Chapter 7

Structural and technological change in the European periphery: The case of Portugal.

Argentino Pessoa

1. INTRODUCTION

It is well known that Portugal has engaged in substantial foreign borrowing for several years, and that the turn to foreign borrowing was facilitated by the entry into the EMU (European Monetary Union). Before the late 1990s, Portugal faced much higher interest rates than did euro area core countries, such as Germany. However, when Portugal joined the monetary union, the interest rates it paid fell sharply as market participants considered that the value of investments would no longer be vulnerable to erosion through currency depreciation (Pessoa, 2011). As a consequence of low interest rates, heavy foreign borrowing by both the public and private sectors was spurred. In addition, the need to minimize the effects of the 2008 crisis, together with the action of some automatic stabilizers, has also contributed to increase the external debt adding to the slow growth a sovereign debt crisis.

The conjunction of slow growth with the debt crisis promoted the idea that both the crisis and the slow growth are the result of the lack of structural transformation and this conviction fed the rhetoric of structural reforms in a so obsessive way as if they are a panacea for retaking astonishing economic growth. However, it must be noted that structural change and structural reform are two very different concepts and using the latter as a magic potion is more detrimental than beneficial of economic growth and structural change. It deviates economy from the spontaneous path to equilibrium and destroys and wastes resources. Usually it has no economic base, other than ideological fundamentalism.

For Portugal and other countries of the European periphery is time to ask: Is there a structural change in the European Periphery? If yes, how has occurred this structural change? How such structural change is connected with the technological
change? What are the effects of the crises and of the way as they are proposed to be solved, on the catching up process? In this chapter, we search answers to these questions, focusing on the European periphery and particularly in the Portuguese experience. Consequently, we investigate the pattern of development of the Portuguese economy, considering its structural change and how this evolved into a technological change.

A good place to start is with a basic recognition of how economic growth occurs. In literature, there are two approaches searching answers for this type of questions: the more abstract in nature economic growth theory and the more appreciative development economics based on building of stylized facts\(^1\). Our study considers both the economic growth contributes and the most important stylized facts of economic development. Accordingly, this chapter is structured as follows. After the introduction, section 2 distinguishes the structural change approach from the structural reforms perspective. Section 3 deals with the process of Portuguese economic growth, relates it with the advantages of backwardness theory and analyses the structural change occurred in Portugal in the European Periphery context. Section 4 is focused on the main traits of the Portuguese technology and innovation performance in the last decades and indicates some factors that explain the difficulties in the growth process of both European and Portuguese Economies. Finally, section 5 concludes.

2. STRUCTURAL CHANGE VS. STRUCTURAL REFORMS.

The process of economic development can be analysed by focussing on changes occurring in the country’s economic structure at the same time as its GDP increases. This is the driving idea of the structural approach to economic development. The basic rationale of the structural change approach refers to a long-term widespread change of the fundamental structure, rather than micro scale or short-term output and employment and can be summarized in a small number of sentences: 1) economic agents respond to market incentives; 2) as GDP grows incentives change; 3) the change in incentives alters the structure of economy at least on three levels: production, employment and

\(^1\) Of course, there is another approach based on the growth empirics. But, in our view, its reductionism is a sufficient reason for preventing it to be seriously taken per se as an inspiration for policy.
demand; 4) the structural transformation is not only a consequence of the GDP growth but also a condition to a sustainable economic growth. However, as GDP grows and the structural change occurs the effects of the latter on the former are getting lower and lower, unless a technological change occurs. So, the role of technical progress is crucial in the process of structural change as suggested by Leon (1967) and Pasinetti (1981). Given the well-known market failures associated to innovation, policy has a role to play in the beginning of the technological change.

This view is somewhat different from the perspective of structural reforms, which is originated in supporters of the “supply-side economics” Although the typical policy recommendations of supply-side economists are lower marginal tax rates and less regulation they also include other reforms as privatisation and liberalization of capital flows. The structural reforms perspective is well synthesised in the ten principles of the “Washington Consensus” (see box 7.1) formerly developed by IMF and World Bank as a recipe for developing countries which face problems in external accounts and consequently asked the financial assistance of such international institutions.

<table>
<thead>
<tr>
<th>BOX 7.1: THE TEN PRINCIPLES OF THE WASHINGTON CONSENSUS</th>
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<tbody>
<tr>
<td>1. Fiscal discipline</td>
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<tr>
<td>2. Reorientation of public expenditures</td>
</tr>
<tr>
<td>3. Lower marginal tax rates and broaden the tax base</td>
</tr>
<tr>
<td>4. Interest rate liberalisation</td>
</tr>
<tr>
<td>5. Unified and competitive exchange rate</td>
</tr>
<tr>
<td>6. Trade liberalisation</td>
</tr>
<tr>
<td>7. Liberalisation of FDI inflows</td>
</tr>
<tr>
<td>8. Privatisation</td>
</tr>
<tr>
<td>9. Deregulation</td>
</tr>
<tr>
<td>10. Secure property rights</td>
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The basic motivation of the structural reforms approach is to substitute quickly the actual economy by an “ideal” economy without unbalances and lock-ins. Current advocates of such approach in the European Union search in the EFC (Expansionary

2 Fisher (1939) and Clark (1940) look at patterns in changes in sectoral employment. According to their arguments the patterns of production are functions of the level of income and resource and production changes are essential parts of development. The main determinant of these shifts is the income elasticity of demand. Goods or sectors for which there is a high income-elasticity of demand will grow in importance as income grows.

3 Supply-side economics argues that economic growth can be most effectively created by allowing greater flexibility by reducing regulation and by lowering barriers for people to produce goods and services, such as lowering income tax and capital gains tax rates. According to supply-side economics, consumers will then benefit from a greater supply of goods and services at lower prices (Wanniski, 1978).
Fiscal Contraction) hypothesis\(^4\) a theoretical support. The EFC view is based on the traditional assumption that reducing government expenditures will lessen crowding out “making room for the private sector to expand”. Of course, this only happens when the economy is near full employment. Furthermore, among the conditions for the EFC hypothesis operating are included a significant currency devaluation, budget improvement through significant tax increases and spending cuts and sufficient liquidity in order to current disposable income does not restrain consumption. If this latter condition is not verified, i.e., when current disposable income constrained consumption, the result is inevitably the recession\(^5\). Other authors studying Denmark fiscal contraction occurred in the 1983-86 period show that the EFC hypothesis may work but only for large and credible fiscal consolidations, and that other reforms may have to play an important role (Barry and Devereux, 1995; Bergman et al., 2010). Also, an IMF working paper (Guajardo et al, 2011) that studied changes in policy designed to reduce deficits found that austerity had contractionary effects on private domestic demand and GDP and also concluded that other studies appeared biased to exaggerating the expansionary effects of austerity.

