	-4.0	-5.2	6.6	1.9	0.5
C23	Manufacture of other non-metallic mineral products	N/A	2.1	1.3	3.7	3.0	1.5	4.8	1.4	-4.1	-7.6	4.2	3.6	-0.6
C24	Manufacture of basic metals	N/A	0.9	3.5	5.6	6.7	1.9	6.1	1.6	-2.3	-15.9	16.6	2.1	-0.1
C25	Manufacture of fabricated metal products, except machinery and equipment	N/A	0.7	0.8	3.3	3.1	2.6	3.2	3.8	-5.4	-12.1	7.7	4.6	-0.5
C26	Manufacture of computer, electronic and optical products	12.3	-6.0	-4.5	5.9	10.9	6.5	9.9	9.5	3.1	-5.3	10.6	7.1	4.9
C27	Manufacture of electrical equipment	N/A	1.1	-0.2	1.5	4.2	3.4	5.8	3.0	-1.0	-8.7	8.3	0.7	0.3
C28	Manufacture of machinery and equipment n.e.c.	N/A	1.9	0.3	1.8	5.5	5.3	6.8	5.7	0.0	-17.6	11.4	7.3	0.8
C29	Manufacture of motor vehicles, trailers and semi-trailers	N/A	1.5	2.6	3.0	4.5	2.5	3.3	5.1	-4.7	-11.9	17.0	7.8	2.2
C30	Manufacture of other transport equipment	N/A	3.2	-1.9	3.5	2.9	2.6	6.1	4.1	3.5	-1.5	5.3	4.5	3.2
C31	Manufacture of furniture	N/A	-2.1	-0.2	0.9	1.4	4.1	2.2	2.8	-1.6	-5.6	4.4	3.0	0.5
C32	Other manufacturing	N/A	3.4	6.1	1.2	1.7	3.9	5.4	1.7	-1.7	-0.9	7.7	0.5	1.4
C33	Repair and installation of machinery and equipment	N/A	1.4	-1.4	1.2	7.3	1.9	7.1	3.7	3.6	-9.5	5.7	5.4	1.6
D	ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	N/A	4.0	5.9	7.9	4.7	1.8	2.6	0.5	0.0	-4.2	4.8	-5.9	-1.0
E	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
F	CONSTRUCTION	2.3	2.3	3.7	3.2	0.9	-3.2	0.1	-0.3	-1.3	1.5	3.4	1.7	1.0

N/A: data not available.
Source: Eurostat.

Table 7.6: EU-27 - Unit labour cost, annual growth rate (%)

