

Focus

Industrial Policy in the 21st Century

Ha-Joon Chang  and Antonio Andreoni 

ABSTRACT

Industrial policy is back at the centre stage of policy debate, while the world is undergoing dramatic transformations. This article contributes to the debate by developing a new theory of industrial policy, incorporating some issues that have been neglected so far and taking into account the recent changes in economic reality. The authors explore how the incorporation of some of the neglected issues — commitments under uncertainty, learning in production, macroeconomic management (especially demand management), and conflict management — changes the theory. They then examine how the theory of industrial policy should be modified in light of recent changes in economic reality: the rise of the global value chain, financialization and new imperialism. This contribution aims at promoting a pragmatic approach to industrial policy and pointing to new areas for policy intervention in a changing world.

INTRODUCTION

Over the last decade, the perception of industrial policy has taken an unanticipated turn. After the very heated debate from the late 1970s to the mid-1980s, prompted by the success of Japanese and other East Asian industrial policy practices, the debate on industrial policy had lapsed into three decades of ideologically motivated wilful neglect (see Chang, 2011, for a review of the early debate). In spite of significant progress in our theoretical and empirical knowledge in the area, ‘industrial policy’ became a phrase that one did not utter in polite company. Unexpectedly, however, industrial policy is now back in fashion, both in academia but also, more importantly, in the real world.

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In academia, while the vast majority of mainstream economists are still at best sceptical and at worst downright hostile towards industrial policy, prominent mainstream (neoclassical) economists like Joseph Stiglitz, Dani Rodrik and Justin Lin have openly come out in favour of industrial policy. Although these economists are very careful not to deviate from the neo-classical framework and often emphatically distance themselves from the old-style industrial policy, especially tariff protection, the mere fact that they have explicitly supported industrial policy has opened the possibility for the debate to be far less ideological and thus more productive (see Lin and Chang, 2009, for an example of a less ideological debate).

In the real world, since the 2008 financial crisis many leading economies have become more willing to recognize the value of industrial policy and have taken measures to strengthen it — the USA and Germany are the most prominent examples (Andreoni, 2016; Mazzucato, 2013). Following the end of the China-driven commodity boom, many developing countries, which had been busy dismantling their industrial policies during the 1980s and the 1990s, have realized that they need industrial policy if they are to upgrade their economies. Many middle-income countries in Asia and some in Latin America now talk of industrial policy as a tool to overcome the ‘middle-income trap’ (see Felipe, 2015; Noman and Stiglitz, 2016). The oil economies in the Gulf region have started talking about industrial policy as a tool for economic diversification (Cherif and Hasanov, 2014). Even the African economies talk about it in their attempt to get out of poverty (Chang et al., 2016; Kanbur et al., 2019; Noman and Stiglitz, 2015).

Given these recent changes, a new, less ideologically charged debate on industrial policy is urgently needed. This article aims to contribute to this effort neither by revisiting the classic debate on industrial policy of the 1990s, centred around the East Asian ‘miracle’,¹ nor by comprehensively reviewing the increasing number of contributions on industrial policy which have developed along the structuralist, evolutionary and developmentalist traditions.² Instead, we identify and develop lines of investigation which either have been neglected or sit uncomfortably within the resurgent industrial policy debate, despite their relevance. This is done in two ways.

First, we discuss a number of issues which cannot be accommodated within the neoclassical framework and which are also often neglected by evolutionary and structuralist contributions — namely, commitment under uncertainty, learning in production, macroeconomic management, and

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1. For a review of the Asian Miracle debate see Amsden (1989); Chang (1994, 2011); Cimoli et al. (2009); Lin and Chang (2009); Rodrik (2008); Wade (1990).
 2. For a review of the debate since 2000, see Andreoni and Chang (2019). For recent contributions see also Andreoni (2016); Cherif and Hasanov (2019); Mazzucato (2013); Salazar-Xirinachs et al. (2014); Stiglitz and Lin (2013); Wade (2018). Five recent journal issues covering frontier themes in industrial policy are: Andreoni et al. (2019b); Foray et al. (2012); Kattel and Mazzucato (2018); Pianta and Zanfei (2016); Storm (2017).

conflict management. Evolutionary economics may have improved our understanding of the role of uncertainty in the innovation process, but it has rather neglected the issues of irreversible investment commitments under uncertainty and learning in production (as opposed to research and development [R&D]). Similarly, while structuralist contributions have highlighted the linkage between the macroeconomy and the meso-industrial dynamics of structural change, few of them incorporate macroeconomic policy in their discussions of industrial policy. Finally, neither evolutionary nor structuralist contributions pay much attention to the political economy dimension of economic change and thus neglect the role of the state in managing the conflicts that arise from the process of change.

Second, we address new challenges for industrial policy makers in a changing world, such as the shifting organization of global production, the increasing financialization of the world economy, and changes in the rules of the global economic system. In selecting these three topics we do not claim to be exhaustive. Rather, this selection reflects the importance we accord to power dynamics in our framework. Power dynamics affect the creation, capture and distribution of value along global value chains (GVCs); they define the ability of governments to resist the anti-production pressure coming from financialization; and they determine the policy space that countries have by affecting the structure and the management of multilateral, regional and bilateral economic arrangements. These three sets of power dynamics have a second-order effect on some of the most pressing industrial policy issues of our time. In particular, the sustainability and inclusiveness of industrialization will depend on how the power relationships that exist between firms (the global value chain), between finance capital and productive capital (financialization), and between countries (global governance) affect the abilities of firms and governments to make their developments more sustainable through a greening transition and to make them more inclusive by creating sufficient numbers of meaningful jobs.

NEGLECTED ISSUES

Since the mid-2000s, a number of important theoretical arguments in favour of industrial policy have re-entered the economic policy debate. However, many other issues have remained largely neglected, mainly because they do not fit easily into the mainstream (neoclassical) view of the world — in particular its limited understanding of two issues: production, and the role of the state. Neoclassical economics sees production as a mechanical process (as expressed in the production function) and overlooks the fact that it requires commitment of resources under uncertainty and continuous learning (Andreoni and Chang, 2017). Moreover, discussions of industrial policy in the neoclassical framework have failed to recognize the importance of managing macroeconomic conditions, on the one hand, and social conflicts, on the

other hand, in the successful conduct of industrial policy. In this section, by exploring these two sets of neglected issues, we also challenge the ongoing ‘mainstreaming of industrial policy’ (for a critical analysis, see Andreoni and Chang, 2019), while providing suggestions on how to incorporate these neglected issues in structuralist, institutionalist and evolutionary theories of industrial development.