Although it is evident that the EFC hypothesis is far from being proved and that current European economic conditions are not appropriate for its application, both the European Commission and many governments are deeply convinced that this is the best road ahead. More recently this approach regained new vitality with the appropriation by the European authorities of the controversial results obtained by Reinart and Rogoff (2009, 2010).

It is difficult to understand the enthusiasm with this type of policies in face of historical results. In fact, the assistance programmes to indebt countries in Africa and Latin America supported by the IMF and the World Bank were not succeeded in both

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\(^4\) The Expansionary Fiscal Contraction (EFC) also known as the “expansionary austerity” hypothesis (Giavazzi and Pagano, 1990) predicts that, under certain restricted circumstances, a major reduction in government spending that changes future expectations about taxes and government spending will enhance private consumption, resulting in overall economic expansion. The authors did not provide a model for EFC but rather described conditions under which it was observed in Denmark from 1983–84 and Ireland from 1987–89, a period when the world was undergoing rapid interest rate declines and world wide growth.

\(^5\) This is recognized in one of the hypothesis’ seminal text: “Keynesian textbook propositions seem to recover their predictive power, as witnessed by the 7% drop in real consumption in 1982 during the first Irish stabilization” (Giavazzi and Pagano, 1990, p. 28).
increasing economic growth and significantly decrease the debt of such countries\(^6\). Also in some national programmes, as those associated with the Thatcher government (1979-1990) in the UK and the Reagan Administration (1981-1989) in the USA, where the structural reforms perspective was firstly implemented, there were no significant positive effects on the long run growth. On the contrary, for instance, in the USA the severe depression and high unemployment, verified in 1981-83, was not followed by an increase in the potential output as the supply-side proponents had advocated.

In sum, because those national and adjustment programmes systematically underestimate the effects of structural reforms on the aggregated demand they are systematically followed by unemployment and recession, while their long run effects on economic growth are at best uncertain. The European Periphery is the most recent and evident example of such erroneous views.

3. PORTUGUESE ECONOMIC GROWTH IN THE EUROPEAN PERIPHERY CONTEXT

When the Second World War finished Portugal was the less developed economy in Southern Europe. As is visible from table 7.1, in 1950, real Portuguese GDP per capita corresponded to 19.79 per cent of the USA, a percentage significantly lower than the ones presented by Spain and Italy.

<table>
<thead>
<tr>
<th>Year</th>
<th>Portugal</th>
<th>Spain</th>
<th>Italy</th>
<th>Greece</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>19.79</td>
<td>28.75</td>
<td>40.29</td>
<td>na</td>
</tr>
<tr>
<td>1960</td>
<td>25.76</td>
<td>39.99</td>
<td>56.51</td>
<td>35.04</td>
</tr>
<tr>
<td>1970</td>
<td>36.16</td>
<td>57.11</td>
<td>69.51</td>
<td>56.79</td>
</tr>
<tr>
<td>1980</td>
<td>41.52</td>
<td>60.59</td>
<td>76.53</td>
<td>65.40</td>
</tr>
<tr>
<td>1990</td>
<td>46.83</td>
<td>64.01</td>
<td>80.46</td>
<td>53.28</td>
</tr>
<tr>
<td>2000</td>
<td>49.32</td>
<td>64.34</td>
<td>72.17</td>
<td>52.16</td>
</tr>
<tr>
<td>2010</td>
<td>48.50</td>
<td>66.17</td>
<td>68.24</td>
<td>61.06</td>
</tr>
</tbody>
</table>

Source: PWT 7.1. Note: na means not available.

\(^6\) For instance, 29 Sub-Saharan African countries contracted adjustment programmes conditioned by structural reforms with the IMF and the World Bank in the 1980s, but the result of those programmes was far from acceptable (see, World Bank, 1994).
It is a well-known fact that Portugal embarked in a process of industrialization, first using import substitution policy and next getting on export promotion together with increasing openness to international trade. The industrialization supported on investment, both public and private, contributed to accelerate convergence with the economic frontier. However, in spite of such convergence process at the end of the twenty-century Portuguese GDP per capita was below 50% of the USA, a barrier surpassed by Italy more than 40 years before and by Spain and Greece in the 1960s.

So, the current economic difference between Portugal and the other European peripheral countries is not consequence of a low pace of economic growth, it expresses the low initial level of the Portuguese GDP. In fact, the Portuguese growth is noteworthy in the second half of the twentieth century showing a steady process of convergence. The convergence as a long-run process is also visible for Spain, Italy and Greece, with some country specificities: while in Spain the convergence process was continuous although uneven, in Portugal the convergence process is interrupted in the first decade of the 21st. century and in Italy the convergence came to an end after 1990. In Greece, 1990 and 2000 decades are marked by a decrease in real GDP per capita. In sum, the convergence process in European periphery has important cross-national differences.

The convergence of Portuguese economy is not only perceptible in comparison with the USA level of GDP per capita but is also accompanied by a divergence with the world level. Starting with a level of GDP per capita similar to the world average in 1960, the Portuguese economy augmented the distance in relation to the world average and in 2001 presented a GDP per capita, at constant prices, which exceeded the world level at about 120 per cent.

However important in the 1960-2000 period as a whole, the pace of economic growth of the Portuguese economy has decreased since the 1960s. In fact, respecting to Portugal, as well as Spain and Italy the pace of per capita growth has been lower and lower along decades, culminating with disappointing growth rates in the 2000-2009 period (figure 7.1). What are the causes of such performance? Although the causes are varied, ranging from some lock-in in the structural transformation to the changes occurred in the international division of labour, the effects of the 2008 crisis firstly and the debt crisis after that, together with the remedy used to calm down the latter, had a
significant impact on the growth rate of the last decade. These factors explain why the GDP per capita downturn is much more evident in the 2007-2012 period (figure 7.1).

Figure 7.1:
Economic growth slowdown

Source: Based on WDI. Note: logarithmic growth rates obtained from GDP per capita at constant prices.

The stumpy growth of the first decade of the 21st century originated much rhetoric about the causes of such disappointing dynamics with the appearance of numerous opinion makers supporting the need of using structural reforms. Simultaneously the programme for the rescue of Greek, Irish and Portuguese Economies organized by the ECB (European Central Bank), EU (European Union) and the IMF (International Monetary Fund) joined its authority to the domestic voices emphasizing the need of such reforms. Alongside with the lack of structural reforms, some consider the growth differences along decades as a direct effect of policy. For instance, respecting to Portugal it is alleged that it performed poorly because governments have used the wrong policies: Government had provided incentives to the consumption instead of promoting investment, or supported investment in infrastructure instead of investment in more immediately reproductive activities.