Code (NACE Rev. 2)	Sector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	Average 2006-2011
B	MINING AND QUARRYING	-2.8	7.7	-0.7	6.8	4.2	1.1	8.5	5.4	10.9	11.2	2.1	11.3	8.1
C	MANUFACTURING	-1.0	2.8	1.6	0.1	-1.4	-0.5	-2.3	-0.3	5.8	9.8	-6.4	-0.8	1.4
C10	Manufacture of food products	0.3	2.3	0.8	2.8	-0.5	-0.7	0.3	1.4	5.0	1.0	0.2	0.0	1.5
C11	Manufacture of beverages	N/A	1.0	-1.6	2.5	3.8	-1.3	-3.8	1.1	5.2	1.6	-1.5	-3.3	0.6
C12	Manufacture of tobacco products	8.8	4.8	0.8	6.5	8.5	6.2	7.0	-4.1	16.2	2.0	-1.4	-9.0	0.4
C13	Manufacture of textiles	7.8	1.8	3.1	0.6	0.7	2.8	-2.3	0.7	8.8	6.0	-8.8	2.8	1.7
C14	Manufacture of wearing apparel	14.4	0.8	9.2	2.4	1.6	4.3	-3.7	-0.5	3.2	2.2	-5.4	6.7	1.1
C15	Manufacture of leather and related products	15.0	9.1	7.3	4.2	9.5	5.8	4.6	4.9	10.3	4.9	-0.8	1.9	4.2
C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	-5.1	5.3	-0.9	-1.8	-0.6	1.0	-0.4	4.7	11.9	4.3	-4.5	2.1	3.6
C17	Manufacture of paper and paper products	0.3	4.8	-2.5	-1.7	-1.2	1.0	-3.5	-1.3	3.5	3.5	-5.1	1.9	0.4
C18	Printing and reproduction of recorded media	2.7	5.1	0.4	-1.4	-1.0	-1.8	-0.7	0.9	4.3	1.9	-4.2	-1.6	0.2
C19	Manufacture of coke and refined petroleum products	6.1	1.0	6.2	-5.0	-1.2	4.1	2.5	2.5	4.0	7.9	3.7	-1.2	3.3
C20	Manufacture of chemicals and chemical products	0.5	3.2	-1.0	1.5	-3.5	-0.9	-3.6	-0.4	4.8	10.6	-9.0	4.5	1.9
C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	N/A	-6.2	-2.8	-0.4	1.6	-2.9	-3.3	4.2	0.3	-3.2	-4.4	1.2	-0.4
C22	Manufacture of rubber and plastic products	0.2	3.3	1.3	-0.2	0.6	0.3	-2.9	-0.9	7.8	8.2	-4.9	0.2	2.0
C23	Manufacture of other non-metallic mineral products	-2.1	2.0	2.9	0.2	-1.0	0.7	-1.8	2.5	8.9	12.3	-3.2	-3.0	3.3
C24	Manufacture of basic metals	-4.9	-3.1	-1.4	-0.6	-3.4	2.9	-3.0	3.0	6.8	23.0	-14.0	0.1	3.1
C25	Manufacture of fabricated metal products, except machinery and equipment	-4.6	4.0	1.9	-0.4	0.0	0.0	-1.0	0.5	10.3	15.1	-6.8	-2.6	3.0
C26	Manufacture of computer, electronic and optical products	-2.2	12.3	6.2	-5.6	-7.7	-4.7	-8.1	-6.2	0.8	10.9	-9.4	-4.2	-1.9
C27	Manufacture of electrical equipment	-4.2	2.4	2.2	0.2	-1.1	-1.0	-4.3	0.6	5.2	12.2	-8.7	2.2	2.0
C28	Manufacture of machinery and equipment n.e.c.	-2.8	2.9	2.8	1.5	-1.9	-2.6	-3.7	-1.6	4.3	27.7	-9.1	-3.7	2.8
C29	Manufacture of motor vehicles, trailers and semi-trailers	0.1	1.1	0.6	0.5	-2.6	-0.5	0.2	-5.4	9.2	16.2	-15.5	-4.2	-0.6
C30	Manufacture of other transport equipment	-0.1	2.9	7.8	0.7	-1.2	0.6	-3.4	0.4	1.8	7.6	-0.1	-1.8	1.5
C31	Manufacture of furniture	N/A	5.5	4.5	-0.6	-1.1	-0.1	-0.2	0.3	7.0	10.3	-3.9	-3.5	1.9
C32	Other manufacturing	-10.7	1.1	-0.9	2.0	0.6	-1.5	-2.4	3.1	3.9	3.3	-5.3	0.3	1.0
C33	Repair and installation of machinery and equipment	-2.3	5.1	5.9	2.4	-2.4	0.8	-4.9	0.0	2.5	12.9	-6.2	-5.1	0.6
D	ELECTRICITY, GAS, STEAM AND AIR CONDITIONING SUPPLY	-1.4	-0.8	1.9	-1.7	-1.3	0.1	4.3	5.1	4.5	8.8	-1.7	6.6	4.6
E	WATER SUPPLY; SEWERAGE, WASTE MANAGEMENT AND REMEDIATION ACTIVITIES	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
F	CONSTRUCTION	-5.8	3.4	3.0	0.1	1.4	5.9	3.3	6.8	6.4	0.4	-2.5	-0.4	2.1

N/A: data not available.
Source: Eurostat.

Table 7.7: EU-27 - Revealed comparative advantage index

Sector	2007	2008	2009	2010
Manufacture of food products	1.20	1.12	1.10	1.09
Manufacture of beverages	1.61	1.58	1.62	1.71
Manufacture of tobacco products	1.52	1.55	1.61	1.67
Manufacture of textiles	0.81	0.76	0.69	0.67
Manufacture of wearing apparel	0.76	0.76	0.76	0.74
Manufacture of leather and related products	0.96	0.90	0.91	0.88
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	1.15	1.17	1.18	1.16
Manufacture of paper and paper products	1.28	1.30	1.35	1.35
Printing and reproduction of recorded media	1.20	1.61	1.79	1.88
Manufacture of coke and refined petroleum products	0.83	0.84	0.77	0.79
Manufacture of chemicals and chemical products	1.13	1.14	1.16	1.16
Manufacture of basic pharmaceutical products and pharmaceutical preparations	1.47	1.54	1.54	1.65
Manufacture of rubber and plastic products	1.18	1.21	1.18	1.19
Manufacture of other non-metallic mineral products	1.22	1.19	1.18	1.15
Manufacture of basic metals	0.92	0.88	0.82	0.86
Manufacture of fabricated metal products, except machinery and equipment	1.18	1.20	1.16	1.20
Manufacture of computer, electronic and optical products	0.60	0.60	0.57	0.57
Manufacture of electrical equipment	0.98	0.98	0.98	0.97
Manufacture of machineryand equipment n.e.c.	1.14	1.17	1.18	1.16
Manufacture of motor vehicles, trailers and semi-trailers	1.22	1.22	1.30	1.28
Manufacture of other transport equipment	0.85	0.87	1.15	1.21
Manufacture of furniture	1.27	1.23	1.20	1.13
Other manufacturing	0.80	0.81	0.75	0.77

Note: there was a transition from NACE REV 1 to NACE REV 2, therefore the data are only available from 2007.
Source: own calculations using Comtrade data.

