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Catching up to the European core:

Portuguese economic growth, 1910-1990[*]

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Abstract

This paper analyses the causes of the Portuguese economic convergence to the European core, in the twentieth century, within a growth accounting framework. It concludes that investment in human and physical capital were the main driving forces of economic growth and that variations in output growth rates were mainly due to changes in total factor productivity growth. The paper explains further the decline in TFP growth after 1973 in terms of structural change in industry, which was induced by the allocation of resources to export oriented sectors with lower growth potential.

Key words: Portuguese economic growth; Convergence; Total factor productivity growth; Structural change.

1. *Introduction*

Throughout most of the nineteenth century, the levels of income per capita of the poor economies of the western European periphery diverged from those of the first industrializers. Contrarily, over the twentieth century, there was convergence of incomes per capita within the whole continent.[1] Convergence, however, occurred with different degrees of intensity and it was more pronounced in the period from 1950-73. This period has been studied more deeply, particularly in a cross-country comparative perspective. Yet, our understanding of the causes behind changes in convergence rates can be increased by paying attention to changing patterns of economic growth over the longer period.

Portugal had a particularly good performance in the twentieth century and caught-up to the levels of income per capita of the European core, although there was a substantial reduction in the rate of convergence after 1973.[2] Traditional explanations of growth and slowdown of the Portuguese economy have put more emphasis on internal factors and, in particular, on economic policy options, which would have shifted in important ways. To start with, government deficits, rapid monetary expansion and the inflation that characterized the Republican period (1910-26) would have been responsible for alleged economic stagnation. According to some authors, the emergence of the Estado Novo, from the accession to power of Salazar, in 1928, enhanced monetary and financial stability but did not lead to higher levels of economic growth. That would have been so because of agrarian and industrial policy options, which would have shifted domestic resources towards the 'wrong' sectors. In fact,

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[1] See Tortella (1994) and Maddison (1995). See also Lains (2002).

[2] See Maddison (1995 and 2001) and country studies in Crafts and Toniolo (eds.) (1996). For Portuguese economic growth in the twentieth century, see also Lains (1994) and Mateus (1998).

the Portuguese government imposed higher levels of control of the economy through agricultural and industrial policies aimed at controlling investment, output levels and prices, mirroring similar policies in contemporary fascist Italy. The industrial policies under the designation of *condicionamento industrial,* introduced in 1926, and the wheat campaign (*campanha do trigo*), introduced in 1929, as well as the first national plan, for 1935-50, are the best examples of the more interventionist stance of the first decades of the *Estado Novo*.[3]

Growth resumed after World War II because, according to similar analyses, and contrarily to the previous period, the dictatorship government imposed a 'strategy aimed at economic growth and structural change'.[4] In fact, the higher growth of the post World War II period is traditionally attributed to Portugal being a founding member of the European Free Trade Association (EFTA), created in 1960, which implied a shift towards open trade policies and liberalization of domestic prices.[5] However, according to the same perspective, the economy did not expand as much as it could have done, because opening up policies were not backed by a more interventionist stance by the government, which kept the budget balanced or because markets were not fully liberalized.[6] The slowing down of economic growth that followed is attributed to the aftermath of the revolution that ended the dictatorship, in 1974, and the nationalization spree in 1975. The privatization of major financial and industrial firms, starting in 1982, and Portugal's accession to the European Economic Communities (EEC), in 1986, would have set the economy on the good direction again. The adhesion to EEC meant an intensification of the liberalization procession and the level of state intervention in the country was finally in tune with the rest of western Europe. The relation

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[3] See, among others, Rosas (2000, Chap. 2). For the analysis of agricultural growth in this period, see Lains (2003a).

[4] Marques (1988, pp. 23-26). See also Rosas (2000, Chap. 2).

[5] Lopes (1994).

[6] Moura (1973)

between changes in trends in economic policy and changes in trends in economic growth and convergence is however weaker than it is often posited.[7]

Some economists have questioned the dominance of internal factors in shaping the pattern of growth of the Portuguese economy. Lopes (1996), recognizes that both internal and external factors were relevant for 'the acceleration of economic development, macroeconomic stability and increasing openness of the economy [during 1950-73]' but he stresses that 'it was above all because of foreign stimuli that the Portuguese economy expanded as it did and became more open to foreign relations'. The same author holds that economic growth slowdown after 1973 was also mainly a consequence of 'external factors'.[8] In order to explain the change in the rhythm of growth after 1973, Mendes (1993) argues that 'it was the reduction by half of the growth rate of the European Communities during the 1970s and 1980s that provides the fundamental explanation for the slowdown in reducing the income gap between Portugal and the centre'. Moreover, according to the same author, the 'complete halt in convergence can only be explained by the circumstance that Portugal run into balance of payments problems and has suffered terms of trade losses during the [1971-92] decades'.[9]

This paper deals with the causes of Portugal's long-run economic performance during the twentieth century. We want to detect the causes of changes in rates of growth and catching-up of the Portuguese economy to the European core. We use parameters from augmented Solow models in order to estimate the effect of input and total productivity growth on output growth. Changes in total factor productivity growth are then related to structural changes, particularly in the industrial sector, along demand patterns. The remaining of the paper is organized as follows: the next section sets down the main periods of growth and catching-up of the Portuguese economy in a comparative framework; section 3 analysis the

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[7] See Costa Lobo (2000).

[8] Lopes (1996, pp. 17 and 23).

contribution of the growth of factor inputs and productivity on overall economic growth, within a growth accounting framework; section 4 discusses the causes of slowdown of economic growth after 1973; section 5 presents the main conclusions of the paper.

2. *The comparative performance of the Portuguese economy*

The evolution of the Portuguese economy during the twentieth century has some common points with the evolution of the European economy. In particular, Portugal was affected by the international financial disequilibrium in the period after World War I and took part in the general economic expansion in the second post-war period, which ended in 1973. But trends of economic growth and fluctuations in Portugal and the rest of Europe also show many important differences. Graph 1 depicts an index for the growth of Portugal's real income per capita and for the growth of an unweighted average income per capita for nine European core economies from Maddison (1995 and 2001).[10] Table 1 shows annual growth rates between peak years of the two GDP series.

TABLE 1 AND GRAPH 1 ABOUT HERE

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[9] Mendes (1993, p. 13).