Commitment Under Uncertainty

One central characteristic of modern industrial economies is that production requires irreversible commitments. Most of these involve physical capital that embody certain technologies (including energy systems) and that cannot be remoulded in any significant way to embody other technologies. Very often the commitments are also organizational — to particular types of internal organizational forms (e.g., vertical integration, diversification) or particular types of long-term relationships with suppliers (e.g., the Japanese just-in-time, or JIT, delivery system). Even at the individual level, workers often have to commit themselves to particular skills, which may be valuable only in a narrow range of industries — or even in just one industry or, in the extreme case, even just in one firm. These irreversible commitments are made because they raise productivity, but the problem is that they make subsequent changes costly. Once a firm commits to a particular technology, it cannot switch to another technology without big costs — even when changes in the environment are such that the firm would have adopted another technology, if it were making the choice *ab initio*.

Of course, if we could predict the future perfectly, at least in the probabilistic sense (as we are assumed to do in neoclassical theory), commitments and the consequent difficulties of making changes would not be a problem. In that case, based on our knowledge of the likelihood of each possible future state of the world, we could decide exactly what degree of commitments we are going to make, by balancing the gains from productivity increase (discounted over time) with the loss from the inability to make the necessary changes in response to changing conditions (also discounted over time). The trouble is that the world is highly uncertain and this kind of calculation is impossible.

Naturally, firms can — and do — do things to reduce the uncertainty of their environment. One classic method is for a firm to increase its control over the market by reducing the number of rivals through predatory pricing (thereby driving some out of business) or through mergers and acquisitions (Richardson, 1960; Singh, 1971). Another common method is to form cartels, although they are not easy to form and maintain due to the well-known ‘free-rider’ problem. Third, firms can try to reduce uncertainty by increasing controls over their suppliers, either by becoming larger and thus increasing bargaining power (the Walmart solution) or by deliberately forming

long-term relationships through investments and technical supports (the Toyota solution). Last but not least, firms try (and often succeed) to control the tastes of consumers by spending money on advertising and brand building.

However, there are also things that individual firms cannot do but industrial policy makers can do, in order to reduce uncertainty. The motive of the policy maker in reducing uncertainty for firms would be to encourage the making of productivity-enhancing investment commitments as well as steering innovation. A number of industrial policy tools reduce uncertainty by guaranteeing demand. First, infant industry protection not only enables the infant firms to survive and continue learning but it significantly reduces demand uncertainty for them, by restricting competition from superior foreign producers, which have much greater ability to create uncertainty in the market through radical technological innovations than domestic (infant) rivals do. Second, the government can guarantee demand by restricting competition among domestic firms. For example, it can give monopoly rights to a particular firm, subject entry into certain industries to government licensing, or allow — or even facilitate — cartels in specific industries to fix prices (especially in the export market) and/or divide up the market. Japan and Korea have used these measures particularly effectively (Chang, 1994: Ch. 3). Third, the government can reduce demand uncertainty by giving preferential treatment in government procurement to domestic firms so that they have stability in demand. The US aircraft industry, the Japanese mainframe computer industry, and the Finnish electronics industry are some of the most prominent examples of industries that have benefited hugely from such treatment. More recently, government procurement has played an important role in the development of green energy technologies, such as solar panel and wind power, in a number of countries (Rodrik, 2014).

At the more dynamic level, industrial policy makers can introduce measures that reduce uncertainty about the future evolution of technology — rather than reducing the uncertainty about market demand, supply of inputs, and the strategies of the rivals, *given the technology*. First of all, the government can provide a clear platform for technological evolution of an industry by taking a lead in the development of the basic technologies. The best example in this regard is the US government, which initially financed the developments of technologies for the computer, the internet, the semi-conductor, etc. through public funding of R&D (Berger, 2013; Block and Keller, 2011; Mazzucato, 2013). Second, the government can push firms to form research consortia to develop basic technologies, which they will share and use in developing more applied technologies, with which they will compete with each other. The developments of Japanese mainframe computers and of US semi-conductors (SEMATECH) benefited from such an arrangement. Third, during the early stage in the development of an emerging industry, where different technological standards compete with each other, the government can reduce uncertainty about the path of future technological evolution by imposing a technological standard. This was done in South Korea in

relation to the CDMA (code-division multiple access) mobile phone technology standard, which it adopted on a national scale ahead of other countries, including the US, whose company Qualcomm developed the technology first. Fourth, the government can subsidize or directly provide technology-related ‘public goods’ (such as data, metrology, prototyping and testing facilities) in order to reduce the risk involved in the scaling-up of emerging technologies. Several technology intermediaries such as the Fraunhofer in Germany or the National Network for Manufacturing Innovation in the US (Andreoni, 2016; Tassej, 2007) provide such services.

Of course, policies to reduce uncertainty can fail. If the government reduces uncertainty in an industry by restricting competition, this can (although it does not have to) lead to lower productivity in the long run by making the firms concerned complacent. Especially in relation to long-term technological evolution, policy makers should be aware that industrial policy measures which try to reduce uncertainty run the risk of prematurely ending the competition between different technological standards and/or backing what turns out to be a ‘wrong’ technology with lower innovation potential in the long run.

However, the possibility that industrial policy measures to reduce uncertainty may turn out to be counter-productive should not be used as an excuse to recommend policy inaction. Even if we don’t know everything — and, more importantly, don’t even know exactly what we don’t know — it does not mean that we do not know anything and therefore cannot and should not take any action. All that we are arguing is that policy makers need to be aware of the limitations of their policies and acknowledge that they need to constantly review the situation. In fact, in advanced industrial nations, a number of governments are engaged with the private sector in road-mapping exercises aimed at identifying future societal needs and global challenges, on the one hand, and the emerging technologies which will help us meet them, on the other hand (e.g., green technologies, new mobility solutions, robots for the ageing society). By developing a joint vision as well as credible expectations among private companies around future public investments, not only does the government reduce the uncertainty faced by companies but it also enables the creation of new markets.

Learning in Production

The promotion of learning, understood as a process of development and accumulation of productive capabilities, is perhaps the ultimate goal of industrial policy. In our view, the most fundamental difference between industrialized and non-industrialized economies is the difference in the levels of various collective productive capabilities embedded in the institutions and productive organizations in the two types of economies — what Moses Abramovitz (1986) originally called ‘social capabilities’. The continuous development

of these collective capabilities through learning is what drives productivity increase, creates employment, and sustains redistributive institutions such as the welfare state.

The recognition of the role of learning in driving industrialization and broader increase in the wealth (and power) of nations dates back to pre-classical (Antonio Serra and Giovanni Botero) and classical political economists (Adam Smith, Charles Babbage and Karl Marx). It also provided the most fundamental foundation to the ‘infant industry argument’ (Alexander Hamilton and Friedrich List) (see Andreoni and Chang, 2019; Chang, 2002; Reinert, 2007). Since the 1970s, development and evolutionary economists have produced a wealth of research on capabilities building and innovation dynamics, starting from this recognition (Dosi et al., 1988; Freeman, 1974; Lall, 2001; Mazzucato, 2018). More recently the so-called ‘product space’ method has attempted an operationalization of the concept of capability and diversification (Hidalgo and Hausmann, 2009), while Schumpeterian analyses of catching-up have explained successful industrialization in terms of learning cycles and innovation (Lee, 2013, 2019).