Table 7.8: EU-27 - Relative trade balance (X-M)/(X+M)

Code (NACE Rev. 2)	Sector	2007	2008	2009	2010
C10	Manufacture of food products	-0.03	-0.03	-0.02	-0.01
C11	Manufacture of beverages	0.21	0.20	0.20	0.22
C12	Manufacture of tobacco products	0.03	0.06	0.06	0.05
C13	Manufacture of textiles	-0.01	-0.01	-0.02	-0.02
C14	Manufacture of wearing apparel	-0.19	-0.19	-0.21	-0.22
C15	Manufacture of leather and related products	-0.07	-0.07	-0.08	-0.08
C16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	0.00	0.02	0.04	0.03
C17	Manufacture of paper and paper products	0.04	0.04	0.06	0.06
C18	Printing and reproduction of recorded media	0.08	0.05	0.04	0.08
C19	Manufacture of coke and refined petroleum products	-0.03	-0.01	-0.05	-0.05
C20	Manufacture of chemicals and chemical products	0.03	0.03	0.06	0.04
C21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	0.07	0.08	0.08	0.10
C22	Manufacture of rubber and plastic products	0.04	0.04	0.04	0.04
C23	Manufacture of other non-metallic mineral products	0.08	0.08	0.09	0.08
C24	Manufacture of basic metals	-0.06	-0.03	0.01	-0.01
C25	Manufacture of fabricated metal products, except machinery and equipment	0.09	0.09	0.10	0.10
C26	Manufacture of computer, electronic and optical products	-0.11	-0.11	-0.11	-0.12
C27	Manufacture of electrical equipment	0.07	0.08	0.08	0.07
C28	Manufacture of machineryand equipment n.e.c.	0.16	0.17	0.20	0.19
C29	Manufacture of motor vehicles, trailers and semi-trailers	0.06	0.08	0.08	0.11
C30	Manufacture of other transport equipment	0.13	0.11	0.11	0.10
C31	Manufacture of furniture	0.04	0.04	0.03	0.02
C32	Other manufacturing	-0.04	-0.04	-0.04	-0.02

Note: there was a transition from NACE REV 1 to NACE REV 2, therefore the data are only available from 2007.
Source: own calculations using Comtrade data

Table 7.9.1: Revealed comparative advantage index in manufacturing industries in 2010 - EU countries, Japan and Brazil, China, India and Russia.