Of course, these explanations are too poor to be taken seriously. First, because in a context of increasing openness and deregulation it needs to be demonstrated that a public policy of orienting private investment against market signals (Pessoa, 2012) can be effective in enhancing growth. Second, the above explanations ignore the effects of economic integration of peripheral economies and mystify the consequences of important transformations occurred at the world economic level. But, more importantly,
a therapy based on that way of looking at the economy risks hampering growth instead of propelling it.

Given the increasing integration of the Portuguese economy in the European Union, and moreover in the Euro Area, the explanation for the decrease of the Portuguese economic growth rate shall take into account the reasons that justify the decrease of the European growth. But even important these reasons cannot cover the need to know how the structural change occurred in the Portuguese economy. Hence, after beginning with the catching-up of the Portuguese economy in the second half of the twenty-century, we will look at the structural change occurred in the Portuguese economy, its limitations and the need of these be addressed in conjunction with a technological change.

3.1. CATCHING-UP EFFECT AND STRUCTURAL CHANGE: THE CASE OF PORTUGAL

In economic literature there are basically two explanations for the convergence process: the neoclassical rationalization (see Barro and Sala-I-Martin, 1992) and the ‘advantages of backwardness’ perspective (Abramovitz, 1979, 1986). Although both approaches state an inverse association between the initial productivity levels of countries and their productivity growth rates in the long run, there is an important difference in the causal relationships of each one.

The perspective known as the ‘advantages of backwardness’ is more adapted to the structural change approach to economic development. In fact, while the neoclassical perspective bases the convergence on the low initial level of capital per worker, the ‘advantages of backwardness’ one, following the leading work of Abramovitz (1979, 1986), calls attention to other factors that are absent from the neoclassical theory. It is not only the low level of capital per worker but also, and more importantly, the existence of a technology gap (Nelson and Phelps, 1969) between the leader and the follower countries that play the most important role. In the simplest version this gap indicates the possibility of profiting from advanced technologies without the cost of inventing them (Fagerberg, 1987). But, as Pack (1993) has pointed out it is dubious that such dividends exist for free everywhere.
The Abramovitz’s (1986) analysis goes beyond that simplest hypothesis; he extends and qualifies the convergence hypothesis taking into account the specific societal characteristics of the countries. In his view, only the countries that possess adequate ‘social capabilities’ can exploit the available technological opportunities, and are thus able to really converge with the most advanced economies. Also, the pace at which the potential for catch-up is realized depends on a number of other factors, related with the ‘technology congruence’, the pace of structural change and the rates of investment and of the expansion of demand (Abramovitz, 1986).

As demonstrated elsewhere (Pessoa, 1998), in the three decades after 1960, the two most important sources of Portuguese economic growth were investment and the use of the “catching up effect”. This conclusion was based on an accounting framework that relied on the “advantages of backwardness” literature. The tendency for Portuguese economy does converge with the technological frontier was the result of not only a technology gap (Nelson and Phelps, 1969) between Portugal and the most developed economies but also in the light of the combined effect of several economic mechanisms associated to the structural transformation of a backward country occurred as economic development proceeds (Abramovitz and David, 2001).

Indeed, as the Portuguese economy was increasingly open to the most advanced countries, it enjoyed from four advantages in growth potential. First, because its tangible capital was technologically obsolete when Portugal expanded or replaced the capital stock the new equipment bought embodied up to date, more productive, technology. So, Portugal could realize larger improvements in the average efficiency of its productive facilities than the economic leader countries, which already used the state-of-the-art technology. This rational is also valid for both disembodied technology and non-technological innovations (new forms of industrial organization and managerial practices, routines of purchasing, production and merchandising, etc.).

Also, the low level of capital per worker, considering the possibility of modernizing capital stock, tended to increase marginal returns to capital and, so, to promote fast rates of capital accumulation. Additionally, given the relatively large numbers of redundant workers in farming and petty trade, with very low levels of productivity, the productivity growth occurred also by the move of labour from agricultural to industrial jobs (see figure 7.3) and from self-employment and family
shops to larger-scale enterprises, even taking into account the cost of the additional capital necessary to maintain productivity levels in the new occupations.

Finally, the relatively rapid growth resulting from the first three sources goes towards fast growth in aggregate output and, consequently, in the scale of markets. This promoted the technical progress, especially the one that is dependent on larger-scale production. This sort of technical progress was able of covering the lack of technological efforts to create new knowledge through R&D activity. All the above factors in conjunction with an industry-based import substitution policy in the 1950s and an export promotion policy based on increasing openness after 1960 explain why the catching up effect played a so important role in promoting rapid economic growth for the Portuguese economy.

Of course, the pace at which the potential for catching-up is realized also depends on a number of other factors related with the transformations occurred in the Portuguese economy and in other economies to which Portugal is connected. The political and societal change occurred in Portugal after 1960s has contributed to increase the Portuguese ‘social capability’. Also, the steadily increase in the access to education and the enlargement in school enrolment, given the initial low level of education, contributed to increase productivity, generating a more qualified labour force, a key condition to boost ‘social capability’.

In addition, since the late 1970s and early 1980s, the progressive normalization after de 1974 revolution, on the one hand, and the expectation for and the entrance to the EEC, on the other, expose Portuguese people to a more open environment and drive economic agents and their business organizations to adapt to the new context. All these changes contributed to increase the congruence of Portuguese economy with the technology and business administration best practice of advanced countries and, consequently, to counteract the tendency to the ‘catching-up’ contribution to economic growth shrink as the country develops. The improvements in ‘social capability’ and in

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7 The economic integration in the EFTA, first, and in the EEC (European Economic Communities), later, are the two most important marks of this increasing openness.

8 Some figures show the initial low level of education even considering the periphery context. In 1972, the primary completion rate, in percent of relevant age group was 56%, which compares with 99.55% in Italy and 102.34% in Greece. The gross percentage of school enrolment in tertiary was 7.22% in Portugal contrasting with 8.67% in Spain, 13.10% in Greece and 17.31% in Italy.
‘technology congruence’, together with other improvements in infrastructure have contributed to reinforce the real catching-up effect.

