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What can Portugal learn from Ireland and to a less extent from Greece? An empirical approach searching for the sources of growth

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What can Portugal learn from Ireland and to a less extent from Greece? An empirical approach searching for the sources of growth.

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Abstract

The present paper focuses on the analysis of growth sources in Portugal, Greece and Ireland explaining the differences in economic performance between these three countries which constitute the “cohesion group” in the EU. During the nineties, Ireland has made a remarkable economic recovery, converging rapidly to the richest countries of the EU, while Portugal converged at a very modest rate. Greece is a peculiar example of having great difficulties of adaptation at the early years of its integration and only recently (since 1999) revealed signs of recovery in contrast to the slowdown of economic activity in Portugal. This raises the questions why was Ireland able to grow faster, which were the causes of its faster growth, and what can Portugal learn from the Irish success in economic improvement and the recent recovery of the Greek economy. This paper tries to shed light to these questions and to identify the main sources which drove economic growth in the three countries. Our evidence shows that differences in productivity levels, capital accumulation in human resources and technology, foreign direct investment and most of all export capacity are the main factors explaining differences in economic performance between these three countries.

Keywords: per capita income, productivity, export-led growth, foreign trade elasticities and error correction models.

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1. Introduction

Portugal, Greece and Ireland are the countries within the European Union, all receiving structural assistance from the community as members of the “cohesion group”. However, during the nineties, Ireland has shown a remarkable economic recovery, converging rapidly to the richest countries of the EU. Greece has grown at higher rates only in the late nineties and in 2003 per capita income in Greece exceeded the Portuguese one. On the other hand, Portugal grew at very moderate rates in the late nineties and with negative records in 2002-2003, diverging from its partners in terms of per capita income and productivity standards. This raises some important questions: why was Ireland able to grow faster, and Greece to a lesser extent? Which were the causes of the faster growth in Ireland and Greece in recent years? What can Portugal learn from the Irish and Greek experience in improving economic performance? This paper tries to shed light to these questions through a theoretical, an empirical and descriptive framework trying to identify the similarities and differences which can explain growth performance in the three countries.

Accordingly, the purpose of this paper is threefold: first, to identify the driving forces of economic growth in Portugal, Greece and Ireland; secondly, to explain the remarkable recovery of the Irish economy, especially in the nineties, the reasonable economic performance of Greece in the late nineties and the modest or negative performance of Portugal in recent years; and thirdly, to show the lessons that Portugal can derive from that positive experience in Ireland and Greece.

The sources of growth can be identified by a decomposition approach of the growth of per capita income. As the evidence shows, the most important contribution comes from productivity growth which is much more higher in Ireland and Greece relatively to Portugal. The remarkable Irish economic recovery can be explained by higher accumulation of technological and human capital and not physical capital as happens with Portugal and Greece. From the analysis of the export-led growth approach becomes clearer the superiority of Ireland in terms of export competitiveness. It is shown that Ireland has more advantages to grow faster without facing any demand constrains, due to lower import penetration and higher export growth. Greece and Portugal are not in such a comfortable position and can face problems in the balance of payments in the near future that can constrain growth. It is also shown that the influence of the EU is stronger in Portugal than in Greece in terms of per capita income and

productivity. On the other hand Ireland absorbs better the productivity gains steaming from the EU.

The proposed paper is organised as follows: The next section provides some historical statistics on the main indicators which characterise economic growth, trying to identify some common tendencies or differences that can explain the growth patterns in the three countries. Section 3, through a decomposition analysis of the growth of per capita income, tries to identify the main sources which drove economic growth in the three countries. Section 4 explores an export-led model that stresses the role of trade as the engine of economic growth, focusing on the importance of the Balance-of-Payments constraint on growth. Section 5 tests the direct influence of the EU as a whole on each individual country's per capita income and productivity, attempting to find some strong links among them. The last section summarises the main findings.

2. Economic performance in Portugal, Greece and Ireland: differences and similarities.

At the beginning of the sixties the three countries had a lot in common. They were small, poor and closed economies, with high levels of emigration and trade protection policies. Their economic structures were similar, characterised by a high share of agriculture in output and employment. Since the sixties the agricultural share has been declining in the three countries but different sectors have risen in its place. The shift of resources to the industrial sector is more intensive in Ireland than in Portugal and Greece. The share of manufacturing in GDP grew faster in Ireland while in the other two countries the share of services gained more importance. Evidence from recent years shows that the contribution of the industrial sector to GDP is still higher in Ireland, around 40%, while in Greece and Portugal industrial share is less than 30%. On the other hand, the industrial share in employment is lower in Ireland indicating higher levels of productivity.

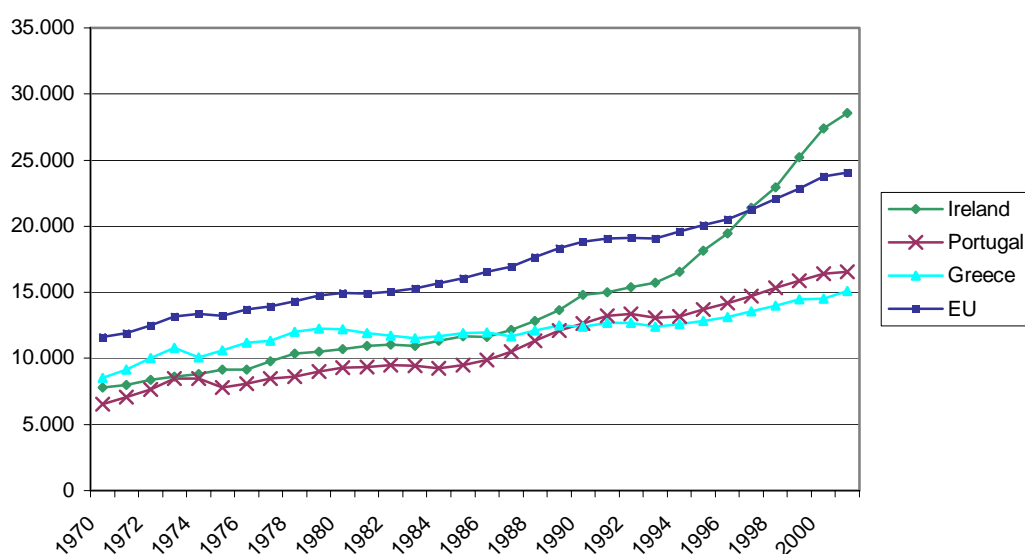
Living standards, measured by GDP per head, and productivity levels measured by GDP per worker, were significantly below the European average when they joined the Community (Ireland in 1973, Greece in 1981 and Portugal in 1986). But Irish higher economic performance in the nineties changed this backward position as can be seen below, in Table 1 and Figure 1.