Despite these advancements, in the current industrial policy debate learning has become increasingly disconnected from production. This is partly because scholars have de-linked production and innovation dynamics from each other — as if an economy does not need to produce to be innovative. But it is also because productive capabilities have been treated as black-box concepts. This is so in two senses. First of all, productive capabilities are discussed without much reference to the ‘realities’ of concrete production processes — that is, how the deployment of productive capabilities is affected by things like properties of materials used, the scales and time horizons of the production process, bottlenecks in the process, etc. Secondly, productive capabilities are discussed without much appreciation of the fact that innovation is exactly about discovering different technological and organizational solutions to problems arising in particular production processes.

The failure to recognize that ‘learning in production’ is the ultimate driver of industrial dynamics, especially innovation dynamics, is reflected in the dominant innovation policy paradigms since the 2000s — for example, the ‘Lisbon Agenda’ in Europe (for a critique see Soete, 2007), and the neglect of production in the discussion of the innovation economy in the US (for a critique see Pisano and Shih, 2013; Tassej, 2014). The failure to recognize the importance of ‘learning in production’ is also found in debates on new technologies. For example, the debate around digitalization is dominated by the idea of a leap into a post-industrial age, without the realization that manufacturing processes and the materiality of production will still matter in such an economy. For another example, it is claimed that robotics and automation will destroy a dramatic number of jobs in the near future, without realizing that firms have been learning how to effectively deploy automated solutions to complement, rather than simply replace, labour.

In the current debate on industrial policy, the dominant view is that innovation is mainly generated by ‘R&D units’, such as public research institutes (e.g., universities) and the R&D (not the production) departments of companies. In this view, once new technologies are developed, they can be deployed almost automatically by any firm with more than the minimum absorption capacity. Given the public-good nature of this knowledge and, thus, the risk of underinvestment in R&D (or in education or in skills development), the best way to promote learning (and innovation) is to give firms intellectual property rights (possibly complemented by some public investments in knowledge creation or R&D subsidies). In this framework, poor production performances are understood as a problem of underinvestment in knowledge inputs, such as R&D and education, while de-industrialization or offshoring are not seen as negatively affecting learning, as production is not where learning happens.

Recently, a few scholars have highlighted the importance of production in sustaining learning and innovation, even in the advanced economies (e.g., Andreoni et al., 2018; Berger, 2013; Locke and Wellhausen, 2014; Tassej, 2014). In this production-focused view, learning is a collective and cumulative process embedded in existing production structures, involving continuous and interdependent changes in agents’ capabilities, organizational configurations, and investments in material assets, including machinery and infrastructure (Andreoni, 2014; Chang, 2010; Lazonick, 1990, 2009; Penrose, 1959; Richardson, 1972). These interdependent changes, constituting what we call here ‘learning in production’, entail much more than the standard ‘learning by doing’ of individual workers (Arrow, 1962). In fact, learning in production is at the very core of the innovation process, especially in those manufacturing industries where the manufacturability of new products is the most critical step in the innovation chain, running from R&D through manufacturing to commercialization.

Learning in production is mainly triggered by three supply-side (or technology-pull) mechanisms and two demand-side (market-pull) mechanisms, and involves reconfiguration of production at the shop-floor level as much as at the level of the industrial ecosystem (Andreoni, 2014, 2018; Rosenberg, 1979, 1982).

In terms of the first technology-pull mechanism, learning in production includes the opportunity to adopt similar technical and organizational solutions to production problems across different products, firms and sectors. For example, the adoption of a certain machine or of a particular organizational technique can affect a whole range of different sectors, from textile to automotive and aerospace, as has been the case with lean manufacturing or with ‘advancements in particular production technologies, such as precision engineering and composite materials.

Second, the existence of indivisibilities — and thus the need to solve ‘scale bottlenecks’ — in production may lead to organizational innovations, not just in the industry itself but through the whole value chain in which

the industry is embedded. It may also enable the adoption in the supplier industries of technologies with high fixed costs that had not been adopted due to limited production volume. As Kaldor put it, '[w]ith every enlargement of production, new "activities" become profitable which would have not been employed earlier, whilst the introduction of such new "activities" leads to the invention of further "activities" which have not been known earlier' (Kaldor, 1972: 1255).

Third, as 'inventions hardly ever function in isolation' (Rosenberg, 1979: 26), any changes in the existing production processes and structures induce changes in complementary products and processes and technologies within and across firms. For example, innovation in the materials used for a certain component can induce changes in the overall product architecture and/or in the nature of other components.

In terms of the market-pull mechanisms, learning in production is driven by changes in the 'quantity' of demand (both final and intermediate demands of commodities) as well as its 'quality' (or composition). First, the interaction with final consumers in different markets is a key driver of learning; they are responsible for various processes of 'learning by using' (Rosenberg, 1982: 122). Second, market-pull dynamics are often mediated by the demands for intermediate industrial goods. The increasing specialization of firms in a limited number of production tasks and/or production of intermediate goods leads to the expansion of the market for intermediate goods and, in turn, for additional/complementary investments. Specialization of one firm, and the resulting productivity gains, then promotes the expansion of demand from other firms. These external economies are often associated with the advantages of geographically 'localized learning', based on local supply-demand relationships, entailing 'technological pollination' and other forms of learning in production, within an industrial ecosystem (Andreoni, 2018).

In the last couple of decades, much emphasis has been put on 'smart' industrial policies that encourage knowledge generation (investments in education and R&D), as against those clumsy, traditional policies that provide protection and subsidies. However, once we recognize the importance of learning in production, we begin to see that no amount of 'smart' policies will generate innovation without those 'dumb' policies that keep firms in business and help them expand, improve and innovate their production activities.

Indeed, the East Asian 'miracle' economies have shown that industrial policy is most successful when it combines measures to help firms produce more (e.g., trade protection, subsidies, state-led restructuring of failing enterprises, export promotion) with measures to help them acquire and generate new knowledge. Moreover, when it comes to the latter measures, successful countries did not just invest in education and R&D but also in knowledge-generating activities that are more closely linked to production activities, such as worker training and publicly provided technological consulting services for small and medium-sized enterprises ('industrial extension services').

Macroeconomic Management

The industrial policy debate has historically had a supply-side bias.³ This supply-side bias is responsible for the tendency of industrial policy scholars to overlook the influence of demand management on the conduct of industrial policy, both domestically (through monetary and fiscal policies) and internationally (especially through exchange rate policy). This tendency, in turn, has led to the neglect of the impacts that changes in demand (sometimes deliberately managed by the government) have on different sectors and on different countries in terms of diversification, specialization and restructuring (Imbs and Wacziarg, 2003).

