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**An Assessment of Real Convergence of Less  
Developed EU Members: Lessons for the  
CEEC Candidates**

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## **AN ASSESSMENT OF REAL CONVERGENCE OF LESS DEVELOPED EU MEMBERS: LESSONS FOR THE CEEC CANDIDATES**

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### ***Abstract***

The main purpose of this study is to provide an assessment of the different experiences of convergence of the four less developed EU members (Spain, Portugal, Ireland and Greece) after joining the EU and their main determining factors. Here special emphasis is placed on the assessment of their respective capital stocks, both physical and intangible, given their essential influence on growth and, consequently, on economic welfare. In addition, it aims to draw conclusions for these experiences that may help in the elaboration of suitable strategies of accession for the CEEC candidates.

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Key words: Convergence, European Union, Central and Eastern European Countries (CEECs), Integration.

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## **1. Introduction**

International trade theory, based on neoclassical growth models, predicts that the lifting of barriers to trade and to the free movement of factors associated with a process of integration not only enhance the general economic welfare of the integrated area, but lead to real convergence among its member countries. Nevertheless, doubt is cast on this optimistic result if one looks at the recent growth and geography models. Thus, on the basis of these models, real convergence across countries is not the only possible outcome. Indeed, due to economic phenomena such as differences in production technologies, increasing return to scale, positive agglomeration externalities and transport costs, an increasingly uneven spatial distribution of economic welfare (real divergence) may take place.

In addition, empirical evidence on the issue is far from being conclusive, because apart from the ambiguity of theoretical predictions there are various ways to define and measure real convergence. In this sense, there is a widespread agreement that the integration of Europe led to substantial economic benefits for the European Union (and even more for the European Economic and Monetary Union) as a whole. It is less clear, however, whether the process of integration is being conducive to real convergence among member countries. In fact, spatial economic disparities between the current fifteen EU partners are an important issue which has fuelled the long-standing economic and political debate which is on the basis of the development of the Community Regional Policy. Moreover, the prospect of the new enlargement of the EU with the accession of the Central and Eastern European Countries (CEECs), with a much lower level of development than the present members, has intensified the interest in the issue of the possibilities for real convergence within the EU.

In this context, the main purpose of this study is to provide an assessment of the different experiences of convergence of the four less developed EU members (Spain, Portugal, Ireland and Greece) after joining the EU and their main determining factors. In addition, it aims to draw conclusions for these

experiences that may help in the elaboration of suitable strategies of accession for the CEEC candidates.

Accordingly, we will begin (*section 2*) by discussing the meaning of real convergence and offering a critical survey of the most common methods used in its assessing, which includes a proposal in an attempt to avoid some of their shortcomings. Then, in *section 3*, we summarize what we can learn from the recent endogenous growth and new geography models about the capability of Regional Economic Agreements for producing both divergent and convergent tendencies in economic wealth of member countries. Against this theoretical background, in *section 4* we explore, first, the nature and trends of real convergence of the four less developed EU members using the measures proposed before and, second, the explanatory factors that can account for their varying performances. Here special emphasis is placed on the assessment of their respective capital stocks, both physical and intangible, given their essential influence on growth and, consequently, on economic welfare. In *section 5* we discuss the extent to which the experiences of those EU Member States are useful for the design of an appropriate strategy for the CEECs which have already began the formal process of negotiation for their accession to the EU. In this respect, we not only take into account what can be drawn from the different catch-up experiences of the four laggard members, but also what we know about the main economic features of the Central and Eastern European candidates. Finally, *section 6* offers some final remarks.

## **2. Real convergence: meaning and assessing**

Broadly speaking, economic convergence in an area formed by different countries (regions) is understood to mean the increasing alignment of the economic variables considered, due to the greater advance of the laggard countries (regions), and not to the deterioration of the more developed ones. In this respect, two types of economic convergence are usually considered:

nominal and real. Nominal convergence refers to the tendency towards greater uniformity of nominal variables (those indicative of macroeconomic stability). Real convergence expresses the approximation of the levels of economic welfare, generally proxied by *per capita* GDP. As was said our analysis here will be focussed on real convergence.