TABLE 1 – GDP PER CAPITA AS PERCENTAGE OF THE EU-15 AVERAGE

	1960	1970	1980	1990	1995	2001
Portugal	25.2	56.5	62.1	67.1	68.3	68.9
Greece	32.5	73.7	81.6	65.9	63.9	62.7
Ireland	59.4	67.0	71.5	78.8	90.4	118.8

Note: GDP per capita in PPP terms

Source: OECD Statistical Compendium, 2003

FIGURE 1 – GDP PER CAPITA (PPP TERMS)

Source: OECD, Statistical Compendium, 2003

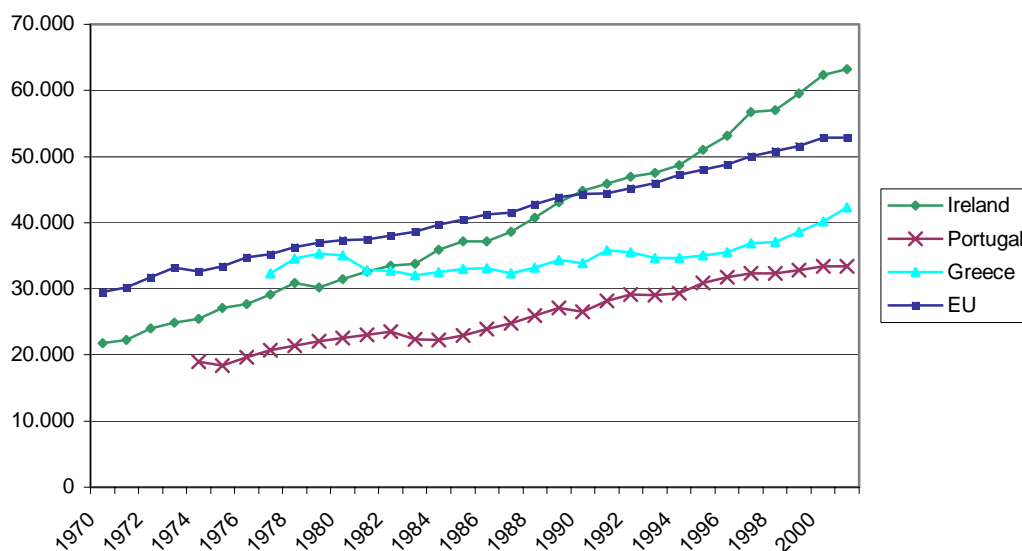
In 2001, Irish per capita income was 19% higher than the EU average but Portuguese and Greek per capita incomes corresponded to only 68.9 and 62.7% of the EU average, respectively. The Greek economy shows a different path, a higher capacity of catching-up in the pre accession period (before 1980) but a reverse tendency afterwards. The Portuguese economy reveals a better adaptation during the post accession period. In terms of GDP per worker (as proxy for labour productivity) Ireland is the country that has been closer to the European Union average. The improvement of Irish productivity was substantial, to the extent that, in 1990, the Irish GDP per worker exceeded the EU-15 average. The same happened with respect to GDP per head in 1999, according to OECD statistics. By the end of the nineties the Irish leaving standards were clearly above the European Union average. Greece also has shown higher productivity levels

than Portugal, but the pattern was unstable. Once more, the achievements in productivity levels were higher in the pre accession period. As we can see from Tables 1 and 2, Greece was closer to the European Union standards in GDP per capita and per worker in the beginning of the eighties than it was in the nineties. In Portugal we find evidence of catching-up both in terms of living standards and output per worker but the improvement is very slow.

TABLE 2 – GDP PER WORKER AS PERCENTAGE OF THE EU-15 AVERAGE

	1970	1980	1990	1995	2001
Portugal	56.9	60.3	59.8	64.2	63.2
Greece	66.4	93.8	76.5	73.1	80.1
Ireland	73.6	84.3	101.2	106.1	119.6

FIGURE 2 – GDP PER WORKER (PPP TERMS)



Source: OECD, Statistical Compendium, 2003

From the sixties to nineties, growth performance reveals substantial differences in the three countries. The average growth rate of Irish GDP per capita was higher in the 90's in contrast to Portugal and Greece where it was higher during the sixties, the decade of higher growth in all Europe. Greece reveals again a higher growth capacity since 1999, in a way that Greek per capita income exceeded once more the Portuguese one in 2003.

The composition of GDP has changed since the 60's, when the contribution of exports was less than 20% in Portugal and Ireland and less than 10% in Greece. This change was due to a new international openness of these economies. By the end of the nineties the share of exports in the Irish economy was close to 95%, but in Portugal it was only 34% and in Greece even less, with a contribution to GDP of only 22%. Foreign trade has always been unbalanced in the three countries due to import penetration being higher than exports. But since the mid -80's, the Irish foreign trade position has changed radically, showing a significant surplus. In Portugal and Greece the deficits persisted over time. By the end of the nineties the Irish trade surplus of goods and services was nearly 15% of GDP. On the other hand, Portugal and Greece registered deficits corresponding to about 10% of GDP.

Looking at the GDP decomposition according to the expenditure approach, it is interesting to note that the Irish Gross Fixed Capital Formation share (20% in 2001) has always been lower than that recorded in Greece (23%) and Portugal (28%). The evidence shows that Ireland invested more in human and technological capital than in physical capital formation. As members of the less developed countries within the European Community, Portugal, Greece and Ireland benefited from structural assistance. The allocation of structural funds received was different in each country. Portugal and Greece allocated these funds, essentially, to improve infrastructures, while Ireland's main application was on the improvement of human capital qualifications and the development of technical progress.

3. Sources of economic growth in the three countries

A simple way to identify the sources of economic growth in different countries is by splitting up the series of per capita output into different components. Using available data, GDP per head can be analysed as the product of four terms: GDP per worker as proxy for labour productivity; employment rate obtained by the ratio of employment to total labour force; participation rate as the ratio of labour force to population of working age; and the dependency ratio obtained by dividing working age population by total population, as it is shown below:

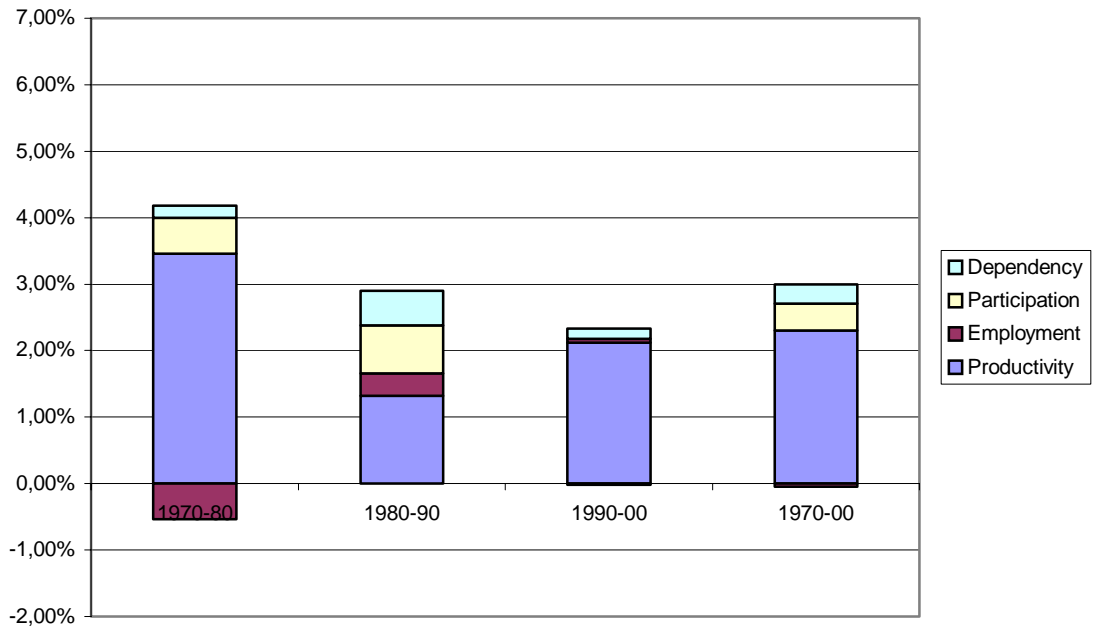
$$\frac{GDP}{Population} = \frac{GDP}{Employment} \cdot \frac{Employment}{Labourforce} \cdot \frac{Labourforce}{Population\ 15 - 64\ years} \cdot \frac{Population\ 15 - 64\ years}{Population}$$