Table 7.2:
Sources of growth of the real GDP per capita in the Portuguese economy, 1960-90

<table>
<thead>
<tr>
<th>Period</th>
<th>RGDPUS</th>
<th>‘Catch-up Effect’</th>
<th>Pop. growth rate</th>
<th>Labor growth rate</th>
<th>Education</th>
<th>Investment</th>
<th>Openess</th>
<th>Total ( %)</th>
<th>Growth rate of GDPPC (%)</th>
<th>Residual (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent variables (average of period)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960-70</td>
<td>-1.544</td>
<td>-0.043</td>
<td>0.2186</td>
<td>2.32</td>
<td>22.87</td>
<td>51.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970-80</td>
<td>-1.206</td>
<td>0.8913</td>
<td>1.953</td>
<td>3.07</td>
<td>24.72</td>
<td>58.73</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980-90</td>
<td>-1.07</td>
<td>0.2549</td>
<td>0.4859</td>
<td>3.94</td>
<td>20.72</td>
<td>74.63</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1960-90</td>
<td>-1.263</td>
<td>0.3678</td>
<td>0.8873</td>
<td>3.079</td>
<td>22.7</td>
<td>61.74</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Decomposition

| Period | Decomposition | | | | | | | | | |
|--------|----------------|-------------------|-------------------|-----------|------------|---------|------------|--------------------------|-------------|
| 1960-70 | 0.017 | -0.0008 | 0.0012 | 0.0048 | 0.021 | 0.0035 | 4.85 | 5.41 | -0.56 |
| 1970-80 | 0.013 | -0.0054 | 0.011 | 0.0064 | 0.023 | 0.004 | 5.18 | 3.49 | 1.69 |
| 1980-90 | 0.012 | -0.0007 | 0.003 | 0.0082 | 0.019 | 0.005 | 4.60 | 3.59 | 1.01 |
| 1960-90 | 0.014 | -0.002 | 0.005 | 0.0064 | 0.021 | 0.004 | 4.83 | 4.18 | 0.66 |

Source: Adapted from Pessoa (1998)

As table 7.2 shows the average growth rate of Portuguese GDP per capita was 4.2 per cent during the 1960-90 period, which constituted the 3rd. highest OECD growth rate of real GDP per capita (after South Korea and Japan). This growth, however, was not constant along time. Real GDP per capita grew more intensively in the 1960s (5.4%) than in subsequent decades. Also from the table is visible that the decomposition of the sources of growth indicates that during 1960-90 period, the most important source of growth was investment in physical capital (2.1 percent points) followed by ‘catch-up effect’ (1.4 percent points) and by education (0.64 percent points), which correspond to a relative participation in the economic growth of 43%, 29% and 13%, respectively. So, catching-up effect was the second higher contributor to the increase of Portuguese income per capita.

Table 7.2 also shows that the relative contribution of the catch-up effect is decreasing, although at a small rate, along the 1960-90 period. This is in accordance with the respective theory. In effect, according to the above clarified ‘advantages of backwardness theory’ (Gershenkron, 1962; Abramovitz, 1979, 1986; Maddison, 1987) as one country moves towards the technological frontier the ‘advantages of backwardness’ are getting smaller and smaller. So, it is not an astonishing fact the rate of economic growth to diminish at the same time as Portuguese economy develops and it is likely that this phenomenon occurs in other peripheral countries.
As mentioned earlier, for the economy as a whole, labour productivity growth can be achieved through technological progress and/or by moving resources from low-to higher-productivity sectors. It is basically this structural transformation the responsible for the decreasing effect of the “advantages of backwardness”, because development makes the economy more homogeneous. In the last four decades of the 20th. Century many Portuguese low-productivity economic activities shrink or even disappear by effect of the advances of economic integration.

Figure 7.2: Evolution of the sectoral share of value added

Indeed, in Portugal as the less developed economy of our sample of peripheral countries growth of GDP was accompanied by a bigger structural change visible in the structure of production. As figure 7.2 shows, periphery countries converge with the trend in EMU from 1970 to 20109: a decline in the shares of value added of agriculture and industry and an increasing trend in value added of services. Of course there are some specificities, particularly affecting Portugal. Giving the low initial level of development of Portugal the diminution in share of agriculture’s value added is significantly more abrupt and the share of industry followed a more uneven decreasing

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9 Greece is not included in table 7.2 because its data on value added are not available in the database used.
trend. Respecting to industrial value added, two countries deviate from the EMU trend roughly after 2000: Spain by excess, owing to the increase in construction, and Portugal by defect. But both Portugal and Spain have a manufacturing share of value added below the trend in Italy and in the EMU.

The changes in the structure of production were associated to changes in the structure of employment, with labour force moving from agriculture to industry and from these two sectors to services, as documented in figure 7.3.

Figure 7.3:
Evolution of employment by sectors

Source: Based on WDI data.

But if employment in agriculture diminished in all countries, in Greece and Portugal the share of employment in agriculture went on well above the share in the other two peripheral countries, which is nearly coincident with the EMU. In the Portuguese case the higher share of employment in agriculture, reflecting the scarce number of jobs created in industry and services is translated in a very low agricultural value added per worker\textsuperscript{10}.

It is likely that the transformation occurred in the structure of production affect the structure of domestic demand. Figure 7.4 shows the change in the components of

\textsuperscript{10} Data on value added of Greece is not available in the database used (WDI).
Gross domestic product (GDP) from the expenditure side, which are household final consumption expenditure, general government final consumption expenditure, gross capital formation and net exports (exports minus imports) of goods and services.

Figure 7.4: Structural change in demand

Source: Based on WDI.

As depicted in the figure 7.4, the structure of domestic demand shows different patterns along time. On the one hand, the general government consumption share in GDP shows a clear increasing trend in the whole period, catching up with the EMU share, with a higher pace in countries that initially have a weaker welfare state. On the other hand, the household final consumption share shows large variability along time. An exception to the big variability of household final consumption is visible in Spain with a steady decrease in the consumption share.

But, figure 7.4 shows also that there was not convergence of both Portugal and Greece with the EMU, in terms of level of household consumption. On the contrary, these two economies increased the household consumption share in the first decade of the 21st century and go on with a high consumption in comparison with the EMU level. But also Italy that followed the EMU trend in consumption during all the 1980s deviate from this trend and began to diverge in the middle 1990s, intensifying the divergence after the 2008 crisis.
The large variability along time is also characteristic of the components of the external demand as is summarized by the last panel of figure 7.4: net exports of goods and services. In spite of the long run increase of exports as a per cent of GDP in all peripheral countries, the external balance on goods and services shows a persistent tendency to be negative in Portugal and Greece, contrasting with alternating periods of positive and negative balances in Italy and Spain.

The high share of household final consumption together with the persistence of negative balance of goods and services in Portugal and Greece makes an analysis of saving and investment mandatory.

Figure 7.5:
Investment and saving in Periphery

Source: Based on WDI.

Figure 7.5 shows a decreasing trend in savings in the last 40 years, which was accompanied with a similar trend in investment. But while in Italy and Spain periods when investment exceeds savings alternate with periods of savings exceeding investment, in Greece and Portugal the share of investment is always higher than the part of GDP saved.