While a number of classical development scholars like Young and later Hirschman have pointed to the role of demand for intermediate goods across vertically disintegrated sectors and consumption linkages (see, e.g., Hirschman, 1958, 1977), they implicitly assumed that the economic system is able to adjust automatically to rising supplies. However, according to Kaldor (1972: 1249–50), the absorption of a continuously rising volume of production depends on ‘additional incomes resulting from the accumulation of capital (in other words, from investment expenditures) combined with the induced character of such investment’. According to Kaldor, for the income multiplier and the investment accelerator mechanisms to be effective, the banking system as well as what he calls the ‘merchants’ have to play critical roles. The banking sector enables capital investments which, in turn, generate the ‘savings–additional investments–savings’ dynamic, while the merchants operate as counter-cyclical forces absorbing stocks in response to excess supply, and releasing stocks in the face of excessive demand.

One obvious macroeconomic policy that has a direct bearing on industrial policy is the interest rate policy. High (real) interest rates discourage investments in general, but have more negative impacts on investments in the manufacturing sector, where the requirement for borrowing is greater due to higher capital requirements than in other sectors. We have vividly seen the negative impacts of high interest rates on the manufacturing sector in countries like Brazil and South Africa in the last couple of decades, with real interest rates frequently being around 10–12 per cent and, as a consequence, few firms being able to borrow to invest.

Interest policy may not be an ‘industrial policy’ issue in the conventional sense, but it has important bearings on industrial policy insofar as high interest rates disproportionately damage capital-intensive industries. The effect of high interest rates on such industries can be, and often has been, countered by industrial policy measures — selective provision of cheaper loans (or priority in lending) by state-owned banks (e.g., Brazil’s BNDES)

3. Gilboy (1932) was an early critic of this bias; for more recent attempts to analyse the macroeconomics of industrialization see Fischer (2015); Nissanke (2019); Ocampo et al. (2009); Storm (2017).

or by private banks subject to the government's directed credit programmes (e.g., Japan). However, it is very difficult to have lively investments when interest rate policy is such that firms cannot make enough profits to repay even the interest on their loans.

The relationship between industrial policy and macroeconomic management does not stop at the domestic front. It also has an international dimension. And in the management of foreign demand — the so-called 'foreign trade multiplier' — the management of the exchange rate becomes crucial. Overvalued currencies may be created by the 'Dutch disease' (a sudden inflow of export earnings from a natural resource bonanza that is not countered by macroeconomic policy) or by the bias of policies towards the financial sector. Overvalued currencies tend to more negatively affect export industries, especially manufacturing industries, although different sectors tend to be affected in different ways according to the price elasticities of demand of their export products. Those products whose elasticity of demand in the global market is lower tend to be affected less than those with high elasticity. Once again, the effects of overvalued currency can be countered to an extent by industrial policy. For example, over the last couple of decades, the BNDES in Brazil has tried to counter the effects of overvalued currency by extending subsidized credit to selected industries.

Exchange rate policy can also be complemented in a positive way by other internationally oriented demand management policies, affecting balance of payments and trade performances. Among these, there may even be policies that are 'micro' in their conduct but have important macroeconomic consequences that have impacts on industrial policy. These are policies that relieve the balance of payments constraints in developing countries. In these countries, once such constraints are relaxed, there can be more investments (as investments mostly rely on imported capital goods). If this happens in a country with strong industrial policy, the impacts of such relaxation will be magnified. One important example is the control imposed on the imports of luxury consumption goods by the governments of Japan and Korea in the earlier days of their economic development — in the 1950s and 1960s in Japan and between the 1950s and the mid-1980s in Korea (on this, see Chang, 1998). Such control enabled these countries to invest more by relaxing their balance of payments constraints, which, when combined with their highly selective industrial policies, enabled the investment and thus the expansion of selected industries.

Thus seen, it is very important for governments to align the multitude of interrelationships between traditional industrial policy instruments and macroeconomic policies. This need was highlighted by Kaldor, who stated that: 'the failure of post-war Governments [in the UK] to pursue a policy consistent in terms of its declared objectives could thus be primarily attributed to an insufficient orchestration of instruments — of not having enough separate policy instruments at hand to secure the simultaneous attainment of the various objectives' (Kaldor, 1971: 3). Interestingly, this 'orchestration of

instruments' was one of the reasons for the East Asian economic successes (Chang, 2010; Stiglitz, 1996), but few contributions have so far looked at this policy alignment and synchronization between industrial and macroeconomic policies (for some exceptions, see Andreoni and Chang, 2019; Borrás and Edquist, 2019). More attention is warranted on this aspect.

Conflict Management

All economic policies are in the end political actions, in the sense that they are partial; they favour one group over another, one ideology over another, or even one culture over another.⁴ Being political, all policies inevitably involve conflicts, at least in latent forms. And depending on the way in which conflicts are addressed (and eventually resolved, or not), policies have different distributional effects. In the case of industrial policy, its 'inclusiveness' depends on the extent to which it constructs new (or steers existing) 'productive coalitions' that are willing to invest in the enhancement of collective productive capabilities, including the welfare state (see below) and are, over time, willing to engage in a more equal distribution of the value generated through these investments. Therefore, successful implementation of any policy requires management of the conflicts that it causes and/or of existing latent conflicts that it unintentionally stirs up.

It is important here to note that 'leaving things to the market' is also a very particular type of conflict management strategy. This method compels the losers from a market-driven change to accept the market outcome, thereby clearly taking the side of the winners of the change process. When the adjustments that need to be made by the losers are large, leaving things to the market may create a lot of conflicts, and therefore may be viable only when the state can prevent the losers from organizing countervailing actions, such as industrial strikes (if the losers are workers in particular industries) or capital flight (if the injured party are the wealthy). This is why a free market, somewhat paradoxically, requires a strong state (Gamble, 1987; Glyn, 2007).

When it comes to 'policies' in the conventional sense, as a rule, the more targeted the policy, and thus the easier it is to identify the winners and the losers, the more immediately it is likely to provoke conflicts. This means that the more targeted policy is likely to require more conflict management. So, for example, fiscal policy is likely to require more conflict management than monetary policy does, as much of the former has clearer winners and losers than the latter. Given this, changes in fiscal policy require the government to

4. In the literature some scholars use the concept of rents to refer to those income- or value-capture opportunities which are created by policies or regulations when they allocate some entities or groups the right to do something, for example, an import licence, a subsidy, preferential access to credit, etc.

make explicit deals with representatives of different groups of winners and losers or at least to present its fiscal policy with a high degree of obscurity so that people cannot easily tell who the winners and the losers are. Even monetary policy, which is often regarded as even-handed, requires conflict management, as it affects the outcome of distributional conflicts, as explained in the conflict theory of inflation by Rowthorn (1977). For example, a tight monetary policy is likely to favour capitalists over workers, as capitalists can more easily counter the impacts by raising their prices — although some small capitalists in highly competitive markets may not be able to do that, while some organized workers may be able to defend themselves by raising their wages. Further, a tight monetary policy also favours financial capitalists over industrial capitalists, as the former tend to benefit from a stronger currency while the latter are forced to pay higher interest on their loans.