The growth rate of GDP per head is therefore the sum of the growth of these four components. Figures 3 to 5 illustrate this breakdown of the series for each country over the whole period 1970-2000 and some sub periods. It is clear that the contribution of productivity growth has been the most important factor explaining the output per head growth in the three countries over the total period 1970-2000, and also in each sub-period. It can also be seen that in Portugal and Greece productivity grew faster during the seventies while in Ireland the decade of eighties was the period of the highest growth in productivity.

Considering the whole period (1970-2000) the contribution of employment rate to per capita income growth was negative, showing a declining tendency in the three countries since the seventies. The contribution of this factor was only positive in the seventies for Greece, in the eighties for Portugal and the nineties in the Irish case.

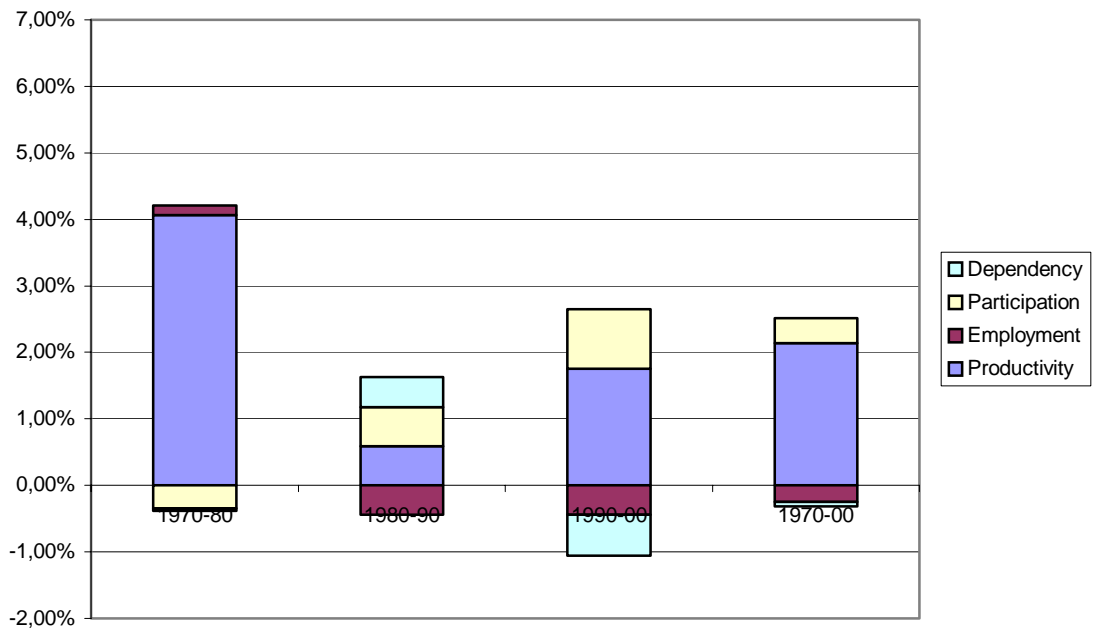
The participation rate made a positive contribution to growth over the whole period (1970-2001) in the three countries. When one looks at the evolution of this rate in the three countries it is interesting to see that only the Portuguese participation rate was higher than the European Union average, by early seventies. During the nineties all the Irish factors made a positive contribution to growth explaining the turnover position of Irish economic performance in this decade. The same did not happen with Portugal and Greece. The employment rate shows a negative contribution to growth in both countries during the nineties, while in Portugal the participation rate also contributed negatively to the growth of GDP per head. Ireland had a substantial increase in the participation and employment rates and also an improvement in the dependency ratio. Although the nineties was the decade of higher growth in GDP per head in Ireland, it was in the 80's that labour productivity grew faster.

FIGURE 3 – BREAKDOWN OF PORTUGUESE GDP PER CAPITA GROWTH



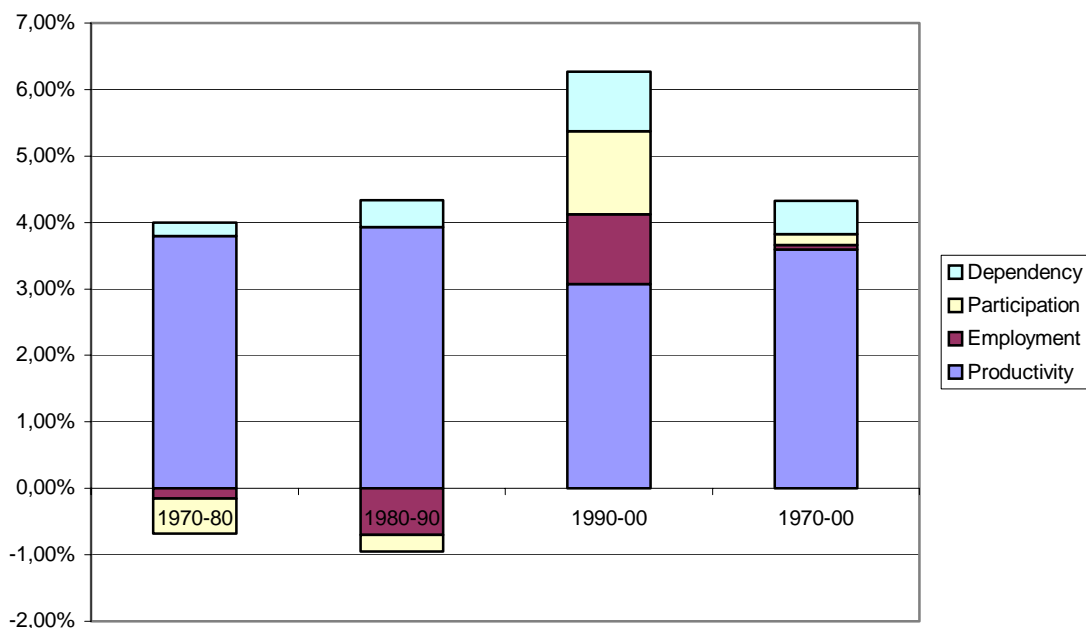
Source: OCDE, Statistical Compendium, 2003

FIGURE 5 – BREAKDOWN OF GREEK GDP PER CAPITA GROWTH



Source: OCDE, Statistical Compendium, 2003

FIGURE 4 – BREAKDOWN OF IRISH GDP PER CAPITA GROWTH



Source: OCDE, Statistical Compendium, 2003

Table 3 shows the progression of the gap between each country and the European Union average with respect to factors that contribute to growth. The growing Irish advantage in labour productivity is very obvious, since the gap has been reduced over time, and in the nineties productivity level in Ireland was higher than the European Union average. On the other hand, the Portuguese and Greek disadvantage in productivity levels became wider over time, and the gap grew continuously since the 70's. The Portuguese position is even worst comparing to Greece, showing a higher distance in productivity differences in all decades.