[10] Portugal's income per capita series is based on Batista *et al.* (1997) linked in 1950 to that of Pinheiro *et al.* (1997) (as reported in Maddison, 2001). These indices are based on direct evaluations of output. The alternative series from Nunes *et al.* (1989) is an indirect estimate, based on the evolution of government revenue and expenditure, and imports, and fluctuates accordingly. The indirect estimate implies a steep decline of income per capita from 1910 to 1921 and a steep recovery thereafter. Yet, it also shows a decline in the trend growth rate after 1932. See Lains and Reis (1991). The nine European core economies are: Belgium, Denmark, France, Germany (West Germany to 1991), Italy, Netherlands, Norway, Sweden and UK. Austria and Switzerland were excluded, because of the poor income data for the period prior

During World War I, both the Portuguese and the European economies were in a depressive cycle, and income per capita reached a trough at the end of the war. From then on, the two indices increased, but the European index peaked in 1929, whereas Portugal's income growth peaked in 1934 (although there was a blip in the series in 1927). Growth was however concentrated in the period before monetary and price stabilization was achieved, in 1924, which means that Portugal experienced a inflation-growth cycle during the interwar period, similar to that of France.[11] A period of stagnation followed this peak and it lasted down to the end of World War II. Stagnation in Portugal's income series lasted throughout the 1930s, but growth resumed shortly after, and another peak in the income per capita series was reached in 1947. Portuguese economic growth was comparatively high during World War II, whereas the European economy, as represented by our average index for nine countries, was negatively affected by the war and it hit a trough in 1945. However, the recovery started earlier in Europe, where economic growth resumed immediately after 1945. In contrast, the Portuguese economy remained virtually stagnant from 1947 to 1950. From then on, economic growth expanded consistently for over two decades in Portugal and the nine core European economies, with a rapid acceleration of convergence during the 1960s, until a new coincident peak was reached in 1973. After 1973, there was an inflexion of the index for the average of nine European countries, rather than a period of slowdown, to 1986, followed by rapid growth, to 1998, which was also the case of Portugal. Portugal's relative position in 1973 was not surpassed until 1990.

Table 2 shows growth rates according to Maddison (1995)'s phases of economic development in the twentieth century. We may observe there that Portuguese income per capita increased at a faster pace than the index for the average of Europe in every phase,

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to 1950 (Maddison, 1995, pp. 126 and 135).

[11] Monetary stabilization was in fact achieved before Salazar came to power, in 1928. See

except during 1929-38 and 1973-86. The table also shows growth rates for Spain and Greece. Within this group of countries, Portugal had a better performance in the interwar period and that was mainly due to the fact that Spain and Greece were both affected by civil wars (in 1936-39 and 1946-49, respectively). During the second post war period, growth rates in these three countries were similar, with Greece expanding at a slightly higher rate. After 1973 the Portuguese economy faired better and it was second only to Ireland, which depicts a different pattern of growth throughout the twentieth century.[12]

TABLE 2 ABOUT HERE

Table 3 reports income convergence rates for the same growth periods (see also Graph 2).[13] Portugal was the only country in the western European periphery to converge during the period from 1913-50, although it did so at quite a modest annual rate. From 1950 to 1973, the country converged at higher speed, at 1.85 per cent per year, but Spain and Greece faired even better. From 1973 to 1998, the Portuguese income per capita also caught up to the average level of the European core, contrarily to what happened to the Spanish and Greek income levels, but it was surpassed by Ireland. Portugal's convergence after the 1973 oil crisis, however, was concentrated in the years between 1986 and 1998.

TABLE 3 AND GRAPH 2 ABOUT HERE

Despite economic growth having slowed down after 1973, the trend growth rate of the Portuguese economy was higher than the trend growth before the golden age of European

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Valério (1994), Carvalho (2001) and Lains (2003b, chap. 5).

[12] See Ó Gráda and O'Rourke (1996).

[13] We consider *absolute* rates of convergence, which do not take into account differences in growth potential or in steady state growth rates, which are contemplated by estimates of *conditional* convergence, as defined by Barro and Sala-i-Maritn (1995). Aguiar and Figueiredo (1999) show a positive and significant rate of conditional convergence for the Portuguese economy in the long-run (1870-1990), taking into account the initial income level and degree of openness of the economy.

growth, as shown in Graph 3. Thus, Portugal fits what Crafts and Mills (1996) termed the 'reverse Janossy hypothesis', what implies that, during 1950-73, there was a 'greater accumulation of technological capability', as well as of infrastructures and economic institutions, which helped to increase the trend growth for the Portuguese economy after 1973.[14]

GRAPH 3 ABOUT HERE

3. *Accounting for economic growth*

Neo-classical growth theory attributes the sources of output growth to the accumulation of human and physical capital and to exogenous technological change. The sources of growth are measured through a production function with constant elasticities. According to Maddison (1995 and 1996), growth accounting models explains fairly well the catching-up process of western European income levels (United Kingdom excepted) to that of the USA, which is the country with the highest average productivity level in the twentieth century. The model shows that most European economies converged because they had higher growth rates of *both* capital stock and total factor productivity, in 1950-73, than the USA.[15] That was also the case of Spain, in the 1965-90 period.[16]

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[14] Crafts and Mills (1996, pp. 416-7). The Janossy hypothesis implies that reconstruction from war damage had an important role in the high growth levels observed in the 1950-73 period and that the rates of economic growth would return to the levels previous to the war. That did not happen in most European economies.

[15] See Maddison (1995, pp. 40-9). See also Denison (1967), Dowrick and Nguyen (1989), Crafts and Toniolo (1996) and Crafts (2000).

[16] See Prados de la Escosura and Sanz (1996, p. 359).

Table 4 sets down the evidence on the growth of inputs for Portugal. The data shows that both human and physical capital expanded more rapidly after 1947. In the case of human capital, which is measured as the average years of schooling of the active population, it increased by 2.08 per cent per year, in the 1910-34 period, 1.14 per cent, in 1934-47, 2.47 per cent, in 1947-73, and 4.83 per cent, in 1973-90. The rate of growth of physical capital doubled twice between 1910 and 1973, from 1.25 per cent per year, in 1910-34, to 3.89 per cent, in 1934-47, and 7.73 per cent, in 1947-73. After 1973, the rate of growth of capital stock declined but it still remained higher than it was before World War II.

TABLE 4 ABOUT HERE

Table 5 shows growth accounts for twentieth century Portugal, based on the 'average production function'[17] by Nehru and Dhareshwar (1994). The first conclusion we may draw from the table is that Portuguese economic growth was more dependent on capital deepening. That happened particularly in the period from 1934-47, but also in 1947-73 and 1973-90, when capital growth accounted, respectively, for 49.9 and 44.3 per cent of domestic output growth.[18] The contribution of human capital growth was relatively small in the years to 1973 and it increased to 41.0 per cent during the last period in the table. Total factor productivity growth had its highest contribution to total output growth in the 1910-34 period, whereas in

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[17] Temple (1999, p. 120).

[18] The fact that we used constant factor shares implies that the contribution of human capital to total output growth is probably overestimated in the earlier periods. A referee has proposed an alternative estimate, according to which the sum of the labour and human capital share is fixed at 60 per cent, the contribution of human capital increases from 10 to 40 over the period and that of labour force declines from 50 to 20 per cent. This alternative estimate reduces the impact of human capital on growth, in the periods from 1910-34 and 1934-47, and implies a stronger reduction in the contribution of TFP growth to total growth, after 1973. the alternative figures for the last column on Table 5 are as follows: 1910-34, 45.2%; 1934-47, 1.4%; 1947-73, 35.4%; and 1973-90, 10.7%.