Having said all of this, it has to be admitted that industrial policy may be the most prone to open conflicts, as it tends to be more explicitly selective than other policies; it inevitably chooses between sectors, technologies, or even individual firms in the same industry. Therefore, conflict management is more important for industrial policy than for other policies, and ultimately defines the political economy of industrialization (for a review of seminal contributions see Andreoni and Chang, 2019; Storm, 2017).

There are two types of measures that can be used in order to reduce conflicts involved in industrial policy: we call them ‘reactive measures of conflict management’ and ‘anticipatory measures of conflict management’. Reactive measures of conflict management in industrial policy can be subdivided into two categories, one temporary and the other permanent. When the trouble that a particular sector is experiencing is deemed to be of a temporary nature, the government can reduce the extent of conflicts in the sector by offering temporary protection and subsidies so that it can more easily weather the difficulties and perhaps restructure itself in the meantime. Temporary reactive measures of conflict management in industrial policy are rather widely used — even the World Trade Organization (WTO), which is not a fan of tariffs, allows its member countries to impose emergency tariffs in the face of a sudden surge in sectoral imports.

When the trouble that a sector is going through is deemed to be of a long-term nature, the government can impose, or offer inducements for, more radical restructuring. First, it can mediate negotiated capacity scrapping among firms in the sector, as the Japanese government did with the ship-building industry in the 1980s (Dore, 1986). Second, it can offer subsidies for the scrapping of obsolete machines and the purchase of new machines, as the South Korean government did with the textile industry, also in the 1980s (Chang, 1993). Third, it can bail out the enterprises in trouble, as the US government did with the auto industry after the 2008 financial crisis. Fourth, the government can nationalize an industry in trouble, with a view to winding it down (as in the case of the nationalization of the Swedish

shipbuilding industry in the 1970s) or with a view to restructuring and eventually privatizing the (temporarily) nationalized firms (as in the case of Volkswagen in West Germany in the 1970s).

The 'reactive' measures of conflict management have often been condemned for 'picking losers' and thereby preventing 'natural selection' in the market and reducing dynamism (see Lindbeck, 1981, for example). This may well be the case, but the critics of these measures disregard the fact that the failure to manage conflicts may impose serious costs on the economy. First, insofar as the sector in trouble possesses 'specific assets' that cannot be deployed in other sectors (or can be deployed only with a serious reduction in their values), bankruptcy of the firms in a sector that is viable in the long run will incur social costs. Second, if some owners of those specific assets can put up resistance, there also will be social costs. For example, if the capitalists in a sector with overcapacity refuse to exit in a game of 'chicken', all firms in that sector will suffer with low profits and thus greater risk of bankruptcy. Likewise, if the workers in a sector resist changes because they own sector-specific skills, they will disrupt production in the short run (thereby increasing the chance of bankruptcy of their firms) and, more importantly, delay the inevitable restructuring in the long run. If we take into account these costs, it may be more efficient in the long term for the government to incur short-term costs to manage the conflicts arising out of the industrial restructuring process.

The second type of measures of conflict management in industrial policy are 'anticipatory', rather than 'reactive'. A clear announcement of policy priorities and their justifications (why the government is backing particular sectors, technologies or even individual firms) in advance — through long-term national visions, five-year plans, or long-term sectoral strategies — can help reduce the conflicts arising out of industrial policy. While such announcements cannot avoid the accusation of 'favouritism' per se, they can deflect accusations of corruption, clientelism, vote seeking, etc., to a substantial degree. Industrial policy measures will become politically even more acceptable if they are announced together with explicit performance targets, evaluation criteria and, where appropriate, a long-term plan to phase them out (e.g., infant industry protection or temporary technological upgrading programmes).

Anticipatory measures of conflict management can also take various forms of 'social insurance' and thus reduce the incentives for the losers to resist socially beneficial changes that harm them. These are not industrial policy measures in the conventional sense, but they can play very important roles in the processes of structural change that characterize the process of industrial development. The most important social insurances for capitalists are limited liability and the modern bankruptcy law (see Chang, 2002: Ch. 3, on the role of these institutions in industrial development). Limited liability caps the loss to what has been invested, thereby reducing the risk of business failure leading to personal ruin, as it did before the late-19th century. The

modern bankruptcy law reduces the cost of business restructuring by giving temporary protection from creditors and even making debt write-downs possible. It also wipes the slate clean for the failed capitalist and gives him/her a second chance. These measures not only encourage risk taking by capitalists *ex ante*, but they also reduce their resistances to restructuring *ex post*.

The welfare state is the most important social insurance mechanism for workers. By ensuring a floor to living standards, the welfare state reduces the incentive for workers to resist restructuring of the industries in which they work. If this is combined with effective programmes for retraining and redeployment, as in countries like Sweden and Finland, this social insurance becomes even more effective in helping economies to achieve structural change while making the process more ‘inclusive’.

NEW REALITIES (AND THE CONSEQUENT NEED FOR NEW THEORIES)

In this section, we expand our theory of industrial policy by focusing on the new challenges. In particular, we focus our attention on three major transformations of the economic reality, which call for the development of a new industrial policy theory. These are: the new patterns of accumulation, value creation and capture; the financialization of the global economy; and finally, new forms of imperialism.

New Patterns of Accumulation, Value Creation and Capture

The global production landscape has been profoundly reshaped by three interdependent processes involving changes in: (1) the global organization of production; (2) the relationships between different sectors of the economy; and (3) the nature of technology systems. While each of these issues has received significant amounts of attention, the relationships between them and their combined impacts on accumulation, value creation and value capture dynamics remain underexplored.

The global business revolution and the emergence of global/regional value chains since the early 1990s have been made possible by a number of technological advances (e.g., falling transportation costs, more interconnectedness via ICTs), cost-reduction opportunities associated with offshoring of labour-intensive manufacturing processes, and the increasing openness to trade and investments (Gereffi, 2014, 2018; Milberg and Winkler, 2013; Nolan, 2001; Ponte et al., 2019; Storm, 2015). For a number of emerging economies, the expansion of transnational corporations (TNCs) and the resulting global segmentation of production tasks have provided an unprecedented opportunity for entering technology-intensive industries and capturing value from advanced manufacturing technologies. Despite the fact that not only China

but also South Korea and Taiwan started their industrialization by linking (backwards) to global supply chains in electronics and other sectors (Amsden, 1989; Chang, 1993; Lee, 2013; Wade, 1990), the industrial policy debate has only recently recognized the different opportunities and challenges that the evolving pattern of the global division of labour is posing to catching-up economies.