The above definition of real convergence is not, however, very useful in the sense that it cannot be used to arrive at a clear-cut diagnosis of a specific situation. In fact, what we have in the specialized literature -see Baumol, Nelson and Wolff (1994), Barro and Sala-i-Martin (1995), Quah (1993, 1996) and Grossman (1996) for references- is a wealth of measures and an open debate on their relative merits.

The simplest indicator for assessing real convergence between countries (regions) within an area is to test whether the relative *per capita* GDP of a country (region) or a set of countries has approached the average of the area.

The two most popular measures are: the *beta*-convergence and *sigma*-convergence. The former implies that the poor countries (regions) grow faster than the richer ones and it is generally tested by regressing the growth in *per capita* GDP on its initial level for a given cross-section of countries (regions). In turn, this *beta*-convergence covers two types of convergence: absolute and conditional (on a factor or a set of factors in addition to the initial level of *per capita* GDP). Whereas by *sigma*-convergence we mean the reduction of *per capita* GDP dispersion within a sample of countries (regions). See Barro and Sala-i-Martin (1995:11) for further details.

The methodology proposed by Barro and Sala-i-Martin to test *beta*-convergence has been criticized for producing biased results. In this sense, in Quah (1993 and 1996) it is argued that it largely neglects the dynamics of changing national (regional) income distributions. In addition, this author identifies a tendency towards “twin peaks” in the cross country distribution, so that the world appears to polarize into distinct classes of income. In other words, countries seem to follow different growth paths and to converge to

distinct steady states, so that they tend to cluster around different levels of *per capita* GDP. In this respect, Quah (1995) proposes the use of a very complex method based on the use of Markov chains to capture the dynamics of the entire cross-county distribution.

More recently, Boyle and McCarthy (1997 and 1999) have suggested the use of the Kendall index of rank concordance –referred to as *gamma*-convergence- in addition to *sigma*-convergence in testing for *beta*-convergence. That measure seems, therefore, more adequate to capture the possible mobility of countries (regions) within the distribution of income levels over time.

In any event, it may be claimed that none of the existing procedures is generally accepted as inherently superior to the others in any circumstances. In fact, what we find is a wide agreement about the idea that the relative merits of each of them may differ depending on what the purpose of the empirical analysis is. In this context, and given that our purpose in this paper is only to assess the achievement in real convergence for each of the four cohesion countries within the EU, it seems sensible to use the simplest of the above mentioned indicators: the trend in the gap to the EU average. In fact, this is the indicator most commonly used when, as in this case, the objective is to analyze the relative catch-up process of a single country within a given area.

However, here we will go beyond other studies in addressing what we think is one of the main and unfairly neglected problems in the debate on the assessment of real convergence: the insufficiency of *per capita* GDP as a proxy of the country levels of economic welfare. Indeed, this debate is too much focussed on the selection of the most reliable statistical measures of convergence in *per capita* GDP and too little on the search for other complementary variables, such as the degree of income inequality, that provide a better assessment of real convergence. In part, this bias is a consequence of the paucity of income distribution data (see Atkinson, 1999, for further details)<sup>1</sup>.

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<sup>1</sup> Slesnick (1998) offers a good survey on the different theoretical and empirical approaches to evaluating economic and social welfare. For a comprehensive review of the theoretical and methodological problems in analyzing inequality and welfare, see Cowell (1999). Aghion, Caroli

Thus, we have not got complete and internationally homogenous and updated series of what is the most common measurement of income distribution: the Gini coefficients.

In any event, we think it is possible and desirable to use other variables that can somehow capture the differences in the inequality across countries and across time. Among them, we have decided to use in our empirical analysis the share of social protection expenditure in GDP, given the quite high level of correlation that –as shown in FIGURE 1- this variable seems to have with the Gini coefficients.

[FIGURE 1 around here]

In addition, for a better qualification of *per capita* GDP as a proxy of country level of economic welfare in empirical analysis of real convergence, we propose to use also the rate of unemployment. Indeed, it seems reasonable to state that, among two countries having a similar level of *per capita* GDP, the one with a lower rate of unemployment enjoys of a higher living standard.