As has been stated by DeLong and Summers (1991, 1993) prices of investment are biased against countries with low GDP per capita. So, it is important to analyse the

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Spain is an exception. After 1994 it shows an increasing trend due to the construction boom, which ends abruptly with the 2008 crisis.
evolution of investment at international prices. If we consider the share of GFC (gross capital formation) in GDP measured at current PPPs (purchasing power parities) we see a clear inversion of the trend in the investment share in Portugal: around 1998 the share of GCF in GDP begins a clear descendent trend. So, if only the first decade of the new millennium is considered, investment rate shows a decreasing trend (figure 7.6), in spite of the low interest rates that the entrance in the EMU made possible.

Figure 7.6:
Trends in share of investment in Portugal, at international prices
a) From 1950 to 1998
b) From 1998 to 2011

Source: Based on PWT 8.0 (Feenstra et al, 2013).

The increasing trend in consumption is understandable giving the decreasing interest rates, with the consequent increasing possibility of obtaining credit to consumption by Portuguese households, but this increasing consumption is satisfied by production from abroad. It has small effect on the domestic production and so domestic firms do not preview increasing demand, reducing accordingly the pace of investment. So, the increasing trend of consumption occurs at the same time as the long run evolution of investment is reversed (see figure 7.6). Although the most obvious explanation for that fact is the forecasted scarce demand, other factors can have played a role in the reverse of the investment trend: some are domestic in nature, but many others are related with the constitution of the EMU and the policy prevailing at the world level. Moreover, given the sharp fall in interest rates that the entry to the EMU made possible the decreasing trend in investment after 1998 cannot be explained by the absence of supply-side public incentives. It is more likely that this declining trend results from a
diversion effect conducting funds to the more moneymaking applications in financial assets.

This downturn in the investment rate is very detrimental to the Portuguese convergence process because, as mentioned previously, the investment in physical capital was the most important source of growth in the 1960-1990 period, and as the catching up effect was slowly vanishing, the conjunction of these two effects can explain an important amount of the decrease in the economic growth rates.

3.2. THE UNFINISHED STRUCTURAL CHANGE

As shown in the previous section the structural transformation was patent in the structure of production and employment. The structural change is not so visible in terms of domestic and external demand. The share of exports in GDP has shown resistance to increase and this is reflected in the external balance of goods and services. Usually this is explained by a lack of competitiveness of the Portuguese economy, which is associated to numerous factors, ranging from the low flexibility of the labour market and the high level of unity labour costs to the fiscal competitiveness. This corresponds to adopt a structural reforms approach.

In my view, a structural change perspective should look at other economic problems. One important but usually ignored factor is the structure of the firms and its evolution along time. Peripheral countries have a distorted structure with an excessive share of very small firms. As shown in table 7.3, Portugal, Italy and Spain have more than 93 % of firms with less than 10 persons employed while in Germany the corresponding share is only 82%. In peripheral countries the number of firms with 50 persons employed or more is less than 1%. This is a structure that faces large indivisibilities with negative effects on the improvement of productivity. It reduces the possibility of benefiting from scale effects preventing for instance the use of professional management or the internalisation of services that can improve the position in the chain of value added.
Table 7.3:
Enterprises in the non-financial business economy by size class of employment (%)

<table>
<thead>
<tr>
<th></th>
<th>Portugal</th>
<th>Italy</th>
<th>Spain</th>
<th>Germany</th>
<th>Austria</th>
<th>EU 27</th>
</tr>
</thead>
<tbody>
<tr>
<td>From 0 to 9 persons employed</td>
<td>94.92</td>
<td>94.63</td>
<td>93.79</td>
<td>82.27</td>
<td>87.43</td>
<td>92.45</td>
</tr>
<tr>
<td>From 10 to 19 persons employed</td>
<td>2.87</td>
<td>3.46</td>
<td>3.56</td>
<td>9.85</td>
<td>6.95</td>
<td>4.08</td>
</tr>
<tr>
<td>From 20 to 49 persons employed</td>
<td>1.49</td>
<td>1.32</td>
<td>1.85</td>
<td>4.86</td>
<td>3.68</td>
<td>2.14</td>
</tr>
<tr>
<td>From 50 to 249 persons employed</td>
<td>0.63</td>
<td>0.50</td>
<td>0.68</td>
<td>2.55</td>
<td>1.60</td>
<td>1.02</td>
</tr>
<tr>
<td>250 persons employed or more</td>
<td>0.09</td>
<td>0.08</td>
<td>0.12</td>
<td>0.47</td>
<td>0.33</td>
<td>0.19</td>
</tr>
</tbody>
</table>

Source: Author’s calculations based on Eurostat (2013) data.

Why this happens in peripheral countries? Because public incentives are biased favouring micro firms, there is an employment fallacy: the micro firms create more employment. Of course, they create more employment. But the question is: why? Because micro firms are less productive. It is normal that a micro firm has low productivity, but best firms grow up and simultaneously become more productive. This increase in the capital labour ratio means less employment but is an essential condition to increase output per capita and, by increasing aggregate demand, generate more employment next.

But not only the entrepreneurial structure is biased towards the micro firms, also the self-employed labour force is considerably higher than the EMU level (figure 7.7).

Figure 7.7:
Self-employment

![Self-employment graph]

Source: Based on WDI.

Here is something like the employment fallacy above mentioned. Because economy creates few employments, individuals should create their own job. But if this solves the individual problem it pushes productivity down. If a structural reform is
needed, it is here: taxes, which diminish the disposable income and the aggregate demand, should not be used for artificially maintaining jobs in micro firms or to support the self-employment.

Both the biased structure of firms and the high weight of self-employment are important barriers to the increase of productivity and show that a policy of flexibility of labour market is not succeeded in increasing productivity. While a policy of flexibility and deregulation of labour market can increase productivity in a large firm by inducing reorganization, in a micro firm the possibilities of increasing productivity in this way are very limited. In a period of stagnating or diminishing demand, while the large firm can react by diminishing costs for the micro firm this usually means the close doors and enlargement of unemployment.

For an economy with high concentration of micro firms, as is the case of peripheral countries, the increase in productivity implies that the structural transformation must go on. This change needs two conditions: first, that there is no artificial barriers to the increase in dimension of firms, except if this increase hurts competition; second, introducing new products, new processes of production or other types of innovations whatever their form. So, now proceeding structural transformation means changing the focus towards technological change.