With regard to participation rate, Portugal shows a clear advantage over Ireland that is even higher with respect to Greece. Portuguese participation rate has always been higher than the EU average and the gap increased through time. The main Irish disadvantage is on the employment rate, always being below the EU average. The low employment rates in Ireland can be the explanation for higher unemployment records in this country. The Portuguese employment rate overcame the EU average and in the nineties the gap was even higher. The higher employment rates in Portugal can be the explanation for low unemployment but also low productivity levels in this country. For Greece the employment rate is also higher than the EU average but the gap has been reduced rapidly approximating the EU levels in the late nineties.

TABLE 3 – GAP BETWEEN EACH COUNTRY AND THE EUROPEAN UNION AVERAGE IN THE FACTORS CONTRIBUTING TO GROWTH

Gap (EU15 - PORTUGAL)	1970-79	1980-89	1990-97
GDP per capita (thousands, PPP)	5.90	6.8	5.7
Productivity (thousands, PPP)	14.80	18.4	17.6
Employment Rate (%)	0.79	-1.90	-4.49
Participation Rate (%)	-3.01	-3.94	-4.51
Dependency (%)	1.54	1.97	-0.32

Gap (EU15 - GREECE)	1970-79	1980-89	1990-97
GDP per capita (thousands, PPP)	4.4	5.4	6.5
Productivity (thousands, PPP)	7.4	10.4	11.9
Employment Rate (%)	-1.50	-2.59	-0.88
Participation Rate (%)	9.57	7.30	8.54
Dependency (%)	-0.26	0.94	-0.41

Gap (EU15 - IRELAND)	1970-79	1980-89	1990-97
GDP per capita (thousands, PPP)	4.9	5.2	2.2
Productivity (thousands, PPP)	7.9	5.4	-2.6
Employment Rate (%)	3.08	5.05	3.61
Participation Rate (%)	2.95	4.38	5.4
Dependency (%)	5.46	6.75	3.71

Finally, in all periods GDP per head (in PPP terms) in Ireland grew faster than in Portugal and Greece, resulting to a faster approximation towards the EU levels, especially in the nineties. The Greek performance in terms of per capita income is disappointing, diverging continuously from the EU average. Portugal, instead, shows some signs of slow convergence in the last decade. Ireland has made a remarkable recovery in living standards overcoming the EU average in recent years.

According to some authors who studied closely the case of Ireland, such as Barry (1999), the strong improvement in productivity in Ireland can largely be explained by foreign investment in manufacturing in high-tech sectors such as electronics, computers and pharmaceuticals. Low profit taxation, a highly-skilled labour force, a flexible labour

market, investment facilities provided by the government, English as a native or commonly spoken language, are, among others, some of the important factors that explain the Irish success in attracting high-tech investment. Foreign investment brought new technology and innovation improving indigenous productivity. High-tech externalities were spread all over the economy, improving competitiveness, exports and thus growth.

Freitas (2000) pointed out the high quality of input factors (capital and labour) as the main advantage of Ireland over Portugal. The evidence shows that Portugal invests more in physical capital but less in innovation and R&D. The reasons for the success of the Irish economy can be found to the quality of new capital and higher qualifications of its labour force. Fuente and Vives (1997) studied the sources of differential growth between the Irish economy and those of Spain and Portugal, over the period 1970-1995. They concluded that the positive differential favouring the Irish economy was due to a higher accumulation of input factors (human and technological capital), a better performance of the labour market and a higher degree of fiscal discipline. Higher exports may be the explanation for the faster growth of the Irish economy in the nineties.

According to the European Commission (2000) the Irish economy appears as one of the most innovative economy in the European Innovation Panel, considering a set of qualified indicators, such as the percentage of college degrees obtained in Science and Technology, R&D expenditure as a percentage of GDP, number of patents per thousand of inhabitants, and so on.

As the evidence shows, labour productivity seems to be the main source of growth in Portugal, Greece and Ireland, since the seventies. Such productivity growth can be explained by a higher accumulation of physical capital in Portugal and Greece. On the contrast, higher accumulation of technological capital and human capital are responsible for higher productivity growth in Ireland. According to various authors, the higher investment in human capital and innovation seems to be the most plausible explanation for higher growth rates achieved by the Irish economy during the nineties.

In this section the factors considered were supply driven. Growth differences between the three countries are explained in terms of differences in the growth of factor supplies and productivity. The studies mentioned above do not consider that growth can be constrained by demand factors, especially external demand. The next section considers this hypothesis.

4. Export-led growth as the explanation of countries differences in the growth of output.

The Keynesian approach to growth stresses the importance of the strength of demand in explaining differences in growth rates between countries. According to this theory it is demand that drives the expansion of the economic system, and demand that might also constrain economic growth. Insufficient effective demand can be the explanation for lower growth and higher unemployment. Some authors of the Keynesian tradition (Kaldor and Thirlwall among others) argue that foreign demand for national products is the most important element of exogenous demand that can constrain growth. Exports are the most potent element of demand that generate higher growth through the Harroddian foreign trade multiplier. This is the essence of export-led growth models, which attribute to exports the role of the engine of growth for various reasons:

- Exports are the only autonomous element of demand since is generated outside the economy;
- Exports are the element of demand with the highest multiplier effect on national income and have the highest saving propensity;
- Exports among the other elements of demand have the lowest import content;
- Exports allow for higher imports (especially capital goods and raw materials) necessary for further economic development, without incurring Balance of Payments crises;
- Exports have the important role of relaxing international payments constraints on demand and thus on growth;
- Technology is transferred through exports and in general, trade is the vehicle for faster diffusion of knowledge from frontier to laggard countries through trade-related R&D spillovers;
- Exports induce innovation and higher efficiency;
- Exports can increase the supply capacity of the economy;
- Exports are responsible for generating higher growth with cumulative characteristics.

According to Kaldor exports can generate a virtuous circle of growth with cumulative causation properties. An increase in exports (for any reason) raises industrial output since this sector produces mostly tradable goods; productivity will increase through the link between productivity growth and industrial output growth (the well-known

Verdoorn Law)¹; a fall in production costs and efficient wages will be the next consequence improving further export competitiveness; a virtuous circle between exports and output growth will start to operate having cumulative characteristics. Countries or regions with an initial comparative advantage will grow faster and reinforce their competitive position making it difficult for others to compete in the same activities.

Thirlwall(1979) developed Kaldor's ideas and formalized an export-led growth model taking into account the cumulative causation principle developed earlier by Myrdal [Dixon-Thirlwall (1975)]. Further, Thirlwall presented a model explaining the importance of the Balance-of-Payments as a constraint to growth. The core idea is that balance-of-payments deficits (in current account) prevent the expansion of demand and consequently the growth of output. The necessary condition for higher output growth is that a country's income elasticity of the demand of exports must be higher than that of imports.