1934-47 it was slightly negative. In the 1947-1973, the contribution of productivity growth in Portugal was smaller than in the rest of western Europe. The role of TFP growth in Portugal's growth experience is in accordance to what happened to the Asian 'tigers', as well as other medium income countries, in the second post war period. This form of 'extensive growth' was also common to some eastern European countries such as Czechoslovakia and East Germany and was in opposition to the '"intensive growth" model which was predominant in western Europe during the post-war period.'[19]

After 1973, there was a substantial fall in the contribution of total factor productivity growth and that was in part due to the fact the increase in the rate of growth of human capital offset the reduction in that of physical capital. The decline in the contribution of total factor productivity, after 1973, is in accordance to what happened elsewhere in Europe.[20] For this period, the contribution of capital growth to total output growth declined only slightly and the decline in the rate of growth of total output can be ascribed mainly to the decline in the contribution of total factor productivity growth.[21]

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[19] It should be note, however, that the labour input had a higher contribution in the Asian fast growing countries. See Young (1995). See also Mateus (1995b), for a comparison of east Asia and Portugal. On the medium income countries, see Syrquin (1994) and on central Europe, see van Ark (1996b, p. 298).

[20] For growth accounting exercises with similar conclusions for Portugal, see Neves (1994 and 1996), Mateus (1995a, 1995b and 1998), Lopes (1996) and Amaral (2002). For Europe, see van Ark and Crafts (1996, pp. 5-6).

[21] An alternative growth accounting model is proposed by Afonso (1999), where output growth is a log-linear function of investment per worker, imports of machinery per worker, and exports per worker. The author also adds as an exogenous variable average TFP growth of the Europe Union (12 members), in order to capture the convergence effect. According to this author, in the 1960-73 period, the growth of the Portuguese economy was led by the growth in capital stock and total factor productivity. The contribution of these two factors of growth added to 93.4 per cent of output growth. For the 1974-85 period, the author finds out a

TABLE 5 ABOUT HERE

Levine and Renelt (1992) propose an alternative augmented Solow model to estimate elasticities of income growth with respect to a series of exogenous variables for a sample of 103 countries in the 1960-85 period. Crafts and Toniolo (1996) use one of Levine and Renelt's equations in order to 'consider what new growth theory might suggest for the speeding up and slowing down of European growth' in the three Maddison's phases of development for the twentieth century.[22] The chosen equation is based on a regression where income per capita growth rates is explained by the initial income per capita in relation to the US level, the investment ratio, secondary and primary enrolment ratio, the ratio of government expenditure to GDP, and population growth.[23] The Levine-Renelt model predicts considerably well the growth of the European economies during 1923-38 and 1950-73, but it underestimates growth for 1973-89. The major differences between the periods before and after 1973 are the higher negative effect of the initial income per capita level, which has decreasing importance over the periods, as the average income of the sample of European countries got closer to the US level. Secondly, the government expenditure share also had a higher negative effect.[24]

TABLE 6 ABOUT HERE

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reduction in the explanatory power of capital deepening and labour productivity growth, and a negative contribution of capital productivity. For the period after 1986, capital and total factor productivity are again the two main sources of growth, although at a lower rate of total output growth.

[22] Crafts and Toniolo (1996, pp. 17-8). The Levine and Renelt (1992) model is an augmented Solow model of the Mankiw, Romer and Weil (1992) type. See Temple (1999).

[23] Levine and Renelt (1992) have also tried with export share growth, but it proved to be statistically non-significant. See below.

[24] See Crafts and Toniolo (1996, Table 1.11).

The Levine-Renelt model can be used in order to determine to what extent Portugal's growth performance was in accordance to a world 'norm'. The results for Portugal are shown in Table 6. We conclude from the data in that table that the model is a relatively good predictor for Portugal's income per capita growth in 1910-34 and 1947-73, although in the second period it slightly underestimates the actual growth rate (i.e. 4.84 vs. 5.03 per cent). However, the model does not account for the slowing of Portugal's economic growth during the interwar period and that is due to the fact that it does not grasp the inflation-growth effect down to 1924 and the negative impact of the stabilization program thereafter.[25] For the period after 1973, despite the reduction in the initial income gap and the increase in the government share, which have negative coefficients, the model predicts an increase in the annual growth rate of the Portuguese economy, from 4.84 to 5.25 per cent, whereas actual growth declined from 5.03 to 2.32 per cent. The reason for the best performance predicted by the model is that Portugal's investment and school enrolment ratios remained considerably high after 1973.

Clearly, in comparison to the European experience, Portugal's initial income per capita had a lower negative effect, which is due to a larger gap in Portugal in relation to the US. The investment effect in Portugal was comparable to that of Europe, whereas the sum of the human capital effects was lower in Portugal, as was the government share effect. The estimates for 1973-90 depict Portugal as an outlier, as the forecast income per capita growth rate is 5.25 per cent per, whereas the actual growth was only 2.32 per cent. This indicates that the observed reduction in Portugal's income growth after 1973 cannot be attributed to the performance of neither the investment ratio, neither the investment in human capital as measured by the school enrolment ratios. It is important to note that the growth predicted by the Levine and Renelt model for Portugal during 1973-90 is close to the growth rate of the

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[25] Carvalho (2001).

Portuguese economy, if the 1947-73 rate of convergence was maintained in the post-1973 period, which was pointed out previously (i.e. 4.89 per cent).

The coefficient for exports is not statistically different from zero in any of the equations in Levine and Renelt (1992). This result seems to contradict the generally held assumption that foreign trade is a major factor of growth in small open economies, but is in accordance with further evidence on Portugal.[26] The openness to trade of the Portuguese economy, which was quite considerable, throughout the second half of the twentieth century, occurred in two phases. The first phase followed membership of EFTA and the ratio of foreign trade to GDP increased from about 17 per cent to 30 per cent, from 1960 to 1973. In the next period to 1986, the ratio remained constant. The second phase followed the entering of the EEC and, from 1986 to 1994, the ratio increased from 30 per cent to about 55 per cent.[27] In 1994, Portugal ranked as the fourth most open economy in the European Union.[28] The fact that the increase in foreign trade was more rapid in the 1986-94 period, which had slower growth than in the period 1950-73, is indicative of the small explanatory effect of trade in Portuguese growth. In fact, according to Mendes (1993), the effect of European integration in Portugal's economic growth was relatively small. He estimates that the participation in EFTA and the 1972 trade agreement with EEC explains between 2 and 2.5 per cent of

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[26] Empirical tests on the export-led growth model have generally refuted a direct causality link between exports and growth. According to Levine and Renelt (1992) findings, trade and growth are linked through investment. Pereira and Xu (2000) find out that the link is through investment *and* employment. See also Pessoa (1998) on the negligible effect of openness on Portuguese economic growth throughout 1960-90.

[27] The ratio is defined as the average of exports and imports over GDP, from Lopes (1996, Graph 4.1).

[28] See Barbosa *et al.* (1999, p. 149).

Portugal's growth of per capita income; and that the gains from joining the European Union accounted for 10.1 per cent of the income per capita growth.[29]

Trends in investment ratios in respect to both physical and human capital explain the increase in growth rates during the two decades following World War II, but they fail to explain the slowdown after 1973. In fact, there were significant investments in human and physical capital in the 1950-73 period, in Portugal, which either increased in the following period or only marginally declined. Yet, after 1973 there was a sharp decline in the overall rate of growth of the Portuguese economy. We thus need to explain domestic factors of growth, which were in place in spite of the high physical and human capital investment ratios.