Moreover, we argue that in order to arrive to a more helpful assessment of real convergence one should also evaluate the capability of the countries (regions) in question for having a self-sustained economic growth. This means, therefore, the need to take into account the factors that, according to the soundest economic growth literature, constitute the main determinants of growth in productivity and income in the medium and long term. In this respect, even when – as shown in more detail in the next section- there is not a consensus, we find a marked coincidence in their emphasis on the importance of certain intangible assets, especially human and technological capital, as essential ingredients of growth. The emphasis placed on these factors does not exclude, however, the relevance of physical capital. In fact, many of the studies indicate that some types of physical capital, such as transport and

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and Garcia-Peñalosa (1999) explore the relationship between inequality and economic growth from the perspective of the new growth models.



communication infrastructure, stand out for their special impact on productivity and economic growth.

In short, in an attempt to overcome the caveats of previous empirical analysis of real convergence based solely on the use of the values of *per capita* GDP, and occasionally the rate of unemployment as a complementary variable, we propose the use of a set of indicators. On the one hand, three variables which try to measure the current level of economic welfare taking into account the importance of the distributive issues: *per capita* GDP (in terms of PPP), unemployment rate and social protection expenditure/GDP (%). And, on the other hand, at least two other variables that seem to best reflect the capability for having a self-sustained economic growth: the stocks of human and technological capital.

Consequently, in our empirical analysis of real convergence for Spain, Portugal, Ireland and Greece within the EU, we will use the above-mentioned set of indicators as the starting basis. They will be, however, supplemented with others that help to achieve a more in-depth diagnosis on the factors underlying real convergence. In any event, before starting that empirical analysis, we should review in some more detail the soundest ideas in the recent growth and geography models, regarding the implications of economic integration on real convergence.

### **3. Regional Economic Integration and real convergence**

This section does not provide a comprehensive survey of the wealth of recent theoretical and empirical work on the question of the extent to which economic integration processes are conducive to real convergence between member countries. Its rather less ambitious objective is to briefly review the main findings in recent literature on growth behavior across economies and its implications for the above posed question.

As we know, neoclassical growth models -as in Solow (1956) and his following versions, for example Mankiw, Romer and Weil (1992)- imply

convergence between poor and rich countries (regions). Assuming that technologies are identical and exogenous, the mechanism behind convergence rests on decreasing returns to scale to capital: countries (regions) with low capital stocks and *per capita* income should have a higher marginal product and return to capital. This should therefore lead to more capital accumulation and faster growth in poor countries (regions) than in rich ones.

Consequently, opening up the country (region) –as happens in the framework of an integration process- should only accelerate the convergence process, as capital should flow to capital-scarce countries (regions) to benefit from higher returns. This is, in fact, the line of reasoning that is the conventional theory of economic integration developed since the pioneering work of Viner (1950)<sup>2</sup>. Thus, those models -sharing the assumptions of neoclassical growth theory- predict a tendency of member countries, prices, costs and income levels to converge, with trade and international factor mobility acting as the convergence mechanisms. This process of real convergence is further stimulated in the case of monetary union by the reduction of transaction costs and the elimination of foreign-exchange uncertainty.

Contrary to the neoclassical paradigm, the new growth theory does not predict that income convergence between rich and poor countries (regions) is the only possible outcome<sup>3</sup>. Thus, according to one of its first contributions, Romer (1986), returns to capital do not have to be diminishing. From this it follows, therefore, that the impact of economic integration on convergence is not so clear as in the Solow setting. In the approach proposed in Lucas (1988), where human capital with increasing returns is the main driving force of economic growth, the possibility of the brain drain acting as a vehicle of cross country growth divergence is considered. Finally, some versions of endogenous growth models that, in the same vein as Romer's (1990), have emphasized the importance of commercially oriented R&D efforts as the main engine of growth,

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<sup>2</sup> Hine (1994) and Baldwin and Venables (1995) offer revisions of the theory and summarize the results of the main empirical studies.