Among neoliberal scholars, under the mantra, ‘you need to import if you want to export’, GVCs have been used to re-emphasize the benefits of international trade and, thus, the need for more trade liberalization. Surprisingly, even the majority of the developmentalist scholars have welcomed the opportunity offered to developing countries by the GVC-based industrialization model in overcoming the highly uncertain and capital-demanding task of developing new sectors *ab initio*. However, we need to carefully analyse the conditions required for countries and companies to benefit from GVC integration as well as identifying the potential risks associated with this new industrialization model (Andreoni, 2019).

First, TNCs are extremely powerful organizations, whose revenue can be comparable to the GDPs of many developing countries. These TNCs exercise their power in global oligopolistic markets. Nolan (2007) estimates that since 2000, in the majority of global industries, the market has been controlled by a handful of TNCs. This power is exercised in a systematic and strategic manner to capture value in the market, by creating entry barriers in the forms of patents, quality standards, copyrights, trademarks, etc. (what Kaldor called ‘institutional monopolies’), on the one hand, and by squeezing the suppliers, on the other hand. This is particularly the case with commodity-based GVCs, where big companies capture value by controlling the retailing stages of the chains, or with low-tech manufacturing GVCs, where TNCs can squeeze value by inducing suppliers to increase scale and raise product quality and then, once resources are committed, exercising downward pressures on prices (the ‘hostage situation’ described by Williamson, 1983).

Second, the very act of committing resources to specific assets designed to perform relatively unsophisticated activities (basic processing or assembly), which developing countries are likely to engage in when they participate in GVCs, can limit the scope for learning in the future. The problem is that foreign-owned companies organizing GVCs create few backward and forward linkages because there are limited supplier and processor capacities in the host economy. Existing small enterprises lack the scale and the skills to provide reliable intermediate products as well as the resources necessary for investing in technological upgrading. The few domestic companies engaged in medium- and large-scale production are also constrained, as they largely rely on imports of semi-processed raw materials and capital goods to assemble relatively simple products, rather than creating backward and forward linkages. Breaking out of this low productivity, high cost

and low value-added cycle requires policy intervention (for a discussion see Gereffi, 2018; Gereffi and Sturgeon, 2013; Salazar-Xirinachs, et al., 2014).

The emergence of a global production system, and the consequent proliferation of offshoring practices, has gone hand in hand with the phenomenon of outsourcing, especially from the mature industrial economies. As a result, the traditional sectoral boundaries — especially those between manufacturing and services — have become increasingly fuzzy. While the literature has come to recognize the emergence of companies specializing in knowledge-intensive, production-related services and the consequent difficulty in drawing a boundary around the manufacturing sector, less emphasis has been given to the fact that, even within the manufacturing sector, the boundaries between different manufacturing industries have become blurred. In fact, production units (manufacturing firms) providing intermediate goods and components are often involved in different ‘manufacturing processes’ that feed into different industries.

Sectoral boundaries are also continuously challenged by technological changes. Technical innovations can change the nature of one sector, while technical innovations straddling different sectors can redefine the sectoral boundaries. The problem is that standard classification of boundaries between sectors is mainly based on products, but they are better defined in terms of underlying production technologies and their linkages. As shown in Andreoni (2018), technological linkages among different manufacturing processes may be used to define ‘capability domains’, that is, domains of techniques, productive knowledge and production technologies/equipment that show a high degree of similarity and complementarity.

With the blurring of sectoral boundaries, analyses at the level of capability domains are becoming more enlightening than analyses at the traditional sectoral level. A manufacturing process could be reconceptualized according to the underpinning capability domain. Different manufacturing processes could then be clustered based on their reliance on particular capability domains. This procedure would allow for a transition from a product-based taxonomy to a production technology-based taxonomy. Using this taxonomy, governments can target the development of capability domains (e.g., food processing, advanced materials, mechanics and control systems, ICT), rather than of particular industries defined in terms of the final product. Each one of these capability domains constitutes a platform of competencies, technologies, productive knowledge and experiences that can be deployed in a plurality of sectors. For example, these days the agro-food sector draws not just on traditional food processing capabilities (e.g., cleaning, cooking, canning), but also on the capabilities in mechanics and in control systems for packaging, on ICT capabilities for food tracking and, finally, on the capabilities in advanced materials for smart packaging. By nurturing the development of complementary sets of capabilities, the scope for technological

innovation within and across sectors can be increased and new development trajectories built.

Financialization

Since the 1980s, the dramatic restructuring of the global production system has been coupled with the process of increasing financialization. Financialization has been particularly strong among the advanced economies of the Anglo-Saxon variety of capitalism (Andreoni et al., 2019c; Lazonick, 2014; Lazonick and O'Sullivan, 2000). It is now widely acknowledged that, in these economies, the recent financial crisis has only been the latest manifestation of structural imbalances resulting from widespread financialization (Blankenburg and Palma, 2009). More recently, the financialization process has also affected a number of developing countries, as revealed by declining and increasingly volatile trends in investment/GDP ratios (even among fast catching-up economies, like China), wages contraction, and the growing share of finance in GDP (Storm, 2018; UNCTAD, 2016).

Financialization is a multi-faceted phenomenon, as it operates at different levels (corporation, country, world) and involves different actors (individual savers and borrowers, corporate managers, financial investors, banks, as well as governments). As a result, the mechanisms through which the global economy has become increasingly financialized are various, span across more than one country, and tend to reinforce each other. This is why addressing the problem of financialization is extremely difficult from a single-country policy perspective. For example, even assuming that a government has the policy space to reduce the instability of capital flows (which is often not the case), the same government might not be able to stop more fundamental processes of financialization occurring at the level of foreign corporations. Today, TNCs have become new channels through which financialization practices are transmitted, through their control structures and strategies. This also means that, through these various transmission mechanisms, even countries at earlier stages of economic development (without a developed financial market) can become over-financialized, especially because they lack the regulatory capabilities. Therefore, without tackling these multiple dimensions of the same financialization process and without understanding the different ways in which it affects industrial development (in particular, capital investments), even the most well-designed industrial policy will be ineffective.

Let us start looking at financialization from the level of the corporation. At this level, financialization manifests itself in five ways: (1) short-termism in corporate control and in investment strategy; (2) increasing distribution of profits through dividends and stock buy-backs; (3) increasing reliance/dependence on external finance; (4) increasing importance of financial activities by non-financial corporations, including stock buy-backs;

(5) increasing size of the financial sector. The bottom line of this financialization process is the breaking of the profit–investment nexus, which has driven the emergence of the ‘modern business enterprise’ and the industrialization of today’s developed countries.