	Food	Bevarages	Tobacco	Textiles	Clothing	Leather & footwear	Wood & wood products	Paper	Printing	Refined petroleum	Chemicals	Pharmaceuticals	Rubber & plastics	Non-metallic mineral products	Basic metals	Metal products	Computers, electronic & optical	Electrical equipment	Machinery	Motor vehicles	Other transport	Furniture	Other manufacturing
	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	C29	C30	C31	C32
Austria	0.92	2.25	0.38	0.70	0.53	0.70	4.47	2.19	1.55	0.25	0.50	1.46	1.35	1.40	1.29	2.15	0.40	1.35	1.40	1.29	0.79	1.22	0.80
Belgium	1.33	0.97	1.10	0.84	0.71	0.96	0.83	0.99	7.72	1.13	2.24	3.48	1.04	1.09	1.10	0.69	0.21	0.43	0.67	1.04	0.20	0.54	1.33
Bulgaria	1.53	0.87	5.38	1.15	3.23	1.29	1.66	0.75	0.22	2.14	0.54	0.86	0.92	2.23	2.76	0.76	0.27	1.10	0.78	0.35	0.33	1.37	0.36
Cyprus	2.22	1.23	40.71	0.13	0.46	0.64	0.16	0.41	0.00	0.00	0.69	6.25	0.37	0.20	0.60	0.94	0.85	0.40	0.45	0.22	0.80	1.02	1.78
Czech Rep.	0.46	0.64	1.65	0.87	0.34	0.38	1.41	0.97	1.18	0.25	0.54	0.31	1.71	1.71	0.65	2.09	1.00	1.60	1.14	2.04	0.38	1.51	0.85
Denmark	3.30	1.36	1.68	0.69	1.73	0.79	1.13	0.69	0.86	0.71	0.65	1.54	1.14	1.01	0.33	1.51	0.52	0.98	1.63	0.31	0.51	2.57	0.89
Estonia	1.29	2.28	0.28	1.32	1.08	0.67	8.96	0.82	0.40	2.60	0.61	0.13	1.42	1.49	0.52	1.93	0.63	1.45	0.64	0.72	0.57	2.97	0.64
Finland	0.35	0.45	0.02	0.26	0.17	0.24	5.11	9.43	0.75	1.57	0.87	0.52	0.84	0.74	1.82	0.90	0.51	1.30	1.43	0.25	1.07	0.24	0.49
France	1.16	4.40	0.63	0.56	0.71	1.06	0.62	1.01	1.67	0.53	1.31	1.77	1.11	0.99	0.75	0.94	0.44	0.87	0.86	1.15	4.13	0.52	0.77
Germany	0.76	0.67	1.85	0.52	0.49	0.36	0.83	1.23	2.60	0.23	1.03	1.37	1.31	1.01	0.79	1.31	0.56	1.20	1.57	1.85	1.30	0.80	0.61
Greece	2.89	1.80	6.52	1.57	2.07	0.75	0.60	0.77	1.92	2.13	0.94	1.84	1.25	2.16	1.99	0.97	0.24	0.75	0.38	0.09	0.87	0.37	0.44
Hungary	0.83	0.41	0.10	0.34	0.27	0.47	0.76	0.82	0.10	0.42	0.57	0.97	1.20	1.15	0.33	0.77	1.75	1.69	0.81	1.71	0.16	0.93	0.26
Ireland	1.39	1.87	0.54	0.10	0.15	0.08	0.41	0.11	0.00	0.22	3.06	8.11	0.32	0.25	0.08	0.24	0.70	0.22	0.31	0.02	0.31	0.09	1.65
Italy	0.92	2.28	0.02	1.36	1.57	2.98	0.54	1.04	1.13	0.85	0.73	1.02	1.37	1.99	1.01	1.76	0.21	1.08	1.83	0.73	0.93	2.42	1.02
Latvia	1.60	6.03	1.62	1.13	1.13	0.26	21.28	0.86	1.75	0.71	0.51	1.23	1.02	1.84	1.43	1.53	0.45	0.62	0.51	0.63	0.29	2.56	0.47
Lithuania	1.89	1.47	6.45	1.04	1.36	0.32	3.58	1.08	0.12	4.80	1.28	0.38	1.13	0.87	0.19	1.04	0.23	0.50	0.56	0.69	0.49	5.73	0.39
Luxembourg	0.95	0.88	6.60	2.32	0.39	0.57	2.38	1.93	0.04	0.02	0.54	0.14	4.12	2.47	4.14	1.24	0.26	0.72	0.75	0.61	0.81	0.16	0.24
Malta	0.96	0.26	0.02	1.14	0.18	0.13	0.06	0.02	1.10	0.01	0.28	1.52	1.29	0.37	0.06	0.27	3.05	1.33	0.24	0.04	0.91	0.09	1.83
Netherlands	1.97	1.35	5.34	0.44	0.55	0.60	0.26	0.87	0.21	2.15	1.65	0.94	0.75	0.45	0.62	0.77	1.12	0.55	1.04	0.34	0.38	0.38	0.81
Poland	1.47	0.46	5.02	0.61	0.71	0.41	2.33	1.57	0.45	0.59	0.71	0.34	1.76	1.54	0.90	1.72	0.71	1.31	0.55	1.67	1.06	4.79	0.29
Portugal	1.20	3.79	5.09	1.98	2.31	3.12	4.24	2.55	0.90	0.69	0.76	0.38	1.87	3.51	0.63	1.87	0.32	1.00	0.47	1.38	0.17	2.87	0.28
Romania	0.45	0.26	5.77	1.06	2.25	2.49	4.24	0.33	1.60	1.01	0.50	0.41	1.49	0.54	1.03	1.10	0.57	1.44	0.75	1.88	1.06	3.49	0.27
Slovakia	0.48	0.37	0.00	0.33	0.58	1.21	1.25	1.15	0.46	0.75	0.40	0.18	1.42	1.08	1.21	1.56	1.31	1.00	0.69	2.28	0.28	1.55	0.32
Slovenia	0.54	0.59	0.00	0.70	0.42	0.63	2.85	1.83	0.21	0.42	0.87	2.22	1.73	1.57	1.04	2.02	0.21	2.26	0.96	1.62	0.15	2.91	0.46
Spain	1.64	2.19	0.49	0.80	1.20	1.22	0.79	1.42	0.39	0.59	1.19	1.34	1.21	2.14	1.09	1.30	0.20	0.86	0.67	2.19	1.07	0.78	0.38
Sweden	0.52	0.89	0.28	0.31	0.33	0.19	3.79	5.50	0.22	1.25	0.68	1.53	0.90	0.61	1.14	1.11	0.79	0.98	1.28	1.05	0.39	1.51	0.49
United Kingdom	0.71	3.70	0.80	0.52	0.61	0.48	0.18	0.70	1.32	1.31	1.23	2.55	0.92	0.74	0.74	0.79	0.65	0.69	1.09	1.25	1.61	0.39	1.10
EU-27	1.09	1.71	1.67	0.67	0.74	0.88	1.16	1.35	1.88	0.79	1.16	1.65	1.19	1.15	0.86	1.20	0.57	0.97	1.16	1.28	1.21	1.13	0.77
USA	0.91	0.75	0.27	0.53	0.15	0.20	0.62	1.20	0.55	1.12	1.48	1.07	1.03	0.76	0.69	0.94	0.98	0.88	1.39	1.01	0.44	0.48	1.59
Japan	0.09	0.06	0.07	0.40	0.02	0.02	0.02	0.29	0.18	0.34	0.95	0.16	1.08	1.01	1.16	0.70	1.06	1.07	1.94	2.16	1.32	0.15	0.43
Brazil	5.36	0.11	0.54	0.42	0.04	2.00	1.97	3.15	0.29	0.50	0.93	0.35	0.73	1.12	1.70	0.79	0.10	0.45	0.76	1.08	1.42	0.64	0.17
China	0.37	0.09	0.16	2.46	2.73	2.50	0.90	0.37	0.18	0.25	0.48	0.22	0.93	1.46	0.51	1.29	1.83	1.44	0.72	0.25	0.88	2.12	1.15
India	1.15	0.10	0.47	3.12	1.95	1.21	0.10	0.24	0.88	3.50	0.96	0.93	0.57	0.77	1.37	0.85	0.16	0.40	0.41	0.41	1.00	0.32	5.03
Russia	0.53	0.26	1.17	0.06	0.02	0.11	3.51	1.01	0.14	8.90	1.40	0.05	0.24	0.50	3.28	0.28	0.09	0.20	0.17	0.09	0.67	0.14	0.08