Thirlwall(1979), proposed a model which determines a country's growth rate consistent with the Balance-of-Payments equilibrium. In this model the demand function of imports is positively related to national income and negatively to relative prices of imports, and the demand for exports function is positively related to foreign income and inversely to relative prices of exports. The import and export demand functions, taking variables in growth rates, are the following:

$$m_t = \psi(pm_t + e - px_t) + \pi y_t \quad \text{import demand function} \quad (1)$$

$$x_t = \eta(px_t - pm_t - e) + \varepsilon z_t \quad \text{export demand function} \quad (2)$$

where m_t and x_t are the rates of growth of real imports and exports, respectively, pm_t and px_t are import and export prices growth rates, respectively, e is the exchange rate variation, y_t is the rate of growth of real domestic output, z_t is world income growth rate, ψ is the price elasticity of the demand for imports, π is income elasticity of the demand for imports, η is the price elasticity of the demand of exports and ε the income elasticity of the demand of exports.

The Balance-of-Payments equilibrium on current account (variables in growth rates) requires:

¹ Verdoorn Law relates the growth of productivity to the growth of output assuming that productivity is endogenous in the growth process. This dynamic relationship captures the technical properties of the production function, namely, the economies to scale characteristics, Verdoorn(1949).

$$p_x + x = p_m + m + e \quad (3)$$

Substituting equations (1) and (2) into (3), we can derive the domestic income growth rate consistent with balance-of-payments equilibrium, given by:

$$y_{BP} = \frac{(1+\eta+\psi)(p_x - p_m - e) + \varepsilon z}{\pi} \quad (4)$$

where y_{BP} is the balance-of-payments equilibrium growth rate for a given economy. The above expression reveals some well-known economic implications, such as, the Marshall-Lerner condition for successful devaluation ($|\eta+\psi|>1$), the dependence of domestic income on the strength of foreign demand (z) and the inverse impact on domestic income of a high import penetration (π). This relation also captures the effects of price and non-price competitiveness depicted in the price and income elasticities, respectively.

Based on a rather realistic assumption that in the long run the terms of trade remain constant, ($p_x - p_m - e = 0$), the balance-of-payments equilibrium growth condition reduces to:

$$y_{BP} = \frac{\varepsilon z}{\pi} \quad (5)$$

$$\text{or } y_{BP} = \frac{x}{\pi} \quad \text{since } x = \varepsilon z \quad (6)$$

Expression (6) is the well-known Thirlwall's Law, which states that the growth of real output can be predicted by the growth of real exports divided by the income elasticity of the demand for imports. This rule is equivalent to the Harrod foreign trade multiplier when it is expressed in a dynamic form². Thirlwall's Law, equation (6), can be expressed in a different way giving some additional information on relative growth rates:

$$\frac{y_{BP}}{z} = \frac{\varepsilon}{\pi} \quad (7)$$

Equation (7) states that a country's growth rate relative to the world is given by the ratio of its income elasticity of the demand of exports to that for imports. In other words, a country will grow faster than the rest of the world, $y_{BP}>z$, if its income elasticity of the demand of exports is higher than its income elasticity of the demand for imports, $\varepsilon>\pi$. As a policy recommendation for higher growth this model suggests the reallocation of

² Thirlwall (1982) shows this equivalence.

resources towards the production of tradable goods with high elasticity of demand in international markets.

Export-led growth evidence from Portugal, Greece and Ireland

The next step is to test the validity of Thirlwall's Law considering the set of our studying case economies, Portugal, Greece and Ireland. We first need to estimate the import and export demand functions for the three economies, to derive the price and income elasticities. An error correction specification of the Engle-Granger two-step approach was used to capture short run dynamics and avoid dynamic misspecification. The estimated equations are of the following type:

$$\Delta \log M_t = \pi \Delta \log Y_t + \psi \Delta \log \left(\frac{P_m}{P_x} \right)_t + \delta \text{res}_{t-1} + v_t \quad \text{Import demand function} \quad (8)$$

$$\Delta \log X_t = \varepsilon \Delta \log Z_t + \eta \Delta \log \left(\frac{P_x}{P_m} \right)_t + \theta \text{res}_{t-1} + w_t, \quad \text{Export demand function} \quad (9)$$

In these equations M is the volume of imports, X is the volume of exports, Y is real domestic income (GDP at constant prices index), Z is real foreign income (GDP at constant prices of the OECD countries), P_m is import price index and P_x the export price index. In the same equations π and ε are the dynamic short run import and export elasticities with respect to national income and foreign income, respectively, ψ and η are the dynamic short run price elasticities with respect to relative prices of imports and exports, respectively, δ and θ are the error correction coefficients, res are the residuals obtained from the estimation of the cointegration equation, Δ is the lag operator of the first differences in logs to express variables in growth rates, and v_t and w_t are the stochastic disturbances. The source of the data is OECD³ covering the period 1970-2001. Table 4 reports the results obtained from the estimation of the demand functions of imports and exports for Portugal, Greece and Ireland. A dummy variable was introduced in the OLS estimation for Portugal and Greece in order to capture the effects of integration in the EEC, Greece in 1981 and Portugal in 1986. A dummy variable was not used for Ireland since this country became member of the EEC in 1973, almost in the beginning of our time series data set.

³ Statistical Compendium, 2003

TABLE 4. ESTIMATION OF THE IMPORT AND EXPORT DEMAND FUNCTIONS FOR PORTUGAL, GREECE AND IRELAND, 1970-2001.

Imports

Portugal

$$\Delta \log M_t = 1.80 \Delta \log Y_t - 0.97 \Delta \log \left(\frac{P_m}{P_x} \right)_t - 0.23 \text{res}_{t-1}$$

(10.14)* (-4.96)* (-1.93)**

$$R^2 = 0.78 \quad \bar{R}^2 = 0.76 \quad DW = 1.92$$

Greece

$$\Delta \log M_t = 1.91 \Delta \log Y_t - 1.61 \Delta \log \left(\frac{P_m}{P_x} \right)_t - 0.54 \text{res}_{t-1}$$

(10.01)* (-5.44)* (-3.60)*

$$R^2 = 0.68 \quad \bar{R}^2 = 0.65 \quad DW = 1.72$$

Ireland

$$\Delta \log M_t = 1.66 \Delta \log Y_t - 0.59 \Delta \log \left(\frac{P_m}{P_x} \right)_t - 0.65 \text{res}_{t-1}$$

(10.74)* (-2.58)* (-4.06)*

$$R^2 = 0.60 \quad \bar{R}^2 = 0.57 \quad DW = 1.96$$

Exports

Portugal

$$\Delta \log X_t = 2.12 \Delta \log Z_t + 0.83 \Delta \log \left(\frac{P_x}{P_m} \right)_t - 0.23 \text{res}_{t-1}$$

(5.79)* (-2.72)* (-1.78)**

$$R^2 = 0.45 \quad \bar{R}^2 = 0.41 \quad DW = 1.37$$

Greece

$$\Delta \log X_t = 2.47 \Delta \log Z_t - 0.49 \Delta \log \left(\frac{P_x}{P_m} \right)_t - 0.36 \text{res}_{t-1}$$