<sup>3</sup> A detail view of endogenous growth models developed since the early 1980s can be found in Barro and Sala-i- Martin (1995); Grossman (1996) and Aghion and Howitt (1998), and a recent survey of the empirical evidence is presented in Temple (1999).

may also explain the existence of permanent, and under some circumstances, even widening, technological and income gaps between countries.

In addition, the new geography literature pioneered by Krugman (1991) and reviewed in Ottaviano and Puga (1998) pose several reasons, in particular the existence of agglomeration economies, to explain why economic integration may lead to a pattern of increased spatial income inequality.

Nevertheless, many versions of endogenous growth models point to more optimistic prospects for international convergence. A characteristic feature of these models is that they assume the existence of knowledge spillover effects of an international scope. Thus, by considering that imitation is cheaper than innovation, these models imply that convergence through technological diffusion is a likely outcome<sup>4</sup>. Apart from taking into account contracts for transfer of technology, they emphasize the role of trade and foreign direct investment as channels for technology spillovers.

Studies that –as Nadiri (1993), Nadiri and Kim (1996), Coe and Helpman (1995), and Keller (1999)- are focussed on technology spillovers spread by trade underline the special importance of transactions in intermediate goods. Yet they also admit this role for trade in final goods in particular in those ones that allow for reversal engineering practices by the import country. As for the technology spillover effects through foreign direct investments, there are a great number of studies – see for example Blomström and Wolff (1994), and Baldwin, Braconier and Forslid (1999) and references there in- which agree on its importance for growth in the host countries.

In this respect, the most elaborated and realistic formulations of innovation-driven growth models also stress the complementarity between both domestic R&D and foreign R&D spillovers and human capital investments. Thus, both the level (stock) and rate of investment in human capital prove

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<sup>4</sup> Note here that historians have always argued that technology transfer favored by relatively cheap imitation –what Gerschenkron called the “advantage of backwardness” is a key driving force behind economic growth.

crucial for growth not only as a separate factor but also as a complement for exploiting the effects of new technologies created by either domestic or foreign innovation efforts<sup>5</sup>. In this sense, human capital is usually considered as an essential condition for convergence.

In addition, some studies – see as an example Aschauer 1989, 2000; Munnell 1990; Easterly and Rebelo, 1993 and Argimon et al. (1997) - underscore the importance of public capital in general, and more specifically the endowment of infrastructure, because of their significant positive externalities on the productivity of companies. Those externalities seem to be particularly big in the case of the transport and communication infrastructure (Easterly and Rebelo 1993; Roller and Waverman, 1994). Moreover, as for telecommunication and the internet infrastructure, it has been put forward how important they are for the technological upgrading of the whole productive system (Crandall, 1997 and Koski and Majumdar, 2000).

Interestingly, some authors argue that at the present time those infrastructures associated with telecommunications and the internet are a key determining factor of growth given their crucial role in the diffusion of the drastic innovations that have been taking place in the last few years. In this respect, the term *general purpose technologies* has been coined (Bresnahan and Trajtenberg, 1995) to refer to a certain type of drastic innovation, such as the Internet, that has the potential for pervasive use in a wide range of sectors in ways that radically change their modes of operation. In fact, we already have a significant number of insightful studies, which illustrate the nature of general purpose technologies, the Internet in particular, and their far-reaching and enduring implications for economic growth and welfare (see Helpman, 1998 and references therein).

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<sup>5</sup> Indeed, as argued in Cannon (2000), there is a tendency to integrate the two existing approaches to analyzing the relationship between education and growth. The first, initiated by Lucas (1988) is based on the idea that growth is primarily driven by the rate of accumulation of human capital. The second, which has its origin in the contribution by Nelson and Phelps (1966), describes growth as being driven by the stock of human capital, which in turn affects a country's ability to generate and imitate technical progress.