4. Structural change and economic growth slowdown

The single most important factor in Portuguese economic growth slowdown after 1973 was the decline in the rate of growth of total factor productivity. In this section we analyse the extent to which the productivity fall is related to changes in the structure of output. Table 7 shows the performance of total productivity in the three sectors of the Portuguese economy during the two development phases, before and after 1973. As shown there, the growth of total factor productivity for the whole economy fell from 2.64 per cent per year, in 1952-73, to 0.31 per cent, in 1973-91. Taking into account the behaviour of total factor productivity in

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[29] Mendes (1993, pp. 16-21). The European Union effect is measured through the impact of structural funds alone (see also Gaspar and Leite 1995). Aguiar and Figueiredo (1999) have concluded that Portugal's level of foreign trade ratio, relative to the average of seven more developed European countries, affected positively and significantly the rate of convergence of the Portuguese economy, over the long-run (1870-1990). Yet, they do not provide estimates for shorter periods.

the three sectors of the economy, we conclude that the decline in the rate of growth of the Portuguese economy after 1973 was due to the decline in the performance of the industrial and the services sector. [30]

TABLE 7 ABOUT HERE

In order to explain the fall in industrial factor productivity growth, we need to take into account the major distinctive features of growth in the periods before and after 1973.[31] The high levels of industrial growth during the period from 1950-73 were due to the expansion of external demand, induced by European growth and to Portugal's participation in EFTA, as well as to the overall favourable performance of the economy and, in particular, of domestic demand. According to Lopes (1996), the growth of the industrial sector output in the period to 1973 was enhanced by growth inducing government policies, including the protection from foreign competition granted to some branches of industry, fiscal incentives, public investment in social overhead capital and in key capital intensive industrial sectors, as well as wage and price controls and low interest rates.[32] The joining of the EFTA meant the opening up to external competition, but the Portuguese government managed to negotiate

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[30] Agricultural labour productivity growth during 1973-90 is associated with the decline in agricultural labour force, by –2.8 per cent per year. Both the decline in labour force and the increase in labour productivity were below rates for most western European countries. See Lains (1994, p. 939) and van Ark (1996a). The decline in total factor productivity in the services sector after 1973 was due to the decline in labour productivity, which is related to the sharp increase in the rate of growth of employment in the sector (see Lains 1994). That increase is related, on the one hand, to the incorporation of immigrant workers from the colonies, and to the post-1975 employment protection legislation.

[31] See Lains (1994).

[32] See also Centeno (1995) and Mateus (1998, pp. 194-8).

gradual and selected reductions in tariff and other forms of domestic protection, whereas Portuguese industrial exports took advantage of the opening up of foreign markets.[33]

After 1973, the share of the more labour intensive sectors in Portugal's industry increased in a significant way. In fact, the sum of the shares of foodstuffs and textiles in industrial value added was 49.4 per cent, in 1958, declined to 44.4 per cent, in 1973, and increased to 46.5 per cent in 1980 and to 50.1 per cent in 1990. This was offset by the decline of the aggregate share of chemicals, basic metals and metallurgy, which accounted for 24.7 per cent of the industrial valued added in 1958, increased to 33.9 per cent in 1973 and 33.3 per cent in 1980, and declined slightly to 30.1 per cent in 1990. In terms of contribution to total output growth, foodstuffs and textiles accounted for 42.7 per cent of total industrial growth during 1958-1973 to about 50 per cent during 1973-80, and over 2/3 during 1980-90. The more capital-intensive sectors accounted for 35.1 per cent of industrial growth in 1958-73, 42 per cent in 1973-80, and 30.7 per cent in 1980-90.[34]

To understand the causes of the fall of factor productivity growth in the industrial sector, after 1973, we have thus to explain what caused the observed shifts in the structure of the output. According to Lopes (1994), Portugal's industrial labour productivity in relation to the United Kingdom was comparatively higher in the 'traditional' sectors, namely, textiles, wearing apparel, leather and footwear, wood products, paper and electrical appliances. Relative productivity levels in these sectors declined over 1977-90, whereas it increased in the remaining industrial sectors. This implies that the structure of Portugal's industrial output evolved along its structure of comparative advantage. This is confirmed by Barbosa *et al.* (1999), who show that labour productivity levels of the industrial sectors with higher growth rates of output and better export performances were below the average of the industrial sector.

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[33] Lopes (1996, pp. 87-8). See also Macedo *et al.* (1988), Lains (1994), Confraria (1999) and Amaral (2002).

In fact, they find a negative correlation of -0.32 between level of labour productivity and the share of exports in output and a negative correlation of -0.30 between labour productivity and an index of revealed comparative advantages, for 49 industrial sectors, in 1993. According to the same authors, there is no causal relationship between labour productivity and comparative advantages. Instead, they argue that such negative correlations are due Portugal's industrial export sectors being less intensive in the usage of capital and technology and hence their lower levels of labour productivity.[35]

The fact that increasing specialization along the export sectors led to a decline in the growth of total factor productivity in industry, implies that the short-term gains accruing from specialization along comparative advantage were offset by the losses accruing from the specialization along sectors with lower growth potential. This is in accordance with Amable (2000), who shows that, for 39 countries during the 1965-90 period, the composition of foreign trade was important and that 'trade is beneficial to growth when a country is specialized in industries where world demand is strong', namely electronics.[36] Timmer and Szirmai (2000) find that for some countries the is no 'productivity bonus' accruing from changes in the structure of output, both in terms of labour and total factor productivity, as we have concluded was the case of Portugal after 1973. The evolution of the structure of the Portuguese industrial sector highlights how aggregate demand can induce changes in the structure of the economy and how those changes can have a negative impact on growth rates.[37] The structure of comparative advantages can be endogenous and changed by appropriate policy measures, leading for example to higher investment in research and development in the export related sectors (Grossman and Helpman, 1990).

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[34] See Lains (1994, pp. 944-5). See also van Ark (1996a) and Broadberry (1998).

[35] See Barbosa *et al.* (1999, pp. 282-4). See also Faustino (1995) and Barros (1997).

[36] See also Grossman and Helpman (1990).

[37] See Dollar and Wolff (1988) and Cornwall and Cornwall (1994 and 2002).

5. Conclusions

Economic historians have shown in the last decades that there is a wide diversity of economic growth experiences, across countries. Different experiences stem from differences in the conditions for economic growth which very from country to country. Such conclusion has a corollary that has not been sufficiently exploited in economic growth studies, which is that conditions for economic growth also vary substantially across time. *Domestic* conditions for the growth of the Portuguese economy have changed substantially, as a consequence of changes in industrial, monetary and fiscal policies, as well as overall political conditions. Yet the *external* conditions for Portuguese economic growth also changed considerably throughout the twentieth century and those changes are associated with transformations in the international and, in particular, in the European economy.

The Portuguese economy went through a process of growth and structural transformation during the twentieth century. Whereas before World War I, Portugal was largely an agrarian economy, with about 60 per cent of the population employed in the agricultural sector, by the end of the century the industrial and the services sectors had substantially transformed the economy. The sheer shift of labour from agriculture to the other sectors of the economy was a source of growth, as the labour productivity in agriculture was about half that of industry and services. This paper has put together evidence showing that high levels of investment in human and physical capital were increasingly important as instruments for rapid economic growth throughout the century.