(6.44)* (-1.08) (-3.09)*

$$R^2 = 0.48 \quad \bar{R}^2 = 0.45 \quad DW = 1.25$$

Ireland

$$\Delta \log X_t = 2.85 \Delta \log Z_t - 0.30 \Delta \log \left(\frac{P_x}{P_m} \right)_t - 0.04 \text{res}_{t-1}$$

(8.48)* (-1.06) (-0.59)

$$R^2 = -0.35 \quad \bar{R}^2 = 0.45 \quad DW = 0.85$$

notes: t-ratio in parenthesis; *- statistical significant at 5%; **- statistical significant at 10%

The estimated results are quite satisfactory except for the export equation for Ireland⁴. The estimated income elasticities are all positive as expected and statistically significant. The same happens with the estimated import price elasticities. In the estimation of export demand functions, the price elasticity is only statistically significant for Portugal but it carries a wrong sign. Price elasticities are negative and

⁴ We believe that the poor performance of the export demand function in Ireland is due to failure in capturing the qualitative characteristics of exports related to technology, innovation, efficiency, productivity, flexibility of labour market, etc.

lower than unity in most cases, as expected. Income elasticities are positive and higher than one, showing that imports and exports are very sensitive (income elastic) with respect to income variations. In the three countries the income elasticity of the demand of exports is higher than the income elasticity of the demand for imports showing that all countries can grow faster without facing constraints on demand. The error correction effect is relatively weak (especially in the export functions) indicating a slow rate of adjustment of imports and exports to their equilibrium levels.

Comparing the three countries, Portugal reports the lowest export income elasticity and Ireland the highest. On the other hand, the Greek income elasticity of the demand for imports is the highest, and the Irish the lowest. According to Thirlwall's rule, Ireland is in a higher advantage to grow faster without incurring balance of payments problems.

The empirical analysis proceeds further to test the validity of Thirlwall's Law by using the necessary information of the foreign trade elasticities and other relevant variables. The results are reported in Tables 5a and 5b for different specifications of Thirlwall's rule.

Table 5a – Thirlwall's Model ($y_{BP} = \varepsilon \cdot z / \pi$)

1970-2001	ε	z	π	$y_{BP} = \varepsilon \cdot z / \pi$	y_a	$y_a - y_{BP}$
Portugal	2,12	2,92%	1,80	3,45%	3,51%	0,07%
Greece	2,47	2,92%	1,91	3,76%	2,58%	-1,19%
Ireland	2,85	2,92%	1,66	5,01%	5,19%	0,18%

Table 5b – Thirlwall's Law ($y_{BP} = x / \pi$)

1970-2001	x	π	$y_{BP} = x / \pi$	y_a	$y_a - y_{BP}$
Portugal	5,69%	1,80	3,16%	3,51%	0,35%
Greece	7,30%	1,91	3,81%	2,58%	-1,23%
Ireland	10,11%	1,66	6,09%	5,19%	-0,89%

Notes:

ε - income elasticity of demand for exports, z – average annual growth rate of real GDP of the OECD countries, π – income elasticity of demand for imports, y_{BP} – Balance-of-Payments equilibrium growth rate, y_a – average annual growth rate of GDP of the respective country, and x – average annual growth rate of real exports.

According to Table 5a, equation $y_{BP} = \varepsilon \cdot Z / \pi$ seems to predict better the growth rates of domestic output in Portugal and Ireland than in Greece. The accuracy of equation $y_{BP} = \varepsilon \cdot Z / \pi$ is specially satisfactory in the Portuguese case, as the difference between the actual growth rate (y_a) and that predicted by Thirlwall's Law (y_{BP}) is extremely small for the whole period (1970-2001). Both Portugal and Ireland show that the estimated Balance-of-Payments equilibrium growth rate (y_{BP}) is lower than the actual growth rate (y_a), implying that both countries grew slightly faster than the balance of payments condition allows. The gap between the predicted and the actual growth rate in Greece is higher than 1%. The fact that the predicted output growth rate is higher than the actual rate indicates that Greece has all the potential to grow faster without confronting any demand constraints. On the contrary, Portugal and Ireland compromise a farther expansion of their economic activity.

Table 5b reports the results of the alternative specification of Thirlwall's Law given by the equation, $y_{BP} = x / \pi$, which also predicts closely the actual growth of real output with higher accuracy in the case of Portugal. However, the picture for Ireland is different. Using the growth of real exports (x) instead of the estimated value ($\varepsilon \cdot Z$), we observe that Ireland could grow slightly faster than actually happened because of higher growth in exports. This is the main advantage of Ireland relative to Greece and Portugal, explaining the higher growth records of the Irish economy, combined also with the lower income elasticity of its demand for imports.

If we look at the estimated income elasticities, the Irish superiority is obvious. Ireland has the highest income elasticity of exports (2.85) and the lowest income elasticity for imports (1.66) relatively to other two countries. This reveals that the products which are produced in this country are more competitive not only in the domestic market but also in international markets. According to our evidence, the Greek economy has shown a higher growth capacity relatively to Portugal, since the predicted growth rate in Greece is higher than in Portugal. Once more, the explanation of output growth differentials can be found on export growth differentials. Greek exports show a higher penetration in the world market, as its income elasticity of the demand of exports is higher relatively to Portugal. On the other hand, Portugal seems to benefit from a lower income elasticity of the demand for imports relatively to Greece.

It is interesting to use the same methodology to predict growth rates for a more recent period (1981-2001) where Ireland registered higher rates of economic activity

converging rapidly to the EU economic average levels. Tables 6a and 6b present all the information needed for such new prediction. As we can see Thirlwall's equations predict fairly well the growth rates of domestic output in the three countries (especially in Portugal) for the more recent period, 1980-2001. In Portugal and Ireland, the estimated Balance-of-Payments equilibrium growth rates are higher than the actual rates, indicating that both countries had the potentiality to grow slightly faster than actually did. Once more, the Irish higher growth performance is explained by its higher income elasticity of the demand of exports and lower income elasticity of its demand for import or the higher growth of exports (Table 6b).

Table 6a –Thirlwall's Model ($y_{BP} = \varepsilon \cdot Z / \pi$)

1981-2001	ε	Z	π	$y_{BP} = \varepsilon \cdot Z / \pi$	y_a	$y_a - y_{BP}$
Portugal	2,54	2,71%	2,26	3,06%	3,00%	-0,05%
Ireland	3,80	2,71%	1,78	5,77%	5,51%	-0,26%
Greece	1,53	2,71%	2,63	1,58%	1,79%	0,21%

Table 6b - Thirlwall's Law ($y_{BP} = x / \pi$)

1981-2001	x	π	$y_{BP} = x / \pi$	y_a	$y_a - y_{BP}$
Portugal	6,96%	2,26	3,08%	3,00%	-0,08%
Ireland	11,95%	1,78	6,70%	5,51%	-1,18%
Greece	3,98%	2,63	1,51%	1,79%	0,27%

Notes:

ε - income elasticity of demand for exports, z – average annual growth rate of real GDP of the OECD countries, x – average annual growth rate of real exports, π - income elasticity of demand for imports, y_{BP} – Balance-of-Payments equilibrium growth rate, y_a - average annual growth rate of GDP of the respective country

Differences in income elasticities between imports and exports, and export growth capacity also explain the poor growth performance of the Greek economy. Income elasticity for imports (2.63) is much higher than income elasticity of exports (1.53) predicting a slower average growth in output of only 1.79% per year. The low rates of export growth (4% per annum) contribute significantly to the slowdown of economic activity in Greece.