4. THE TECHNOLOGICAL CHANGE IN PORTUGAL

The causes of long-term growth are complex, and are often perceived by using over-simplified models and imperfect sets of indicators. A single methodology is unlikely to find out all the growth factors. So, econometric analyses must be complemented by historical studies, using varied theories and approaches. This combination of analyses is the best way of searching ‘common features and patterns’ (Kuznets, 1959) in the comparative experience of nations with different size, location and historical heritage in order to establish regularities in the structural transformation. Following Kuznets (1959), we use such regularities, generally known as stylised facts, to explain the best way of propelling economic growth in European periphery.

In literature on causes of economic growth, we can select several quantitative studies not contradicted by historical analyses that show empirical results pointing out
the following stylised facts: 1) TFP (total factor productivity), usually interpreted as the main effect of technical progress, is the most important contributing factor in economic growth (Solow, 1957; Dennison, 1962); 2) Innovative activity, as measured by R&D (Research and Development) expenditure and by patenting, is closely associated with the level of output and income per capita at country level (Fagerberg 1987; Fagerberg and Srholec, 2008); 3) there are positive and significant correlations between productivity, at firm and industry level, and the amount of R&D which firms and industries perform (Griliches, 1987; Nadiri, 1993; and Gault, 2003); 4) R&D is positively correlated to growth, mainly via private business R&D (Guellec and van Pottelsberghe de la Potterie 2001); 5) although public R&D has limited direct positive effects on productivity, it has important effects in stimulating business R&D (Guellec and van Pottelsberghe de la Potterie, 2001, 2003); 6) countries with higher levels of innovative activity have higher shares of world trade (Fagerberg, 1988); 7) social rates of return to R&D are consistently higher than private rates of return (Bernstein and Nadiri, 1991; Griliches, 1992) indicating the existence of spillovers and increasing returns to scale.

Before 2000, the performance of the Portuguese economy in R&D (research and development) grounds was very poor. In fact, when looking at figures representative of the research inputs, the distance to the OECD average is evident (table 7.5). The indicator relative to personnel engaged in research shows the scarce number of human resources dedicated to study and explore new ideas and knowledge exploitation: in Portugal, the number of researchers per 1000 total employment was 22% of the OECD average, in 1982. If we look to the R&D expenditure we see even a more evident discrepancy: 14 percent in that year. In 2000, expenditure in R&D represented only 24 percent of the equivalent OECD indicator in per capita terms, and the GERD as a percent of the GDP was 33 percent of the OECD average. It is also evident in table 7.5 a distorted structure of financing, biased towards government, which is typical of less developed economies. In fact in 2000, while in Portugal industry financed less than a half of the amount financed by government, in OECD the funds provided by industry were 127% higher than the ones supplied by government.

12 However, the poor performance was covered by the increase in investment in physical capital and by the other factors included under the umbrella concept of catching up.
Table 7.4:
Evolution of Research and development indicators, Portugal, 1982-2010

<table>
<thead>
<tr>
<th></th>
<th>Researchers per 1000 total employment</th>
<th>Gross Domestic expenditure on R&amp;D (GERD)</th>
<th>Financed by:</th>
<th>Per capita at current USD, PPPs</th>
<th>Business enterprise expenditure on R&amp;D (BERD)</th>
<th>% of GERD</th>
<th>% of value added in industry</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>% of GDP</td>
<td>Government</td>
<td>Industry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1982</td>
<td>1.0</td>
<td>0.27</td>
<td>61.9</td>
<td>30.0</td>
<td>17.39</td>
<td>31.24</td>
<td>0.11</td>
</tr>
<tr>
<td></td>
<td>(4.6)</td>
<td>(1.99)</td>
<td>(43.6)</td>
<td>(52.3)</td>
<td>(225.25)</td>
<td>(66.17)</td>
<td>(1.90)</td>
</tr>
<tr>
<td>2000</td>
<td>3.3</td>
<td>0.73</td>
<td>64.8</td>
<td>27.0</td>
<td>129.52</td>
<td>22.68</td>
<td>0.32</td>
</tr>
<tr>
<td></td>
<td>(6.7)</td>
<td>(2.20)</td>
<td>(28.3)</td>
<td>(64.2)</td>
<td>(541.27)</td>
<td>(69.48)</td>
<td>(2.29)</td>
</tr>
<tr>
<td>2005</td>
<td>4.1</td>
<td>0.78</td>
<td>55.2</td>
<td>36.3</td>
<td>166.38</td>
<td>38.47</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td>(7.5)</td>
<td>(2.22)</td>
<td>(29.2)</td>
<td>(62.4)</td>
<td>(662.45)</td>
<td>(67.87)</td>
<td>(2.30)</td>
</tr>
<tr>
<td>2010</td>
<td>9.37</td>
<td>1.59</td>
<td>44.93</td>
<td>44.09</td>
<td>406.22</td>
<td>46.07</td>
<td>1.21</td>
</tr>
<tr>
<td></td>
<td>(7.5*)</td>
<td>(2.19)</td>
<td>(31.08)</td>
<td>(60.28)</td>
<td>(806.26)</td>
<td>(66.52)</td>
<td>(2.47)</td>
</tr>
</tbody>
</table>

Source: Based on Main Science and Technology Indicators, OECD (2013). Notes: Figures in parentheses are the corresponding values for the OECD total; *figure refers to 2007, which is the last year available.

The distorted structure of financing was accompanied by a small investment in R&D made by business enterprises. In spite of the increase after 1982, in terms of percent of value added in industry Portugal only made an effort correspondent to 14 percent of the one made in the OECD, in 2000. As is also apparent from table 7.4, from 2000 to 2010 all indicators are considerably improved and in 2010 not only the GERD as a percent of GDP is closer to the OECD average (73%) but also the number of researchers (FTE) per thousand total employment surpassed the corresponding figure for OECD.

The R&D performance is remarkable in the European periphery context (figure 7.8). While before 2000, Portugal shared with Greece the last place in the ranking of peripheral countries at a big distance from Spain and Italy both in GERD and BERD, after 2000 it increases significantly the share of R&D outlays in GDP and particularly after 2005 accelerates and surpasses all the other peripheral countries. Also noteworthy is the increase in the number of researchers per thousand labour force. Beginning with a figure similar to Greece, Portugal surpassed Italy, Spain and even the Euro Area (see figure 7.8). However, there is a reverse in the ascending trajectory of shares of GERD and BERD after 2009.
Along with the increase in the number of researchers, the output of researchers, measured by the number of scientific and technical journal articles has quickly converged with the EU level: from 2000 to 2009, the annual growth rate of the number of these articles was 1.6 per cent in the EU-27, in Portugal such rate climbed to 8.86. This convergence has meant an increasing share of articles of Portuguese researchers in the European Union, as documented in the last line of table 7.5.