What is more, for some of the supporters of this view those radical and pervasive innovations in the area of information and communication technologies imply the birth of the so termed “new economy”. What is meant with this is a revolutionary change in the modes of production and in the behavior of both economic agents and institutions, which is making our inherited economic knowledge obsolete. Without going so far, one cannot but admit the paramount importance of those new technologies as determinants of both the level and the “quality” of economic growth.

Before concluding this brief review of recent literature on economic growth and related issues -in a search for a useful guide for our empirical assessment of real convergence - we should include some mention to the studies that have analyzed the relationship between nominal and real convergence.

This topic has recently drawn considerable and increasing attention in view of the quite large number of countries that are experiencing a rapid and non-inflationary growth accompanied by a significant generation of employment in a framework of a stringent fiscal policy (see Perotti (1996) and Alessina and Perotti (1995,1996)). Such experiences have somehow cast doubt on some hypothesis on the impact of consolidation policies on growth, which were generally considered conventional wisdom. In this sense, it is argued that the increasing globalization of markets at a world level is resulting in a greater importance of the credibility effect associated with strict stabilizing policies, which allows for a reduction in the risk premium in interest rates on international financial markets. However, together with these findings one should keep in mind the other evidence mentioned above concerning the significant role that government investments play in growth, in particular in the case of investments in areas such as education, R&D and transport and communications infrastructures.

Summing up, the literature reviewed above leaves one with rather inconclusive predictions as to the question of whether or not economic

integration is able to procure real convergence between country members by itself.

Thus, when the rather rigid assumptions of the pure neoclassical growth model are relaxed, particularly that production technologies are identical and exogenous across countries, opening up to trade and factor mobility may become a source of divergence. Indeed, in some versions of endogenous growth models integration, although still leading to aggregate welfare gains, may be conducive to income polarization processes.

Nevertheless, the majority of evidence available suggests that a trend towards real convergence is the most likely outcome, although it is generally considered that this will be a kind of conditioned convergence. More specifically, what is suggested is the need that laggard member countries have for boosting efficient investments to enlarge and improve their endowments in all those kinds of capital assets with special influence on growth, namely: technology, human capital and infrastructure. In addition, most of those models argue that the existence of international technological spillovers make it possible to implement a strategy of growth based on a less costly way of imitation of foreign innovations, provided they manage to have a good enough human capital endowment. Here it is also underlined how important it is for any strategy of growth to have the provision of good telecommunication infrastructures. In addition, the need for keeping a climate of macroeconomic stability that favors the investments in all those kinds of capital assets required to achieve a sustained economic growth has been pointed out as well.

#### **4. Real convergence within the EU: the case of the four laggard members**

In our assessment of the real convergence patterns of the four cohesion EU countries, we will start by looking at the simplest indicator: the trend of their respective *per capita* GDP in relation to the EU average, expressed in PPS

(Purchasing Power Standard)<sup>6</sup>. Specifically, FIGURE 2 shows the evolution of this indicator for Spain, Portugal, Ireland, Greece and, in order to have the leader reference, also for USA, over the 1960-2000 period. It should be pointed out that all the laggard members have managed to narrow the gap deficit to the EU average, but there are significant differences between them. Ireland is the most successful of the four and Greece the least<sup>7</sup>.

[FIGURE 2 around here]

The intensity of the catch-up process has varied over the time, so that, with the sole exception of Greece in the early years after its accession, the cohesion countries show a better performance after their membership<sup>8</sup>. The case of Ireland proves to be particularly impressive in this respect. Thus, over the 90s no other EU member has been able to match its outstanding growth performance. Such differences across member countries suggest, therefore, that far from being spontaneous their respective process of real convergence is largely attributable to differences in their respective growth strategies.

In this respect, on the basis of a simple arithmetic exercise, it is possible break down the *per capita* GDP growth of every country into its components, in the way that is carefully explained in BOX 1. Thus, it is shown that a country's *per capita* GDP growth hinges on an increase in labor productivity -which in turn can be broken down into variations in working time and in hourly productivity- and on employment rate growth.