Historically, during the first wave of big business development, from the mid-19th century to the 1920s, finance capital did not play a critical role, with the exception of the financing of infrastructure (primarily railroads and telecommunications). Industrial firms increased their scale mainly by re-investing profits and by restructuring operations, such as mergers to integrate production and distribution (O’Sullivan, 2016). Starting from the 1980s, this profit–investment nexus started weakening and corporations became ever-more financialized. The increasing globalization and fragmentation of production, the refocusing of TNCs on core businesses, and the increasing power of institutional investors, shifted corporate strategies from the old logic of ‘retaining and investing’ to one of ‘downsizing and distributing’. The emergence and the subsequent dominance of what came to be called ‘shareholder value’ ideology (Lazonick, 2014; Lazonick and O’Sullivan, 2000) has been the culmination of corporate financialization, which has contributed to the financialization of the entire economy.

If we look at financialization at the country and the global levels, it has been widely stressed that the international financial architecture is incapable of channelling financial resources in the right direction — from the centre to the periphery, as well as into the productive sectors of the economy. Not only has the unregulated global financial system been ineffective in making resources available where needed, it has in fact exposed countries to instability in financial capital flows and macroeconomic shocks (Chang, 2007a). The financialization of the global economy and the lack of global regulations in the areas of capital flows, as well as tax avoidance and evasion, have weakened governments in both developed and developing countries. In particular, the capacity of governments to set and maintain favourable macroeconomic conditions for growth, to finance infrastructural investments, and to run effective industrial policy has been declining dramatically as a result of financialization. Given that public investments tend to play a catalytic role for private investments (crowding-in effect), the reduced capacity of government to make investments (or support private investments through industrial policy), when combined with the financialization of corporations, has pushed economies towards a spiral of dis-investment and de-accumulation. This lack of investment in the future is a fundamental threat to the very reproduction of the society as well as the economy.

Industrial policy in the form of corporate governance reform, geared towards increasing productive investments, can play an important role in reversing the vicious cycle caused by financialization. However, given the systemic nature of the financialization phenomenon, it is destined to fail if it is not aligned with regulations at the different levels discussed above,

that is, corporate governance, the domestic financial market, and the global financial system.

Imperialism, Old and New

All economic policies have an international power dimension. For example, the rich countries have used the International Monetary Fund (IMF) and other global financial organizations that they control in order to impose ‘monetarist’ macroeconomic policies on developing countries in macroeconomic trouble, while conducting more ‘Keynesian’ policies when they face similar problems themselves (Chang, 2007a: Ch. 7). However, nowhere is this international power imbalance more prominent than in the area of industrial policy, whose scope has been very explicitly and clearly constrained by the imperialist policies of the stronger countries in the last three centuries.

Up until the end of World War II, these actions took the most blatant forms in the colonies (see Chang, 2002: 51–53). First, certain high-value manufacturing activities were banned outright in the colonies. Second, exporting activities by producers in the colonies were restricted in order to minimize competition with the producers in the colonizing countries. Third, in the colonies, raw material production was strongly encouraged through subsidies and other policy measures, with the explicit purpose of making manufacturing activities less attractive. Fourth, between the early 19th century and the mid-20th century, ‘unequal treaties’ were forced upon the weaker countries that were not formally colonies. Among other things, these treaties deprived them of the right to set their own tariffs (known as ‘tariff autonomy’), which made it impossible for them to provide infant industry protection by allowing only very low, uniform tariff rates (3–5 per cent) for revenue purposes. These treaties also introduced the concept of ‘most favoured nation’, which meant that if one of the stronger countries managed to extract a concession from a weaker nation, all the stronger countries would be entitled to the same concession. These treaties lasted well into the 20th century for some countries.

With the end of the unequal treaties by the 1920s and the subsequent wave of decolonization between the 1940s and the 1970s, the imperialist countries significantly loosened their grip on the developing countries. The new global regime of trade, embodied in the General Agreement on Tariffs and Trade (GATT), put only mild restrictions on the trade policy of developing countries, with the choice not to sign up to the agreements that they didn’t want (so-called plurilateralism). Within this relatively permissive framework, the need for infant industry protection and other industrial policy measures was widely recognized — although the free trade ideology re-asserted itself soon enough.

The 1980s was the turning point. Following the Third World Debt Crisis of 1982, IMF–World Bank Structural Adjustment Programmes — which

emphasized fiscal austerity, trade liberalization, deregulation and privatization — were rolled out across the developing world. The collapse of the Soviet bloc in the late 1980s ushered in an era of free market triumphalism, further strengthening the ideological dominance of free market, free trade economics worldwide.

These shifts were institutionally consolidated in the 1990s. In 1994, the NAFTA (North American Free Trade Agreement), the first free trade agreement including developed countries and a developing country, was signed. The NAFTA also contained an important new provision, known as Chapter 11, on the Investor State Dispute Settlement (ISDS) mechanism, which took the unprecedented step of allowing corporations to directly sue host governments for damaging their profits through regulation. In 1995, following the conclusion of the Uruguay Round of trade talks, the GATT was transformed into the WTO. In contrast to the plurilateral principle of the GATT, the WTO demanded that all member countries sign up to all the agreements (the so-called ‘single undertaking’ provision), which were not only more restrictive than those under the GATT but also covered new areas, most notably intellectual property rights (TRIPs) and regulations on foreign investment (TRIMs). The 1990s also saw the rapid spread of investment treaties. The number of bilateral free trade agreements also started increasing in the 1990s and exploded in the 2000s; they numbered around 50 in the mid-1990s but there are now over 250 of them.⁵ As a result, the developing countries are today much more constrained in the use of many industrial policy measures that were the standard fares of the early post-colonial era between the mid-1940s and the mid-1970s.

However, it is important to note that, unless developing countries have signed bilateral agreements with the rich countries (especially the US), there is still a considerable amount of ‘policy space’ (for further details on the points below, see Chang et al., 2016: Ch. 5, section 5.1). First, there are industrial policy measures that are basically domestic in nature and thus not subject to international agreements. Targeted infrastructural investments, subsidies for (or public provision of) worker training or R&D, government procurement programmes, tax incentives for physical investments, and the strategic use of state-owned enterprises are only some of the more prominent examples of ‘domestic’ policies.⁶

Second, many industrial policy measures that are international in nature can still be used. Some policy measures have no international restrictions

5. See: www.economist.com/blogs/graphicdetail/2015/10/global-trade-graphics

6. There is an ‘Agreement on Government Procurement’, but it is ‘a plurilateral agreement within the framework of the WTO, meaning that not all WTO members are parties to the Agreement’, as the WTO website itself describes (www.wto.org/english/tratop_e/gproc_e/gp_gpa_e.htm). At the moment, only 20 parties comprising 48 WTO members (that is, counting the 28 members of the EU as ‘a party’) have signed up to it. They are all developed countries, except for a few peripheral European countries (e.g., Moldova, Ukraine, Montenegro).

because no international consensus has evolved around them. Also, ambiguities in certain rules or their application can create further scope for pushing certain policies until they are detected or challenged. Third, there is still room for using tariffs. The WTO requirement is only that its members ‘bind’ (that is, set the upper limit to) at least some of their tariffs. As a result, many poorer members of the WTO have bound virtually none of their tariffs, while many of those who have bound their tariffs have done so at quite high levels. Given that the current levels of tariffs in most countries are well below their bound levels, these countries could raise tariffs substantially, if they wanted. Countries can also apply extra tariffs or even quantitative restrictions to address balance of payments problems, whether economy- or sector-wide.