Table 7.5: Comparative evolution of the number of scientific and technical journal articles

<table>
<thead>
<tr>
<th>Year</th>
<th>Portugal</th>
<th>EU 27</th>
<th>1/2 (in %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>1,88</td>
<td>222,688</td>
<td>0.84</td>
</tr>
<tr>
<td>2001</td>
<td>2,081</td>
<td>220,408</td>
<td>0.94</td>
</tr>
<tr>
<td>2002</td>
<td>2,331</td>
<td>221,720</td>
<td>1.05</td>
</tr>
<tr>
<td>2003</td>
<td>2,423</td>
<td>224,854</td>
<td>1.08</td>
</tr>
<tr>
<td>2004</td>
<td>2,853</td>
<td>230,487</td>
<td>1.24</td>
</tr>
<tr>
<td>2005</td>
<td>2,912</td>
<td>235,121</td>
<td>1.24</td>
</tr>
<tr>
<td>2006</td>
<td>3,629</td>
<td>242,848</td>
<td>1.49</td>
</tr>
<tr>
<td>2007</td>
<td>3,424</td>
<td>245,973</td>
<td>1.39</td>
</tr>
<tr>
<td>2008</td>
<td>3,857</td>
<td>249,956</td>
<td>1.54</td>
</tr>
<tr>
<td>2009</td>
<td>4,157</td>
<td>248,656</td>
<td>1.67</td>
</tr>
</tbody>
</table>

*Source: Own calculation based on WDI data.*

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13 Scientific and technical journal articles refer to the number of scientific and engineering articles published in the following fields: physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering and technology, and earth and space sciences.
Minor progress was registered in the output of applied research, measured by patents (table 7.6): both figures of triadic patent families\(^{14}\) and patent applications filled under the PCT go on being very low in comparison with the value of the OECD average. However, some improvement in patent indicators is visible, when comparing the 1985-2000 period with the evolution after 2000.

<table>
<thead>
<tr>
<th>Priority year</th>
<th>Triadic patent families</th>
<th>Patent applications filled under the PCT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ICT</td>
</tr>
<tr>
<td>1985</td>
<td>1.5</td>
<td>0</td>
</tr>
<tr>
<td>2000</td>
<td>2.46</td>
<td>3.4</td>
</tr>
<tr>
<td>2005</td>
<td>8.53</td>
<td>27.78</td>
</tr>
<tr>
<td>2011</td>
<td>9.74</td>
<td>45.75</td>
</tr>
</tbody>
</table>

Source: Calculations based on OECD MSTI database (online). Notes: figures in parentheses are the Portuguese percentages in the EU-15 total.

In fact, in 1985 Portugal had taken 1.5 triadic patent families, which corresponds to the insignificant share of 0.018 percent of the EU-15, and fifteen years later goes on with the same percentage. From 2000 to 2011 the percentage of triadic patent families increased at a significantly higher rate. Respecting to the patents filled under the PCT, the indicators presented by Portugal in 2000 are also very low, as is visible by the extremely low shares on the EU-15 total. Although the evolution from 2000 to 2011 has been positive in all categories of patents documented in table 7.6, Portugal goes on to be very far from the figures presented by the more developed economies.

We can also see that the above positive evolution is not enough by analysing the TBP (technology balance of payments). In fact, respecting to disembodied technology, the Portuguese TBP, which registers the international flow of industrial property and know-how\(^{15}\), shows for 2006 a negative balance of 169.5 million euros (table 7.7). The

\(^{14}\) According to the OECD definition of triadic patent families, a patent is a member of the triadic patent families if and only if it is filed at the European Patent Office (EPO), the Japan Patent Office (JPO) and is granted by the US Patent and Trademark Office (USPTO).

\(^{15}\) The following operations are included in the TBP: patents (purchases, sales); licenses for patents; know-how (not patented); models and designs; trademarks (including franchising); technical services; finance of industrial R&D outside national territory. The following operations are excluded: commercial, financial, managerial and legal assistance; advertising; insurance; transport; films, recordings, material covered by copyright; design; software.
balance was also negative in all preceding years, showing a chronic incapacity of generating receipts to pay the disembodied technology bought abroad.

But after 2006 the TBP shows a positive evolution, although with unlevelled participation of its different items. From 2007 onwards it have presented a positive balance, only with one exception for 2010. As usually, the acquisition and use of royalties and license fees, which includes receipts and payments of acquisition and utilization of patents, trademarks and similar rights, has contributed for the negative performance, which shows the low propensity to patents in the Portuguese economy alleged above.

Table 7.7:

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>Acquisition and use of royalties and license fees</th>
<th>Technical assistance services</th>
<th>Research and development services</th>
<th>Other technical services</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Credit</td>
<td>Debit</td>
<td>Balance</td>
<td>Credit</td>
<td>Debit</td>
</tr>
<tr>
<td>2006</td>
<td>776 768</td>
<td>946 272</td>
<td>-169 504</td>
<td>120 319</td>
<td>354 782</td>
</tr>
<tr>
<td>2007</td>
<td>1 063 674</td>
<td>937 959</td>
<td>125 715</td>
<td>196 793</td>
<td>319 403</td>
</tr>
<tr>
<td>2008</td>
<td>1 227 546</td>
<td>1 161 948</td>
<td>65 598</td>
<td>178 462</td>
<td>363 905</td>
</tr>
<tr>
<td>2009</td>
<td>1 272 886</td>
<td>1 175 129</td>
<td>97 757</td>
<td>164 839</td>
<td>389 460</td>
</tr>
<tr>
<td>2010</td>
<td>1 143 787</td>
<td>1 167 210</td>
<td>-23 424</td>
<td>41 564</td>
<td>409 827</td>
</tr>
<tr>
<td>2011</td>
<td>1 308 111</td>
<td>1 231 960</td>
<td>76 151</td>
<td>83 362</td>
<td>385 553</td>
</tr>
</tbody>
</table>

Source: Based on data from Banco de Portugal (2012).

As is visible from table 7.7, the items that contribute for the positive balance of Portuguese TBP are services of research and development, technical assistance and other technical services, but Portugal goes on with a deficit of patents and other similar rights. There are several reasons for the low propensity to patents, and this is not the adequate space for discuss them, but the type of industrial sectors predominantly based on the supplier-dominated industries (Pavit, 1984) and the structure of firms prevalent in the Portuguese economy have some responsibility in such low figures. In this respect, the development of the Portuguese technological capacity will depend not only on the ability of Portuguese researchers to increase the commercially-used knowledge stock but also, and more importantly, on the capacity of firms to use the patented technology.