Source: Own calculations using COMTRADE data.

Table 7.9.2: Relative trade balance (X-M)/(X+M) in manufacturing industries in 2010 - EU countries, Japan and Brazil, China, India and Russia.

	Food	Bevarages	Tobacco	Textiles	Clothing	Leather & footwear	Wood & wood products	Paper	Printing	Refined petroleum	Chemicals	Pharmaceuticals	Rubber & plastics	Non-metallic mineral products	Basic metals	Metal products	Computers, electronic & optical	Electrical equipment	Machinery	Motor vehicles	Other transport	Furniture	Other manufacturing
	C10	C11	C12	C13	C14	C15	C16	C17	C18	C19	C20	C21	C22	C23	C24	C25	C26	C27	C28	C29	C30	C31	C32
Austria	-0.05	0.53	-0.69	-0.02	-0.43	-0.20	0.43	0.23	-0.26	-0.59	-0.26	0.04	-0.03	0.00	0.04	0.11	-0.12	0.12	0.07	0.05	0.26	-0.17	-0.07
Belgium	0.15	-0.05	0.03	0.27	-0.01	0.17	0.00	-0.02	0.07	0.03	0.15	0.09	0.07	0.11	0.20	-0.04	-0.17	-0.04	0.05	-0.07	0.04	-0.17	0.06
Bulgaria	-0.09	-0.17	0.41	-0.45	0.52	0.05	0.19	-0.38	-0.80	0.14	-0.38	-0.23	-0.29	0.13	0.39	-0.31	-0.36	-0.07	-0.17	-0.26	-0.01	0.16	-0.24
Cyprus	-0.70	-0.88	-0.28	-0.93	-0.92	-0.87	-0.97	-0.91	-1.00	-1.00	-0.75	-0.05	-0.90	-0.97	-0.73	-0.81	-0.51	-0.88	-0.81	-0.94	-0.86	-0.89	-0.52
Czech Rep.	-0.21	0.09	0.36	0.09	-0.16	-0.25	0.34	-0.05	0.16	-0.14	-0.17	-0.40	0.02	0.26	-0.22	0.18	-0.12	0.14	0.19	0.35	0.20	0.30	0.18
Denmark	0.28	-0.16	0.52	-0.02	-0.04	-0.22	-0.32	-0.37	-0.09	-0.20	-0.10	0.15	-0.08	-0.13	-0.34	0.05	-0.11	-0.03	0.25	-0.40	-0.43	0.19	-0.07
Estonia	-0.03	-0.24	-0.58	0.04	0.02	-0.10	0.45	-0.24	-0.71	-0.12	-0.24	-0.69	-0.11	0.04	-0.27	0.14	-0.07	0.04	-0.07	0.04	0.14	0.59	0.04
Finland	-0.42	-0.42	-0.97	-0.35	-0.68	-0.43	0.55	0.81	-0.48	0.28	-0.01	-0.24	-0.03	-0.10	0.33	-0.01	-0.09	0.18	0.25	-0.48	0.37	-0.59	-0.09
France	-0.06	0.63	-0.58	-0.14	-0.37	-0.13	-0.36	-0.18	0.19	-0.35	0.03	0.08	-0.11	-0.18	-0.09	-0.12	-0.22	-0.05	-0.04	-0.05	0.29	-0.52	-0.16
Germany	0.06	-0.04	0.58	0.03	-0.30	-0.29	0.10	0.14	0.33	-0.36	0.14	0.14	0.23	0.19	0.01	0.25	-0.04	0.23	0.40	0.40	-0.03	-0.10	0.07
Greece	-0.32	-0.39	-0.11	-0.18	-0.37	-0.69	-0.66	-0.71	-0.45	-0.16	-0.52	-0.57	-0.33	-0.22	0.01	-0.37	-0.69	-0.42	-0.63	-0.88	-0.83	-0.82	-0.70
Hungary	0.13	0.07	-0.74	-0.17	-0.02	-0.07	0.11	-0.07	-0.81	-0.03	-0.07	0.04	-0.01	0.12	-0.30	-0.14	0.07	0.09	-0.07	0.42	0.29	0.42	0.00
Ireland	0.27	0.22	0.04	-0.34	-0.62	-0.65	-0.01	-0.68	-0.98	-0.50	0.69	0.77	-0.24	-0.29	-0.30	-0.15	0.32	-0.15	0.19	-0.78	-0.60	-0.61	0.55
Italy	-0.13	0.59	-0.99	0.20	0.11	0.26	-0.42	-0.07	0.09	0.26	-0.21	-0.11	0.25	0.41	-0.12	0.42	-0.48	0.20	0.45	-0.15	0.26	0.63	0.13
Latvia	-0.23	0.25	-0.35	-0.10	-0.03	-0.57	0.79	-0.43	-0.46	-0.59	-0.41	-0.24	-0.26	-0.03	0.07	-0.01	-0.17	-0.26	-0.23	-0.11	-0.46	0.30	-0.30