The catching-up of the Portuguese economy to the European core was however more rapid in the period to 1973. The decline thereafter was due to the fall in the rate of growth of

total factor productivity in the services and the industrial sectors. The fall in industrial factor productivity growth was due to the observed increase of the relative share of industrial sectors with lower levels of labour productivity. This was a consequence of the fact that the Portuguese industrial sector adapted to the changes in the structure of demand, within an increasing level of integration in the European Union. This conclusion implies that the *structure* of exports matters for growth and that it may offset any positive benefits from higher export *levels*. Unless appropriate policy measures are taken in order to change the country's pattern of comparative advantages, by investing in research and development.

References

Afonso, O. (1999), *Contributo do Comércio Externo para o Crescimento Económico Português, 1960-1993*. Lisbon, Conselho Económico e Social.

Aguiar, A. and O. Figueiredo (1999). 'Abertura e Convergência da Economia Portuguesa, 1870-1990'. *Estudos de Economia* **19***,* pp. 209-32.

Amable, B. (2000). 'International Specialization and Growth'. *Structural Change and Economic Dynamics* **11**, pp. 413-31.

Amaral, L. (2002). *How a Country Catches Up. Explaining Economic Growth in Portugal in the Post-war Period.* Unpublished PhD Dissertation, European University Institute, Florence.

Barbosa, A. Pinto *et al.* (1999), *O Impacto do Euro na Economia Portuguesa.* Lisbon, Publicações Dom Quixote.

Barro, R. and J. W. Lee (1993). 'International Comparisons of Educational Attainment'. *Journal of Monetary Economics* **32**, pp. 363-94.

Barro, R. and X. Sala-i-Maritn (1995). *Economic Growth*. New York, McGraw-Hill.

Barros, P. Pita (1997), 'Crescimento Económico'. In P. Pita Barros and M. St. Aubyn. *Problemas Actuais da Política Económica Portuguesa: Crescimento, Desemprego, Participação na União Económica e Monetária*. Lisboa, Conselho Económico e Social, pp. 9-53.

Batista, D., C. Martins, M. Pinheiro and J. Reis (1997). 'New Estimates for Portugal's GDP, 1910-1958'. *História Económica* **7**.

Broadberry, S. (1998). 'How did the United States and Germany overtake Britain? A Sectoral Analysis of Comparative Productivity Levels, 1870-1990'. *Journal of Economic History* **58**, pp. 375-407.

Carvalho, V. M de (2001). 'Answers to a Puzzle. Monetary Regimes and Macroeconomic Performance in the Portuguese 20s' (Mimeo, University of Cambridge).

Centeno, M. (1995). 'Poupança Pública *versus* Poupança Privada. Que Relação de Longo Prazo?'. *Boletim Económico* **1** (1), pp. 67-72.

Confraria, J. (1999). 'Portugal: Industrialization and Backwardness'. In J. Foreman-Peck and G. Federico (eds.). *European Industrial Policy. The Twentieth-century Experience.* Oxford, Oxford University Press, pp. 268-94.

Cornwall, J. and W. Cornwall (1994). 'Growth Theory and Economic Structure'. *Economica* **61**, pp. 237-51.

Cornwall, J. and W. Cornwall (2002). 'A Demand and Supply Analysis of Productivity Growth'. *Structural Change and Economic Dynamics* **13**, pp. 203-29.

Crafts, N. (2000), 'Development History'. *Working Papers* **54** (London School of Economics).

Crafts, N. and T. C. Mills (1996). 'Europe's Golden Age: An Econometric Investigation of Changing Trend Rates of Growth'. In B. van Ark and N. Crafts (eds.). *Quantitative Aspects of Post-war European Economic Growth.* Cambridge, Cambridge University Press, pp. 415-31.

Crafts, N. and G. Toniolo (1996). 'Post-war growth: an overview'. In N. Crafts and G. Toniolo (eds.). *Economic Growth in Europe since 1945.* Cambridge, Cambridge University Press, pp. 1-37.

Crafts, N. and G. Toniolo (eds.) (1996). *Economic Growth in Europe since 1945.* Cambridge, Cambridge University Press.

Denison, E. E. (1967). *Why Growth Rates Differ: Postwar Experience in Nine Western countries.* Washington (D.C.), The Brookings Institution.

Dollar, D. and E. N. Wolff (1988). 'Convergence of Industry Labor Productivity among Advanced Economies, 1963-1982'. *Review of Economics and Statistics* **70**, pp. 549-58.

Dowrick, S. and D-T. Nguyen (1989). 'OECD Comparative Economic Growth, 1950-1985: Catch-up and Convergence'. *American Economic Review* **79**, pp. 1010-30.

Faustino, H. Crespo (1995). 'O *Cluster* Europeu de Portugal em termos de Comércio Intra-sectorial: Análise ao Nível dos Principais Produtos para o Período1983-1992'. *Estudos de Economia* **15**, pp. 391-426.

Gaspar, V. and A. Nogueira Leite (1995). 'Coesão e Convergência: Efeitos Económicos dos Fundos Estruturais'. *Boletim Económico* **1** (3), pp. 49-55.

Grossman, G. M. and E. Helpman (1990). 'Comparative Advantage and Long-Run Growth'. *American Economic Review* **80**, pp. 796-815.

Lains, P. (1994). 'O Estado e a Industrialização em Portugal, 1945-1990'. *Análise Social* **29**, pp. 923-58.

Lains, P. (2002). 'Southern European Economic Backwardness Revisited: The Role of Open Economy Forces in Portugal and the Balkans, 1870-1913'. *Scandinavian Economic History Review* **50**, pp. 24-43.

Lains, P. (2003a). 'New Wine in Old Bottles: Output and Productivity Trends in Portuguese Agriculture, 1850-1950'. *European Review of Economic History* **7**, pp. 1-30 (forthcoming).

Lains, P. (2003b).*Os Progressos do Atraso. Estudos de História Económica de Portugal.* Lisbon, Imprensa de Ciências Sociais (forthcoming).

Lains, P. and J. Reis (1991). 'Portuguese Economic Growth, 1833-1985: Some Doubts'. *Journal of European Economic History* **20**, pp. 441-53.

Levine, R. e D. Renelt (1992). 'A Sensitivity Analysis of Cross-country Growth Regressions'. *American Economic Review* **82**, pp. 942-63.

Lobo, M. Costa (2000). 'Portugal na Europa: uma Leitura Política da Convergência Económica'. In A. Barreto (ed.). *A Situação Social em Portugal, 1960-1999.* Lisbon, Imprensa de Ciências Sociais, pp. 611-43.

Lopes, L. Peres (1994). 'Manufacturing Productivity in Portugal in a Comparative Perspective'. *Notas Económicas* **4**, pp. 57-76.

Lopes, J. da Silva (1996). *A Economia Portuguesa desde 1960*. Lisbon, Gradiva.

Macedo, J. B. de, C. Corado e M. L. Porto (1988). 'The Timing and Sequencing of Trade Liberalization Policies: Portugal, 1948-1986'. *Working Papers* **114** (Faculdade de Economia, Universidade Nova de Lisboa).

Maddison, A. (1995). *Monitoring the World Economy, 1820-1992.* Paris, OECD.