5. Long-run dependence between each country and the EU

An important issue also to study is how the economic performance of each country is influenced by the EU behaviour as a whole. In order to test this hypothesis of dependence between the individual country and the EU, we relate income per capita or productivity of each country to the EU average and the familiar ARDL specification is used to estimate error correction models⁵. This approach allows us to distinguish the short-run and long-run externality effects of the EU to each country, by estimating the co-integration equations.

The long-run relationship between each individual country and the EU is given by the following simple equation:

$$y_{i,t} = a + by_{EU,t} + u_{i,t},$$

where y_i is per capita income or productivity of the individual country (in log), y_{EU} is the EU average of per capita income or productivity (in log), t is time and u a white noise error term.

Per capita income dependence

The equation of per capita income between each country and the EU average is estimated and the results are reported in Table 7. The regressions are shown to be quite satisfactory for Portugal and Greece but not for Ireland. From Table 7 we observe that all the estimated coefficients of the short-run and long-run effects for Portugal and Greece are statistically significant at the conventional levels. The long-run per capita income elasticity of Portugal with respect to the EU average is higher (greater than one). The externality effects of the EU economic performance in per capita income are smaller in the case of Greece. If EU per capita income increases by 1% this induces 1.3% increase in Portugal and only 0.54% in Greece, in terms of the same variable. The error correction term is significant in the two equations but the adjustment process is somewhat faster in Portugal. This confirms our previous observation that Portugal adapted faster to the integration rules than Greece. Finally, it was not possible to find any statistical significance between Ireland and the EU in terms of per capita income revealing that the links between the two are not strong.

⁵ The details for the specification and estimation of Autoregressive Distributed Lag Models can be found in Greene(1997).

TABLE 7. LONG-RUN PER CAPITA INCOME DEPENDENCE BETWEEN EACH INDIVIDUAL COUNTRY AND THE EU, 1970-2001.

Portugal-EU	
$\Delta y_{POR,t} = -1.8137 + 0.73181\Delta y_{POR,t-1} - 0.25152\Delta y_{POR,t-2} + 0.26841\Delta y_{POR,t-3} + 1.1929\Delta y_{EU,t}$ <p style="text-align: center;"> (-3.79)* (4.28)* (-2.21)* (2.4987)* (4.37)* </p> $- 0.94961y_{EU,t-1} - 0.4922ecm_{t-1}$ <p style="text-align: center;"> (-2.50)* (-3.83)* </p>	
$ecm = y_{POR} - 1.3328y_{EU} + 3.6849 \quad ARDL(4,2)$	
$R^2 = 0.8035, \bar{R}^2 = 0.73473, DW = 1.7614, F\text{-stat.} = 13.6304$	
Long-run relationship	$y_{POR} = 3.6849 + 1.3328y_{EU,t}$ <p style="text-align: center;"> (9.84)* (34.29)* </p>
Greece-EU	
$\Delta y_{GRE,t} = 1.2737 + 0.15969\Delta y_{EU,t} - 0.29983ecm_{t-1}$ <p style="text-align: center;"> (1.51) (2.21)* (-1.95)* </p>	
$ecm = y_{GRE} - 0.5326y_{EU} - 4.2481 \quad ARDL(1,0)$	
$R^2 = 0.16477, \bar{R}^2 = 0.098, DW = 1.312, F\text{-stat.} = 2.466$	
Long-run relationship	$y_{GRE} = 4.2481 + 0.5326y_{EU,t}$ <p style="text-align: center;"> (4.0)* (4.89)* </p>
Ireland-EU	
$\Delta y_{IRL,t} = -1.2492 + 0.1711\Delta y_{EU,t} - 0.039851ecm_{t-1}$ <p style="text-align: center;"> (-1.98)** (1.28) (-0.54) </p>	
$ecm = y_{IRL} - 4.2934y_{EU} + 31.3459 \quad ARDL(1,0)$	
$R^2 = 0.3587, \bar{R}^2 = 0.30739, DW = 1.5289, F\text{-stat.} = 6.9916$	
Long-run relationship	$y_{IRL} = -31.3459 + 4.2934y_{EU,t}$ <p style="text-align: center;"> (-0.71) (0.91) </p>

Notes: ARDL – Autoregressive Distributed Lag Model, ecm- error correction term, t-ratio in parenthesis; *- statistical significant at 5%, **- statistical significant at 10%, ***- statistical significant at 15%

Productivity dependence

The same procedure can be used to test for any plausible relationship between each country and the EU in terms of productivity. Productivity is defined as output per unit of effective labour (the ratio of real GDP to total employment). The short-run and long-run relations of GDP per worker between the individual countries and the EU average

TABLE 8. SHORT-RUN AND LONG-RUN PRODUCTIVITY DEPENDENCE BETWEEN EACH INDIVIDUAL COUNTRY AND THE EU.

Portugal-EU (1974-2001)	
$\Delta y_{POR,t} = -1.4097 + 0.59346 y_{EU,t} - 0.68614 \Delta y_{EU,t-1} + 0.47655 \Delta y_{EU,t-2}$ <p style="text-align: center;">(-2.46)* (1.26) (-1.23) (1.03)</p> $+ 1.5291 \Delta y_{EU,t-3} - 0.36939 ecm_{t-1}$ <p style="text-align: center;">(3.42)* (-2.59)*</p>	
$ecm = y_{POR} - 1.3078 y_{EU} + 3.8161 \quad \text{ARDL}(1,4)$	
$R^2 = 0.58223, \bar{R}^2 = 0.43478, DW = 1.6612, F\text{-stat.} = 4.7385$	
Long-run relationship	$y_{POR} = 3.8161 + 1.3078 y_{EU,t}$ <p style="text-align: center;">(14.67)* (3.96)*</p>
Greece-EU (1977-2001)	
$\Delta y_{GRE,t} = -0.091820 + 0.29088 \Delta y_{EU,t} - 0.28837 ecm_{t-1}$ <p style="text-align: center;">(-0.01) (3.60)* (-1.98)**</p>	
$ecm = y_{GRE} - 1.0087 y_{EU} + 0.31840 \quad \text{ARDL}(1,0)$	
$R^2 = 0.46713, \bar{R}^2 = 0.40792, DW = 1.7966, F\text{-stat.} = 7.8897$	
Long-run relationship	$y_{GRE} = -0.31840 + 1.0087 y_{EU,t}$ <p style="text-align: center;">(-0.01) (3.10)*</p>
Ireland -EU(1970-2001)	
$\Delta y_{IRL,t} = -5.1439 + 1.0283 \Delta y_{EU,t} - 0.54609 ecm_{t-1}$ <p style="text-align: center;">(-3.36)* (3.42)* (-3.44)*</p>	
$ecm = y_{IRL} - 1.883 y_{EU} + 9.4196 \quad \text{ARDL}(1,0)$	
$R^2 = 0.32124, \bar{R}^2 = 0.26694, DW = 2.1274, F\text{-stat.} = 5.9160$	
Long-run relationship	$y_{IRL} = -9.4196 + 1.883 y_{EU,t}$ <p style="text-align: center;">(-20.1)* (42.85)*</p>

Notes: ARDL – Autoregressive Distributed Lag Model, ecm- error correction term, the lag structure is decided according to SBC criteria, t-ratio in parenthesis; *- statistical significant at 5%, **- statistical significant at 10%

are exposed in Table 8. All these elasticities are statistically significant, indicating substantial externality effects on productivity emanating from the EU. However, Ireland is more productivity elastic than Portugal and Greece. Both short and long run productivity elasticities are higher in Ireland than in the other countries. A 1% increase in productivity in the EU causes 1.9% increase in productivity in Ireland but only 1.3% in Portugal and even less in Greece (1%). This shows that Ireland absorbs in a more

efficient way the spill-over effects of the gains in productivity all over the EU, and converges faster than Portugal and Greece in terms of this variable.