Lithuania	0.13	-0.18	0.56	-0.11	0.27	-0.28	0.29	-0.17	-0.83	0.79	-0.01	-0.41	0.01	-0.12	-0.42	0.05	-0.25	-0.12	-0.08	-0.07	0.24	0.83	0.04
Luxembourg	-0.30	-0.59	-0.08	0.64	-0.47	-0.18	0.19	-0.05	-0.88	-0.99	-0.39	-0.69	0.35	0.04	0.40	-0.12	-0.34	-0.12	0.01	-0.50	-0.45	-0.86	-0.46
Malta	-0.46	-0.82	-0.98	0.41	-0.68	-0.74	-0.90	-0.98	-0.49	-1.00	-0.61	0.18	-0.02	-0.74	-0.84	-0.61	0.34	-0.02	-0.52	-0.81	-0.74	-0.91	0.35
Netherlands	0.27	0.17	0.71	0.08	-0.17	-0.06	-0.54	-0.01	-0.43	0.19	0.24	0.07	0.00	-0.18	0.00	0.02	0.01	-0.02	0.22	-0.19	0.01	-0.34	0.03
Poland	0.17	-0.10	0.79	-0.30	-0.06	-0.31	0.40	-0.05	-0.35	0.02	-0.26	-0.46	0.05	0.13	-0.07	0.08	-0.17	0.14	-0.27	0.25	0.13	0.75	-0.26
Portugal	-0.36	0.40	0.58	0.00	0.12	0.17	0.36	0.13	-0.24	-0.14	-0.38	-0.63	0.05	0.34	-0.35	0.11	-0.39	-0.13	-0.34	-0.21	-0.44	0.27	-0.58
Romania	-0.49	-0.43	0.70	-0.48	0.53	0.08	0.53	-0.63	-0.17	0.11	-0.40	-0.57	-0.23	-0.50	-0.09	-0.33	-0.22	-0.15	-0.27	0.28	0.61	0.61	-0.25
Slovakia	-0.12	-0.22	-1.00	-0.15	0.09	0.26	0.31	0.18	-0.10	0.26	-0.11	-0.53	0.06	0.08	0.29	0.09	-0.05	0.04	0.07	0.28	0.40	0.32	0.09
Slovenia	-0.33	-0.17	-1.00	-0.04	-0.31	-0.33	0.11	0.10	-0.74	-0.60	-0.17	0.37	0.12	-0.02	-0.14	0.16	-0.27	0.34	0.11	0.08	-0.19	0.34	-0.07
Spain	0.02	0.21	-0.80	-0.06	-0.29	-0.13	-0.13	0.00	-0.58	-0.41	-0.09	-0.11	-0.03	0.31	0.10	0.07	-0.55	-0.07	-0.12	0.16	0.17	-0.28	-0.43
Sweden	-0.31	-0.12	-0.35	-0.20	-0.43	-0.48	0.55	0.70	-0.65	0.14	-0.14	0.39	-0.06	-0.23	0.12	0.09	0.00	0.03	0.17	0.00	0.15	0.08	-0.07
United Kingdom	-0.45	0.07	-0.40	-0.31	-0.59	-0.58	-0.83	-0.47	0.30	0.08	-0.06	0.16	-0.23	-0.28	-0.14	-0.24	-0.26	-0.24	0.00	-0.17	0.08	-0.69	-0.18
EU-27	-0.01	0.22	0.05	-0.02	-0.22	-0.08	0.03	0.06	0.08	-0.05	0.04	0.10	0.04	0.08	-0.01	0.10	-0.12	0.07	0.19	0.11	0.10	0.02	-0.02
USA	-0.02	-0.49	-0.17	-0.36	-0.89	-0.83	-0.43	0.01	0.40	-0.12	0.15	-0.22	-0.16	-0.25	-0.21	-0.16	-0.27	-0.25	0.02	-0.32	-0.43	-0.71	-0.21
Japan	-0.84	-0.81	-0.95	-0.12	-0.97	-0.95	-0.98	-0.17	0.32	-0.41	0.21	-0.59	0.38	0.30	0.34	0.20	0.16	0.35	0.63	0.79	0.56	-0.62	-0.27
Brazil	0.79	-0.81	0.90	-0.46	-0.76	0.62	0.87	0.55	-0.25	-0.62	-0.42	-0.63	-0.27	0.07	0.20	-0.16	-0.83	-0.42	-0.41	-0.14	-0.01	0.42	-0.55
China	0.09	-0.42	0.70	0.70	0.96	0.81	0.36	-0.14	0.29	-0.14	-0.27	0.24	0.37	0.60	-0.14	0.59	0.24	0.31	-0.04	-0.17	0.40	0.92	0.74
India	0.19	-0.11	0.82	0.65	0.95	0.63	-0.39	-0.51	-0.29	0.55	-0.32	0.45	0.07	0.06	-0.47	0.11	-0.66	-0.26	-0.45	0.27	-0.13	0.07	0.22
Russia	-0.62	-0.77	0.19	-0.87	-0.97	-0.90	0.64	-0.20	-0.86	0.93	0.10	-0.94	-0.72	-0.49	0.56	-0.71	-0.83	-0.78	-0.82	-0.89	-0.07	-0.78	-0.83