Maddison, A. (1996). 'Macroeconomic Accounts for European Countries'. In B. van Ark and N. Crafts (eds.). *Quantitative Aspects of Post-war European Economic Growth.* Cambridge, Cambridge University Press, pp. 27-83.

Maddison, A. (2001). *The World Economy. A Millennial Perspective.* Paris, OECD.

Mankiw, N., D. Romer and D. N. Weil (1992), 'A Contribution to the Empirics of Economic Growth'. *Quarterly Journal of Economics* **107**, pp. 407-37.

Marques, A. (1988). *Política Económica e Desenvolvimento em Portugal (1926-1959).* Lisbon, Livros Horizonte.

Mateus, A. (1995a). 'Os Factores de Crescimento da Economia Portuguesa: Capital e Integração'. In Proceedings of the Conference *Para Onde Vai a Economia Portuguesa?.* Lisbon (ISEG).

Mateus, A. (1995b). 'O Sucesso dos "Tigres Asiáticos". Que Lições para Portugal?', *Working Papers* **254** (Faculdade de Economia, Universidade Nova de Lisboa).

Mateus, A. (1998). *Economia Portuguesa. Crescimento no Contexto Internacional (1910-1998).* Lisbon, Verbo.

Mendes, A. J. Marques (1993). 'The Development of the Portuguese Economy in the Context of the EC'. In J. Silva Lopes (ed.). *Portugal and EC Membership Evaluated.* London, Pinter Publishers, pp. 7-29.

Moura, F. Pereira de (1973). *Por Onde Vai a Economia Portuguesa?* Lisboa, Seara Nova.

Nehru, V. and A. Dhareshwar (1994). 'New Estimates of Total Factor Productivity Growth for Developing and Industrial Countries'. *Policy Research Working Papers* **1313** (World Bank).

Neves, J. César das (1994). *The Portuguese Economy: a Picture in Figures. XIX and XX centuries.* Lisbon, Universidade Católica Editora.

Neves, J. César das (1996). 'Portuguese Post-war Growth: A Global Approach'. In N. Crafts and G. Toniolo (eds.). *Economic Growth in Europe since 1945*. Cambridge, Cambridge University Press, pp. 329-54.

Nunes, A., E. Mata e N. Valério (1989). 'Portuguese Economic Growth, 1833-1985'. *Journal of European Economic History* **18**, pp. 291-330.

Ó Gráda, C. and K. O'Rourke (1996). 'Irish Economic Growth, 1945-1988'. In N. Crafts and G. Toniolo (eds.). *Economic Growth in Europe since 1945*. Cambridge, Cambridge University Press, pp. 388-426.

Pereira, A. M. and Z. Xu (2000). 'Export Growth and Domestic Performance'. *Review of International Economics* **8**, pp. 60-73.

Pessoa, A. (1998), 'Catch-up Tecnológico, Investimento e Convergência Real: Um

Exercício de Contabilidade do Crescimento Aplicado à Economia Portuguesa'. *Working Papers* **83** (Faculdade de Economia, Universidade do Porto).

Pinheiro, M. *et al.* (1997). *Séries Longas para a Economia Portuguesa. Pós II Guerra Mundial vol. I - Séries Estatísticas*. Lisbon, Banco de Portugal.

Prados de la Escosura, L. and J. G. Sanz (1996). 'Growth and Macroeconomic Performance in Spain, 1939-1993'. In N. Crafts and G. Toniolo (eds.). *Economic Growth in Europe since 1945*. Cambridge, Cambridge University Press, pp. 355-87.

Rosas, F. (2000). *Salazarismo e Fomento Económico, 1928-1948. O Primado do Político na História Económica do Estado Novo*. Lisbon, Editorial Notícias.

Summers, R. and A. Heston (1988). 'A New Set of International Comparisons of Real Product and Price Levels Estimates for 130 Countries, 1950-1985'. *Review of Income and Wealth* **34**, pp. 1-25.

Syrquin, M. (1994).'Structural Transformation and the New Growth Theory". In L. L Pasinetti and R. M. Solow (eds.). *Economic Growth and the Structure of Long-Term Development.* New York, St. Martin's Press.

Teixeira, A. (1999). *Capital Humano e Capacidade de Inovação. Contributos para o Estudo do Crescimento Económico Português, 1960-1991*. Lisbon, Conselho Económico e Social.

Temple, J. (1999). 'The New Growth Evidence'. *Journal of Economic Literature* **37**, pp. 112-56.

Timmer, M. P. and A. Szirmai (2000). 'Productivity Growth in Asian Manufacturing: The Structural Bonus Hypothesis Examined'. *Structural Change and Economic Dynamics* **11**, pp. 371-92.

Tortella, G. (1994). 'Patterns of Economic Retardation and Recovery in South-western Europe in the Nineteenth and Twentieth Centuries'. *Economic History Review* **47**, pp 1-21.

Valério, Nuno, *As Finanças Públicas Portuguesas entre as duas Guerras Mundiais.* Lisbon, Edições Cosmos, 1994.

Valério, N. (ed.) (2001). *Estatísticas Históricas Portuguesas.* Lisbon, Instituto Nacional de Estatística.

van Ark, B. (1996a). 'Sectoral Growth Accounting and Structural Change in Post-war Europe'. In B. van Ark and N. Crafts (eds.). *Quantitative Aspects of Post-war European Economic Growth.* Cambridge, Cambridge University Press, pp. 84-164.

van Ark, B. (1996b). 'Convergence and Divergence in the European Periphery: Productivity in Eastern and Southern Europe in Retrospect'. In B. van Ark and N. Crafts (eds.). *Quantitative Aspects of Post-war European Economic Growth.* Cambridge, Cambridge University Press, pp. 271-326.

van Ark, B. and N. Crafts (1996). 'Catch-up, Convergence and the Sources of Post-war European Growth: Introduction and Overview'. In B. van Ark and N. Crafts (eds.). *Quantitative Aspects of Post-war European Economic Growth.* Cambridge, Cambridge University Press, pp. 1-26.

Young, A. (1995). 'The Tyranny of Numbers. Confronting the Statistical Realities of the East Asian Growth Experience'. *Quarterly Journal of Economics* **110,** pp. 641-80.

Table 1 – Growth of real income per capita in Portugal, 1910-1998

(peak-to-peak annual growth rates; per cent)

1910-1934	1.57
1934-1947	1.15
1947-1973	5.03
1973-1990	2.32
1910-1990	2.77

Notes and sources: Batista *et al*. (1997, pp. 93-94) to 1950 and Maddison (2001, p. 278) thereafter. Peak years (1910 excepted) are derived from a log-linear time trend for 1910-1998.

Table 2

Growth of real income per capita in the European periphery, 1913-1998

(Maddison's phases of development; annual growth rates between 3-years averages; per cent)

	Portugal	Spain	Greece	Ireland	Average 9
1913-1929	1.35	1.65	2.45	0.33	1.39
1929-1938	1.28	-3.53	1.50	0.87	1.16
1938-1950	1.56	1.48	-2.72	0.94	1.00
1950-1973	5.47	5.63	5.99	2.98	3.55
1973-1986	1.52	1.31	1.75	2.47	2.01
1986-1998	3.45	2.65	1.39	5.42	1.88
1913-1950	1.40	0.31	0.51	0.66	1.21
1950-1973	5.47	5.63	5.99	2.98	3.55
1973-1998	2.40	1.92	1.59	3.81	1.95
1913-1998	2.79	2.20	2.29	2.19	2.06

Notes: 'Average 9' is based on an unweighted average index for the following

European core countries, from Maddison: Belgium, Denmark, France, Germany (West

Germany to 1991), Italy, Netherlands, Norway, Sweden and UK.