6. Summarizing the main conclusions

In this study an attempt has been made to shed light to three main issues: first, to identify the driving forces of economic growth in Ireland, Greece and Portugal; second, to explain the remarkable recovery of the Irish economy since the nineties, the reasonable economic performance of Greece in the late nineties and the modest or negative performance of Portugal in recent years; and third, to show the lessons that Portugal can derive from that positive experience in Ireland and Greece.

The evidence from the comparative analysis and especially in terms of per capita or per worker incomes shows that the gap between Ireland and both Portugal and Greece has become wider, particularly during the nineties. Ireland seems to have accumulated a set of advantages in comparison to Portugal and Greece in many areas. At the beginning of the sixties the levels of development in the three countries were considerably below the European average, but by the end of the nineties the Irish economy has made a remarkable economic recovery, catching up with the richest economies of the EU. Portugal and Greece were not able to recover to the same extent as Ireland, despite the fact that both of them have shown a modest convergence towards the EU standards.

According to our analysis, the main source explaining the growth of per capita income was labour productivity in the three countries. However, productivity gains were much higher in Ireland and even in Greece than in Portugal. For many authors, the higher productivity growth in Ireland can be explained by higher human and technological capital accumulation. Ireland invested more in human and less in physical capital, in contrast to Portugal and Greece. The combination of higher-qualified human capital and a flexible labour market characterized by moderate increases in real wages were powerful attractions to foreign direct investment in high technology sectors, which have been a very important vehicle for technological diffusion. The Irish government also contributed to attract foreign direct investment towards some target sectors through fiscal benefits, persuading foreign enterprises to create clusters in sectors such as electronics, computers and pharmaceuticals. The production of small sized products and easily transported goods implies lower transportation costs. From the point of view of

the spatial economics this is an important element especially for a peripheral country like Ireland.

The allocation of resources to sectors with higher productivity and the development of export-orientated activities can be the explanation for the higher growth rates achieved in Ireland. Thirlwall's export-led approach confirms this evidence. It was found that Ireland can grow faster than Portugal and Greece without facing any constraint on demand. According to Thirlwall's model Ireland has shown clear advantages since the seventies in comparison to Greece and Portugal. The products that produces are competitive both in domestic and international markets and this can be seen from the high elasticity of demand of exports relatively to the low elasticity of demand for imports. Comparing Portugal and Greece, Greek exports have revealed a higher penetration in the world market during the whole period (1970-2001), shown by a higher income elasticity of the demand of exports. This seems to be Greece's main advantage over Portugal. On the other hand, Greek main disadvantage is its income import elasticity, the highest between the three countries.

The relative economic success of Ireland in comparison to Portugal and Greece could be explained by a set of structural factors, such as, higher human and technological capital accumulation, higher labour productivity and higher export performance.

The evidence also shows that the Portuguese and Greek economies are much more linked to the European Union than Ireland in terms of per capita income. In terms of productivity Ireland seems to benefit more from the EU performance and to converge faster.

Higher qualifications of human resources, higher technological capital accumulation (innovation and R&D) and specialisation in high-tech activities with lower transportation costs are some of the lessons that Portugal can learn from the Irish experience. Irish labour productivity growth was due to its human capital accumulation. The high qualifications of its workforce attracted the kind of foreign direct investment that drives technological diffusion and economic growth. On the contrary, the higher rates of physical capital accumulation in Portugal failed to have the expected results on growth, since labour productivity remains the main structural problem of the Portuguese economy. To improve productivity, Portugal has to invest more in human resources and less in physical capital accumulation. More innovation and R&D are needed to improve the competitiveness of the Portuguese economy. The Irish economic success in the 90's

was the result of the 60's and 70's policies on education, R&D and foreign investment attraction in high-tech activities with high elasticity of demand in international markets. This experience can be a guide for better economic performance in Portugal and Greece.

References

Barry, F. (1999a), "From Periphery to Core? Foreign Direct Investment, Cost Competitiveness and the Transformation of the Irish economy", paper presented to Trade and Industrial Policy Secretariat Annual Forum on Growth and Investment in South Africa

Barry, F. (1999b), "FDI and Industrial Structure in Ireland, Spain, Portugal and the UK: Some Preliminary Results", paper presented to Annual Conference on the European Economy, ISEG, Lisbon

Barry, F. and Crafts, N. (1999), "Some Comparative Aspects of Ireland's Economic Transformation", *Irish Banking Review*, Autumn, pp. 39-44

Barry, F., Bradley, J. and O'Malley (1999) "Indigenous and Foreign Industry: Characteristics and Performance" in Barry, F. (ed.), *Understanding Ireland's Economic Growth*, London, Macmillan Press

Bernard, A.B. and Durlauf, S. (1995), "Convergence in International Output", *Journal of Applied Econometrics*, 10, pp.97-108

Dixon, R. J. and Thirlwall, A.P. (1975), "A Model of Regional Growth Rate Differences on Kaldorian Lines", *Oxford Economic Papers*, July, vol.27, pp. 201-214

European Commission (2000), *A inovação numa economia do conhecimento*, Brussels.

Freitas, M.(2000), "Quantidade versus qualidade: a contabilidade do crescimento da Irlanda", *Boletim Económico do Banco de Portugal*, Março 2000

Fuente, A. de la and Vives, X. (1997), "The Sources of Irish Growth", CEPR Discussion Paper No. 1756

Greene, W.(1997), *Econometric Analysis*, 3rd Edition, London: Prentice-Hall International.

McCombie, J.S.L. and Thirlwall, A. P. (1994), *Economic Growth and the Balance of Payments Constraint*, London, Macmillan Press

Soukiazis, E. (2000), "Productivity convergence in the EU. Evidence from cross-section and time-series analysis", *Discussion Paper*, n°4, CEUNEUROPE, Faculdade de Economia da Universidade de Coimbra (www4.fe.uc.pt/ceue)

Thirlwall, A.P. (1979), "The Balance of Payments Constraint as an Explanation of International Growth Rates", *Banca Nazionale del Lavoro Quarterly Review*, March

Thirlwall, A. P. (1982), "The Harrod Trade Multiplier and the Importance of Export Led Growth", *Pakistan Journal of Applied Economics*, March.

Verdoorn, P.J.(1949), "Fattori che Regolano lo Sviluppo della Produttività del Lavoro", *L'Industria*, n°1. English translation by A.P.Thirlwall in Pasinetti(ed.), *Italian Economic Papers Vol.II*(Oxford: Oxford University Press, 1993)