Source: Own calculations using COMTRADE data.

Table 7.10: Revealed comparative advantage index in service industries in 2010- EU countries, US, Japan and Brazil, China, India and Russia.

	Communication	Computer and information	Construction	Finance	Insurance	Other business services	Personal, cultural and recreational	Transportation	Travel
Austria	0.95	0.60	0.83	0.28	0.98	1.05	0.63	1.15	1.49
Belgium	1.70	0.72	0.76	0.50	0.57	1.49	0.96	1.42	0.49
Bulgaria	1.20	0.93	1.10	0.06	1.01	0.49	0.85	0.93	2.29
Cyprus	0.33	0.17	0.23	1.84	0.28	1.17	0.65	1.17	1.14
Czech Republic	0.96	0.98	1.81	0.04	0.61	0.98	1.21	1.19	1.47
Denmark	0.34	0.48	0.24	0.15	0.22	0.65	0.92	2.97	0.40
Estonia	1.65	0.74	1.83	0.28	0.10	0.76	0.41	1.92	1.02
Finland	0.43	3.93	1.58	0.28	0.19	1.44	0.04	0.54	0.00
France	1.15	0.18	1.69	0.24	0.40	0.90	1.79	1.21	1.38
Germany	0.83	1.11	1.91	0.70	1.12	1.27	0.59	1.14	0.61
Greece	0.41	0.21	0.73	0.06	0.51	0.21	0.65	2.66	1.44
Hungary	0.88	0.99	0.77	0.11	0.08	1.14	8.49	0.94	1.19
Ireland	0.28	6.24	0.00	1.10	4.94	1.18	0.00	0.24	0.18
Italy	2.58	0.34	0.04	0.35	1.38	1.03	0.41	0.72	1.69
Latvia	0.97	0.59	0.83	0.83	0.35	0.65	0.41	2.40	0.75
Lithuania	1.03	0.15	0.80	0.12	0.02	0.31	0.51	2.87	1.07
Luxembourg	1.48	0.19	0.25	8.23	2.49	0.49	3.82	0.25	0.27
Malta	0.42	0.22	0.00	0.89	0.55	0.63	46.84	0.46	1.13
Netherlands	1.93	1.08	1.13	0.19	0.31	1.33	0.94	1.30	0.58
Poland	0.64	0.77	1.57	0.23	0.26	1.16	1.21	1.31	1.26
Portugal	1.00	0.26	1.11	0.12	0.26	0.74	1.99	1.30	1.87
Romania	2.42	1.96	2.96	0.19	0.20	0.90	1.39	1.42	0.56
Slovak Republic	1.22	0.96	1.08	0.10	0.31	0.61	1.54	1.50	1.66
Slovenia	1.76	0.42	1.24	0.11	0.75	0.67	1.10	1.27	1.81
Spain	0.64	0.85	1.30	0.50	0.41	0.91	1.83	0.83	1.82
Sweden	0.98	1.87	0.34	0.23	0.40	1.55	1.11	0.75	0.75
United Kingdom	1.25	0.89	0.34	2.71	1.59	1.28	3.24	0.60	0.55
EU-27 TOTAL	1.12	1.16	0.93	1.12	1.13	1.10	1.63	1.04	0.89
United States	0.78	0.41	0.49	1.65	1.26	0.71	0.00	0.63	1.07
Japan	0.19	0.12	2.92	0.35	0.42	1.17	0.14	1.34	0.41
Brazil	0.51	0.11	0.03	0.88	0.61	1.93	0.44	0.76	0.81
China	0.27	0.88	3.28	0.11	0.47	1.40	0.09	0.97	1.16
India	0.43	7.48	0.16	0.66	0.67	0.91	0.35	0.52	0.50
Russian Federation	1.12	0.49	2.26	0.32	0.48	1.11	1.35	1.62	0.85