Sources: Maddison (1995 and 2001) and the same as in table 1 for Portugal.

Table 3

Convergence of real incomes per capita in the European periphery, 1913-1998

(Maddison's phases of development; annual growth rates between 3-years averages; per cent)

	Portugal	Spain	Greece	Ireland
1913-1929	-0.04	0.26	1.04	-1.04
1929-1938	0.12	-4.64	0.33	-0.29
1938-1950	0.55	0.47	-3.69	-0.06
1950-1973	1.85	2.01	2.36	-0.546
1973-1986	-0.49	-0.69	-0.26	0.45
1986-1998	1.54	0.76	-0.48	3.48
1913-1950	0.19	-0.89	-0.69	-0.54
1950-1973	1.85	2.01	2.36	-0.55
1973-1998	0.44	-0.03	-0.36	1.82
1913-1998	0.72	0.14	0.23	0.13

Notes: convergence defined according to:

$$\phi = [(y_i / y9)_{(t+1)} / (y_i / y9)_{(t)}]^{[1/(t+1-t)]}$$

where y_i is income per capita for the 4 countries in the table and y9 is the average for the United Kingdom, France, Germany (West Germany to 1991), Belgium, the Netherlands Italy, Sweden, Denmark and Norway.

Sources: see Tables 1 and 2.

Table 4 – Growth of factors and GDP, 1910-1990

(peak-to-peak annual growth rates; per cent)

	Labour	Human capital	Capital	GDP
1910-1934	1.00	2.08	1.25	2.17
1934-1947	1.31	1.14	3.89	2.09
1947-1973	0.70	2.47	7.73	5.17
1973-1990	0.05	4.83	5.21	3.92

Notes: 'Labour' is total employment estimated as 95% of active population, to 1925, and total number of hours worked of employed population, thereafter. The weekly number of hours worked declined from 48.5 hours in 1925 to 40 hours, in 1990. 'Human capital' is the average years of schooling of active population (according to Barro and Lee, 1993), based on Census data; 'Capital' is the stock of capital based on the growth of gross domestic capital formation (residential capital excluded).

Sources: Computed from Mateus (1998, Electronic Data Set, File 'cn_h_sl', Sheet L). See also Mateus (1998, Apêndice estatístico).

Table 5

Growth accounting for Portugal: sources of growth and output growth, 1910-1990

	Annual growth rates					As percent of output growth			
	Labour	Human capital	Capital	TFP	Output	Labour	Human capital	Capital	TFP
1910-1934	0.33	0.70	0.42	0.72	2.17	15.4	32.1	19.2	33.3
1934-1947	0.44	0.38	1.30	-0.02	2.09	20.8	18.2	62.0	-0.10
1947-1973	0.23	0.82	2.58	1.53	5.17	4.5	15.9	49.9	29.7
1973-1990	0.02	1.61	1.74	0.56	3.93	0.5	41.0	44.3	14.2

Notes: Sources of growth are based on factor growth rates from Table 4 weighted by factor shares of 1/3, according to Nehru and Dhareshwar (1994). See Mateus (1995b, Tab. 9) and Mateus (1998, Apêndice estatístico).

Sources: see Table 4

Table 6 – Growth factors according to the Levine-Renelt model: Portugal, 1910-1990

	Levels				Contribution to growth (annual growth rates; per cent)			
	1910-34	**1934-47**	**1947-73**	**1973-90**	**1910-34**	**1934-47**	**1947-73**	**1973-90**
Constant	--	--	--	--	2.01	2.01	2.01	2.01
Initial income	0.245	0.302	0.208	0.448	-1.08	-1.33	-0.92	-1.98
Investment share	0.050	0.083	0.209	0.301	0.47	0.77	1.95	2.80
Second. enrol. ratio	0.018	0.057	0.177	0.622	0.02	0.07	0.21	0.75
Primary enrol. ratio	0.582	0.798	1.231	1.373	1.04	1.43	2.20	2.46
Government share	0.110	0.100	0.099	0.135	-0.70	-0.64	-0.63	-0.86
Population growth	0.803	1.089	0.201	0.770	0.06	0.09	0.02	0.06
Forecast growth	--	--	--	--	1.82	2.40	4.84	5.25
Actual growth	--	--	--	--	1.57	1.15	5.03	2.32

Notes: the contribution of each factor is taken from the parameters of the following equation (see Levine and Renelt, 1992, Tab. 5, col. ii):

$$gyp = 2.01 - 0.69^* \, inyp + 9.31^* \, inv + 1.21 \, sec + 1.79^* \, pri - 6.37^* \, gov + 0.08 \, gpo$$
$$(0.83) \quad (0.12) \quad\quad (2.08) \quad\quad (1.17) \quad\quad (0.58) \quad\quad (2.03) \quad\quad (0.18)$$
$$N = 103; \quad R^2 = 0.68; \quad {}^* = \text{statistical significant at the } 0.05 \text{ level}$$

Sources: 'Initial income level' (inyp): relative income level Portugal/USA in the beginning of each period from Summers and Heston (1988). The value of the observation is the ratio in the table multiplied by the United States 1950 GDP per capita level (i.e. $US 6,401).