Fourth, with regard to subsidies, the WTO categorically bans only those for export promotion (except for the LDCs and some selected developing countries) and those requiring local contents. All subsidies can be challenged in a WTO dispute (‘actionable’ in the WTO parlance), but the procedures for subsidy disputes are rather complicated and time-consuming, so even an ‘illegal’ subsidy can remain in force for several years before it is challenged (if it ever is) and ruled illegal. And indeed, another few years may be needed for the accumulation of the damage that makes it eligible for a WTO dispute.

Fifth, under the WTO, it has become more difficult to regulate foreign direct investment (FDI), due to the Trade Related Investment Measures (TRIMs) agreement and the General Agreement on Trade in Services (GATS) agreement. However, the TRIMs agreement only prohibits domestic content requirements and foreign exchange balancing requirements (that is, the requirement that a foreign-invested company should not run a ‘trade deficit’). Regulations regarding joint venture, technology transfer, or limitations on foreign equity ownership can still be used. As for the GATS, countries are required to accept restrictions on their FDI regulation only in sectors in which they have made ‘commitments’ — most countries, especially developing countries, have made only a limited number of commitments in relation to the service industries.

To sum up, while the restrictions on industrial policy by developing countries have become strengthened in the last couple of decades, this does not mean that industrial policy has become impossible.⁷

CONCLUDING REMARKS

Since the 18th century, the debate surrounding industrial policy has been one of the most important in the political economy of development. The debate

7. See Chang (2007b) for further discussion on policy space in historical perspective, and Andreoni et al. (2019a) for an analysis of policy space for the achievement of the Sustainable Development Goals.

has often been ideologically highly charged, but recent developments in the real world and in academia have opened up space for a more balanced, pragmatic debate. This article contributes to this new phase of the debate by raising some neglected issues and discussing the changes in reality that demand reformulation of the theories behind industrial policy.

Starting from the firm level, we have shown that the problem of commitments under uncertainty is a key issue in industrial policy, as it affects investments in specific productive capabilities, the latter being one of the most fundamental drivers of capitalist accumulation and technological change. We then moved to analyse various processes of learning in production and the critical relationship between agency and material structures within the realm of production. We highlighted how learning is the main source of value creation and how it cuts across various firms and sectors. Third, we showed how the dynamics triggered by the commitments under uncertainty and learning processes within firms are linked in a circular and cumulative relationship with demand. In this respect, we highlighted how successful industrialization is possible only under certain macroeconomic conditions. Finally, we focused on the political economy dimension, specifically the issue of managing the conflicts that arise from industrial policy. The type of conflict management has important implications for the ‘inclusiveness’ of the industrial development process.

Despite differences across countries in terms of their stages and levels of industrialization, their macroeconomic regimes and their political economy settings, the three sets of neglected issues we have focused on are and will remain of paramount importance. In fact, the problem of committing resources in specialized assets has become even more critical with recent technological changes that have made technological cycles shorter, and with the opportunities (and challenges) posed by digitalization. Similarly, the need to address long-term grand challenges, like climate change, calls for massive and coordinated investments in energy systems, production practices and mobility. The achievement of these global transformations still depends on micro-level structural changes in productive organizations and government interventions in creating new worlds of production as well as managing industrial and social restructuring. The latest industrial policies launched by leading industrial nations, like ‘Industry 4.0’ in Germany and ‘Made in China 2025’, build on these foundational principles and, while being nationally focused, have major global implications.

The second part of the article discussed these new insights in order to help us better understand three critical features of today’s global economy that affect industrial policy. First, we analysed how the transformation of the global production system has led to a new accumulation regime as well as a new dynamics of value creation and capture. In this regard, we looked at the combination of vertical disintegration and horizontal concentration of global businesses, the increasing fuzziness of standard sectoral boundaries, and the increasing need to understand production processes in terms

of capability domains, rather than final products. Second, we analysed the financialization of the global economy. We showed how the financialization of corporations as well as of the overall financial system has led to a spiral of underinvestment, thus threatening the very reproduction of capitalist economies. Finally, we looked at the extent to which countries have been able to make policy responses to these new challenges within the new global policy regime. The analysis focused on the distinctive features of what we can call a new form of imperialism.

These three global transformations are establishing new interdependences across national industrial policies, in some cases even leading to unexpected and unintended consequences. For example, given the global value chain structures, governments have lost control over the ultimate effects of trade wars. The main beneficiaries of the trade war between the US and China may be countries like Vietnam and Ethiopia, possible relocation destinations for US firms currently operating in China. Similarly, with the emergence of trillion-dollar companies like Apple, Amazon or Microsoft and increasing concentration in high-value manufacturing sectors like aerospace (Airbus and Boeing), some companies have acquired an unprecedented market power and, even more importantly, have enormous amounts of resources at their disposal, many times larger than government industrial policy budgets. As a result of financialization, corporate governance and investment decisions of these companies can be captured by short-term oriented financial interests, leading to declining investments and missed opportunities for innovation — what some have called ‘predatory value extraction’ (Lazonick and Shin, 2019).

From the 1990s until the global financial crisis of 2008, the industrial policy debate remained constrained by ideological battles, and important opportunities for research and policy development were lost in many countries. The last decade has witnessed a strong resurgence of interest in industrial policy, though the debate has quickly entered a potential diminishing-returns territory, as it usually involves revisiting the issues of the old debate using new terminologies (Andreoni and Chang, 2019). This article has attempted to provide the building blocks of a new theory of industrial policy that we hope will help the industrial policy debate to enter the territory of increasing returns.

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Ha-Joon Chang (corresponding author: hjc1001@cam.ac.uk) is Reader in the Political Economy of Development, Faculty of Economics, and Director, Centre of Development Studies, University of Cambridge, UK. He works on the role of the state in economic change, global economic governance, economic development in historical perspectives, institutions and development, and economic pluralism.

Antonio Andreoni (a.andreoni@ucl.ac.uk) is Associate Professor of Industrial Economics at University College London (UCL), and Head of Research of UCL Institute for Innovation and Public Purpose, London, UK. He is also Visiting Associate Professor, SARChI Industrial Development, University of Johannesburg, South Africa. He works on production, technology and innovation dynamics, financialization, corruption, structural change, governance and industrial policy.