Source: IMF, OECD.

BACKGROUND STUDIES

Chapter 1 - "The external sector in the recession" was written by Jorge Durán and benefitted from excellent research assistance by Miroslav Skriecka. Comments and suggestions are acknowledged to Alessandra Tucci who helped improve sensibly parts of the text.

Chapter 2 – "The EU Industry in the Global Value Chain" was coordinated by Mats Marcusson and is based on the background study "Global Value Chains and the EU Industry" by Robert Stehrer (co-ordinator, wiiw), Marcin Borowiecki (AIT), Bernhard Dachs (AIT), Doris Hanzl (wiiw), Steffen Kinkel (Fraunhofer ISI), Johannes Pöschl (wiiw), Magdolna Sass (RCERS FAS), Thomas Christian Schmall (Fraunhofer ISI), Andrea Szalavetz (RCERS FAS).

Chapter 3 – "Energy content in exports and eco-innovation" was written by João Libório. The section on eco-innovation is partly based on the background study "Competitiveness Aspects of Eco-Innovation Adoption of European Firms" by Klaus Rennings and Sascha Rexhäuser both from the Centre of European Economic Research (ZEW, Mannheim). Robert Stehrer, Roman Stöllinger (both from wiiw, Vienna Institute for International Economic Studies) and Miroslav Skriecka provided research assistance collecting and processing data. Comments and suggestions are acknowledged to Konstantin Pashev, Mats Marcusson and Ágnes Magai.

Chapter 4 – "FDI flows and EU industrial competitiveness" was coordinated by Ágnes Magai. The section on 'FDI flows and EU industrial competitiveness is based on the background study 'FDI flows and impacts on the competitiveness of the EU industry' by Martin Falk, Rahel Falk, Yvonne Wolfmayr (WIFO); Gábor Hunya, Roman Stöllinger (wiiw); Oskar Kowalewski, Tomasz Napiórkowski, Mariusz-Jan Radlo, Marzena Weresa (WERI); Mark Knell (NIFU-STEP). Additional experts: Randolph Bruno, Nigel Driffield and Yama Temouri. Comments and suggestions are acknowledged to Alessandra Tucci, Jorge Durán Laguna, João Libório, Konstantin Pashev and Mikael Garellick.

Chapter 5 – "Clusters and Network" was coordinated by César Roa and Maya Jollès and is based on the background study "The impact of clusters and networks of firms on EU competitiveness" by Christian Ketels, Harvard Business School and EBS Business School.

Chapter 6 – "Competitiveness developments along the external borders of the European Union" was coordinated by Tomas Brännström. and is based on the background study "European Neighbourhood – Challenges and Opportunities for EU Competitiveness" by Peter Havlik, Vasily Astrov, Mario Holzner, Gabor Hunya, Roman Stöllinger, Sandor Richter, Isilda Mara and Hermine Vidovic (wiiw, Vienna Institute for International Economic Studies).

European Competitiveness Report 2012

Reaping the benefits of globalization

The 2012 edition of the European Competitiveness Report studies some of the main driving forces of globalization and the opportunities it brings for EU industries. By looking at international trade, global value chains, FDI, energy efficiency of EU exports, clusters and networks and relations with neighborhood countries, the report provides empirical evidence that the European industry is well positioned to benefit from globalization and draws the corresponding implications for industrial policy.