'Investment' and 'Government shares' (inv and gov): GDP shares in current market prices. From Batista *et al*. (1997, pp. 93-4), to 1952; and from Pinheiro *et al.* (1997, pp. 197-200), for 1953-90. 'Primary enrolment ratio' (pri): Ratio of enrolment in public (to 1940) and private (from 1941) primary schools as percent of 5-9 (to 1940) and 6-9 (from 1941) age groups. 'Secondary enrolment ratio' (sec): Ratio of enrolment in general public, general private (from 1917), professional public (from 1929) and professional private (from 1941) secondary schools as per cent of 10-19 (to 1940) and 10 to 17 (from 1941) age groups. Sources: Amaral, 2002 (to 1940) and Teixeira (1999, pp. 147-9) (from 1941) and Valério (2001, p. 55). All shares and ratios are averages for the periods indicated. 'Growth of income per capita' and 'Population growth' (gyp and gpo)*:* same as Table 1.
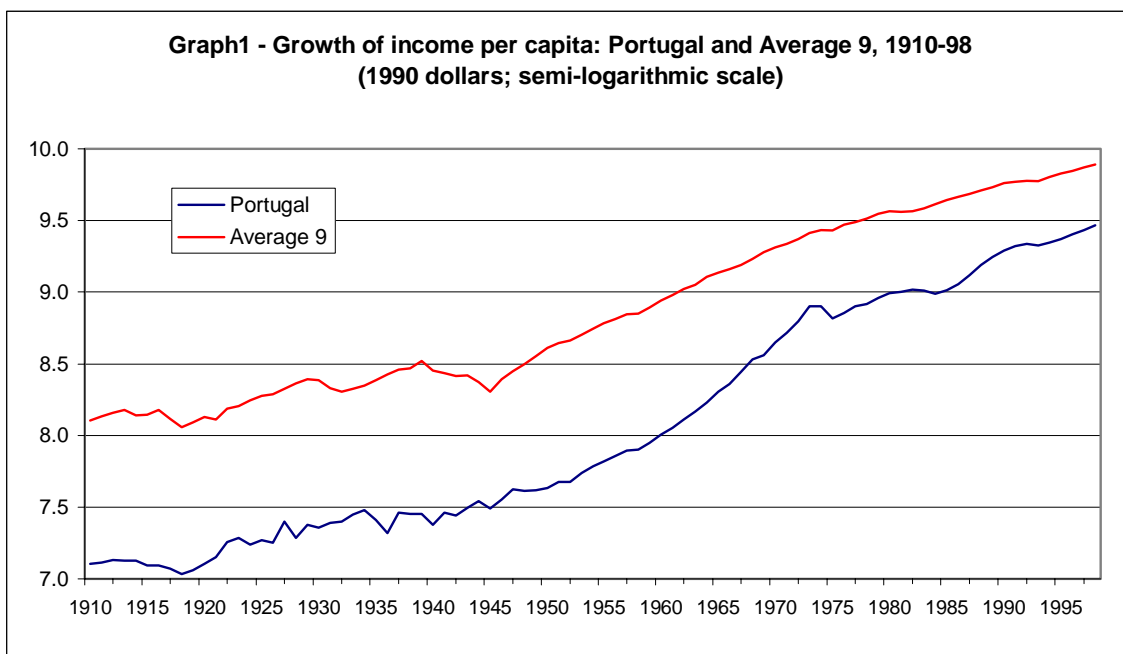
See also Crafts and Toniolo (1996, p. 18).

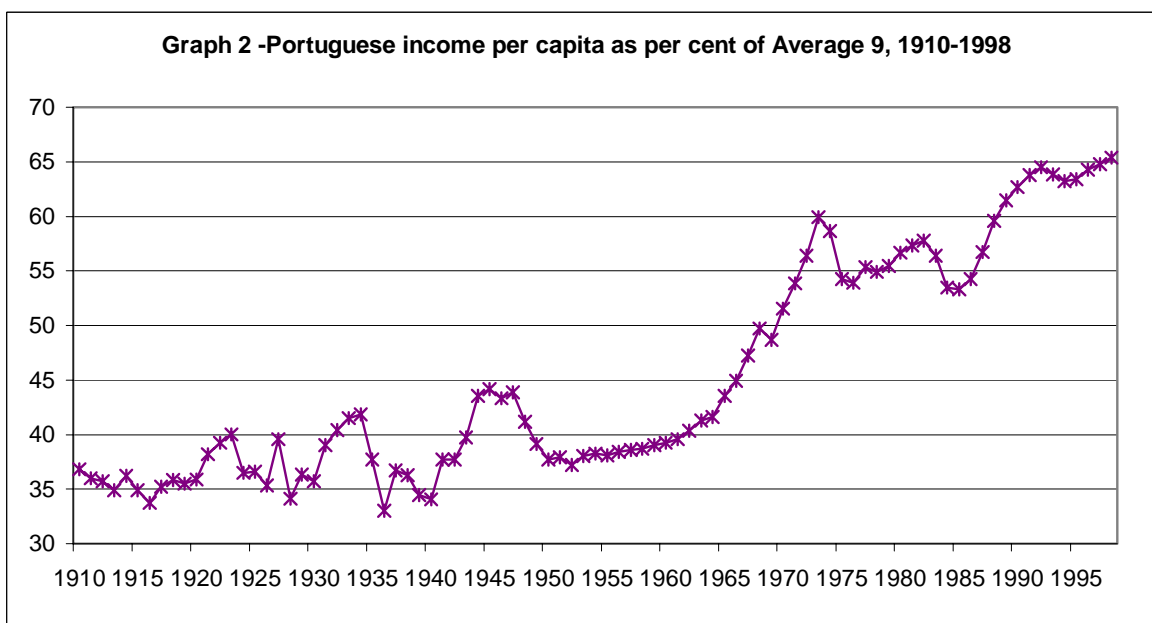**Table 7 – Sectoral sources of growth and output growth, 1952-91**

(annual growth rates; per cent)

	Sources of growth			Output
	Labour	**Capital**	**TFP**	**growth**
GDP				
1952-73	0.37	2.80	2.64	5.80
1974-91	0.86	1.60	0.31	2.76
Agriculture				
1954-73	-0.33	0.94	0.47	1.09
1974-87	-1.14	0.66	2.23	1.76
Industry				
1954-73	1.02	4.37	3.00	8.38
1974-87	0.72	1.99	-0.90	1.81
Services				
1954-73	0.80	2.79	2.51	6.10
1974-87	2.10	0.96	0.10	3.16

Source: Neves (1994, pp. 72-73). The estimates in this table are not fully comparable to those of Table 5 above, most of all because they do not take into account the role of human capital.
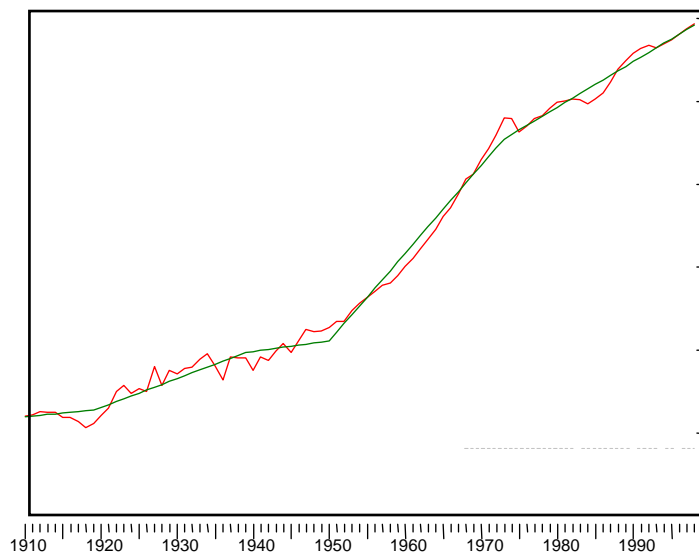
Graph1 - Growth of income per capita: Portugal and Average 9, 1910-98
(1990 dollars; semi-logarithmic scale)

Sources and notes: see Tables 1 and 2. Values in logs of GDP per capita.

Graph 2 -Portuguese income per capita as per cent of Average 9, 1910-1998

Sources and notes: see Tables 1 and 2.

Graph 3

Segmented trend for Portugal's income per capita growth, 1910-1998

Sources: See Table 1.
Notes: The segmented trend is estimated according to Crafts and
Mills (1996, pp. 418-9) with break in 1919, 1939,1950 and 1973.
The estimated equation is as follows (LYP is log of income per capita and D are the
time dummies):

LYP = -1.540 Constant + 0.005 Time + 0.013 D19 − 0.011 D39 + 0.046 D50 − 0.025 D73 + Ut
          (-0.18)   (1.00)   (2.30)   (-2.89)   (13.65)   (-12.08)

$R^2 = 0.995$; F = 3638