In sum, a change in the technological pattern is clear in the Portuguese economy. However, the effects of such change were neither translated in retaking convergence nor apparent in benefits at the economic growth level. Besides the need to consider the necessary time lags for converting technology change in economic growth, two facts
must be noted. First, this change occurred at the same time as the Portuguese economy faced new competitors and a lot of inefficient firms were destroyed. Second, given the ongoing globalisation and the increasing integration of the Portuguese economy in the European Union, and moreover in the Euro Area, it is not an astonishing fact that the explanation for the decrease of the Portuguese economic growth rate must take into account also the reasons that justify the generalized decrease in economic growth in developed countries and particularly at the European level, in the first decade of the 21st century. As is visible from figure 7.1 in section 3, this decade is the sole where the European Union and the Euro Area grew less than the world economic level.

Why economic growth has been so difficult in Europe after 2000? The way as the EMU was constructed and implemented, and the concept of competitiveness adopted by the European Commission and by the Euro Area core countries are certainly part of the answer to the above question. In this respect the fixation on the virtues of structural reforms, and particularly on the wage flexibility, instead of adopting a more dynamic concept of competitiveness based on the competition around new products and new productive processes, has contributed to lose leadership in technology and innovation. Additionally, the attempt to substitute the wage-led growth model prevailing until the middle of 1990s in a number of European countries by a profit-led model (considered as the best way for transforming such countries in export-led economies) is other of the main reasons for explaining the instability of GDP growth and its stumpy rate, both in Portugal and in the Euro Area as a whole. Furthermore, the priority given to the financial markets and to the globalisation of capital instead of the real economy also contributes to explain the low level of investment and the high level of unemployment.

Some of the above mentioned factors not only affect the EU and its member countries but also hurt the growth performance of the majority of the developed countries in this century. In fact, the downturn in economic growth is not a specificity of the Portuguese economy. It is generalized to all developed world but within this, the Euro Area was particularly affected (figure 7.1 in section 3). Alongside with the factors that are common to the developed world and to the EU, two factors are more specific of the Portuguese economy and of others in the EU periphery: The effects on the interest rate, resulting from the entry into the EMU, and some “Dutch Disease” type effects,
resulting from the European Funds, that jointly distorted the ratio tradable / non tradable goods. The minimization of these effects calls for a right exchange rate policy. However, with the entry into the EMU, Portugal and the other periphery countries lost this possibility.

The ideology of structural reforms has proposed a substitute for the lack of the exchange rate control: the so called internal devaluation (Pessoa, 2011) and the expansionary austerity. However, the results of such strategy are well visible in Portugal and Greece: constant failure of economic and financial targets and a resulting recession spiral accompanied with increasing debt to GDP ratios.

Although in dealing with a crisis, theory teaches that the instruments to address the immediate problem must support a long-term view, there is real danger that the structural reforms initiated in Portugal and other peripheral countries may only search financial equilibria, without any discernible long-term positive effects on the real economy. Furthermore the existing financial and economic crisis creates severe challenges for the design and implementation of development policies, and moreover in countries that are in the process of building technology and production capabilities. Because the downward spiral of economic activity does negatively influence employment, investment and production, policy makers risk to putting the wrong recipe in place, compromising the growth prospects and aggravating, instead of minimizing, the effects of the crisis.

In Portugal, the history of the precedent crises shows a contraction on the values of ratio GERD/GDP. If the present crisis has the same outcome\textsuperscript{16}, the timid progresses registered in the Portuguese economy can be entirely reversed. Moreover, when short-term and rescue policies prevail, the consensus for S&T policies tends to decline. But, if Portugal abandons its efforts for S&T policy, the production structure that will emerge after the crisis will not be able to catch up with the new technologies and paradigms that will shape global production and trade. Instead of catching up, there is a risk of augmenting the gaps with leading countries.

\textsuperscript{16} A first glance to the MSTI database for 2011 is not encouraging: the percentage of GERD performed by the Business Enterprise Sector is 45.9% while it was 51.24 in 2007; the GERD per capita is 379.09 vs. 408.27 in 2009; the GERD as percent of GDP is 1.49 vs. 1.64 in 2009; the BERD as percent of the value added of industry is 1.14 vs. 1.28 in 2009.
5. CONCLUSION

This chapter is about structural and technological change in the Portuguese economy. It deals with the way a country situated far from the technological frontier can converge with the technological and economic leaders. Inspired in several stylised facts, our point of departure was the proposition that sustained development implies structural change. But there are limits to the structural transformation if technology does not change accordingly. Moreover, as economic growth proceeds, the direction of causation between the two dynamics changes. Initially, the structural transformation pulls the technology; while lately should be technology to push the structural change and growth. Understand this is mainly important for countries placed far from the technological and economic frontier, particularly when “catching-up” is becoming increasingly difficult. Although Portugal managed to grow in the past using the advantages of backwardness, when these advantages shrink the turn of investment to R&D and the innovation policy become crucial to go on the convergence process.

Although all R&D indicators show that the Portuguese economy was in 2000 far from the technological frontier, it is evident that some progress was registered from then on. Moreover, around this date there was a change in the technological pattern. In fact, while before 2000 the technological indicators do not show any significant convergence with the OCDE average, both at the business enterprise level and the financing structure of GERD, after 2000 the situation seems to be changing, at a slight and uneven pace firstly, and with acceleration after 2005. In fact, there was a shortening of the distance between Portugal and the OECD average in all Science and Technology indicators. Also, the structure of funds for GERD presented a convergence with the OECD average pattern. But, more importantly, the data available show an increase in speed of the convergence in S&T indicators.

In fact, Portugal experienced a significant increase in GERD as a percent of GDP, and the increase of R&D outlays was even more significant at the business enterprise level. This augment was accompanied by an increase in human resources devoted to R&D, particularly the FTE (full time equivalent) number of researchers per thousand total employment. Some other indications show an evolution of the same type. For instance, the global index of innovation of EIS show also an improvement in the
score of Portugal in the EU27 ranking, from 22 in 2006 to 16 in 2011 (IUS, 2012). This improvement in the innovation ranking is connected to some other qualitative changes at the micro level, which constitute significant case studies of introduction of innovative processes and products both in the science base sectors and in supplier-dominated industries.

Even though the Portuguese economy is making progress there are still a lot of challenges ahead, in order to catch-up with the EU and OECD level of technology. Because the main picture goes on being a lack of investments in new technologies, patenting, and so forth, it’s crucial to maintain the long run horizon in Science, Technology and Innovation policy. As the recent OECD report has shown (OECD, 2009), the investment in innovation in times of crisis allowed Finland and South Korea to become more competitive and innovative.

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MSTI, Main Science and Technology Indicators, OECD, online database. Available at http://stats.oecd.org/Index.aspx?DataSetCode=MSTI_PUB


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