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<sup>6</sup> The purchasing power standard (PPS) is defined in such a way that, for each individual aggregate, the European Union total obtained from converting the values in national currency with the purchasing power parities is equal to the European Union total for that individual aggregate in ecus/euros. In a sense, the PPS can therefore be thought of as the ecu/euro in real terms (EUROSTAT, 1999).

<sup>7</sup> It should be noted that the brilliant performance of the Irish economy in terms of GDP growth is not so clear in terms of GNP, given the huge importance of the activities of the multinational companies located in this country.

<sup>8</sup> Ben-David (1993, 2000) shows that members of the European Economic Community had experienced greater income convergence than in the industrialised countries as a whole.

### BOX 1

- **Breakdown of the per capita GDP ( $GDP_{pc}$ ):**

$$GDP_{pc} = \frac{GDP}{Pop} = \frac{GDP}{L} \frac{L}{Pop} = Lp * Er$$

where,

$GDP$ : Gross Domestic Product

$Pop$ : Population

$L$ : Employment

$Lp$ : Labour productivity

$Er$ : Employment rate

- **Breakdown of the Labour productivity ( $Lp$ ):**

$$Lp = \frac{GDP}{L} = \frac{GDP}{L * h} h = Hp * h$$

where,

$h$ : Working time (in yearly hours per person)

$Hp$ : Hourly productivity

- **Breakdown of the Employment rate ( $Er$ )**

$$Er = \frac{L}{Pop} = \frac{L}{Lf} \frac{Lf}{Eap} \frac{Eap}{Pop}$$

where,

$Lf$ : Labour force

$Eap$ : Economically active population

The result of this exercise of breakdown of *per capita* GDP growth for every country over the period of reference - that here and in the rest of the paper will be from 1980 onwards- are presented in TABLE 1 and also, in a more intuitive way, in FIGURE 3<sup>9</sup>. As both of them show, the major part of *per capita* GDP in all countries has been due to the significant increases in labor productivity. Once more, the case of Ireland deserves a special mention. Here it should be pointed out that the case of the Irish economy is outstanding not only

<sup>9</sup> For a correct interpretation one should note that those figures are not expressed in absolute but in relative terms. Specifically, they represent the contribution (in percentage) of each component to the *per capita* GDP growth in each country.



for its impressive labor productivity growth but also for its capability for increasing its employment rate. Productivity gains in Spain are also outstanding in comparison with the EU average (and higher than that of Portugal), specially taking into account the significant reduction experienced in its working time. In this respect, it is interesting to remark that the Spanish gains in labour productivity have been mainly due to the "pure hourly growth effect" (see TABLE 1).

[TABLE 1 and FIGURE 3, around here]

The differences in the catch-up experiences across countries are reinforced when we exam the two indicators that –given the paucity of proper data to elaborate better ones- we have decided to use to approach the distributive dimension of economic growth: the unemployment rate and social expenditure/GDP. In this respect, a glance at the level and trend of these two indicators in relation to the EU normalized average, represented (together with other indicators that we will comment later on) in FIGURE 4 reveals striking differences between the four countries.

[FIGURE 4 around here]

Looking at the share of social protection in relation to GDP, Spain stands out for having the most sustained and highest value<sup>10</sup>. On the contrary, the relative effort devoted to finance the Welfare State has been diminishing significantly in Ireland, the country with the best growth performance. We are aware that the use of the increases in the relative social protection expenditures as a test for rising inequality has some shortcomings. In this respect, the fact that social expenditure have decline in Ireland may, for instance, reflect a robust unemployment growth. Nevertheless, given the significant correlation that -as we reported in FIGURE 1- we found between the share of social protection

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<sup>10</sup> Note that according to the value of the Gini coefficient, calculated on the basis of the European Community Household Panel published by EUROSTAT, Spain was in 1994 the country with the most egalitarian distribution of income among the four cohesion EU countries and Ireland the one with the least.

expenditures and the Gini index for inequality, it seems reasonable to use the former as a proxy of the latter. Moreover, a closer look to the data of Ireland provides two additional pieces of evidence. First, that the reduction experienced by its social protection expenditures is significantly higher than that of unemployment expenditures. That the Gini index has increased from 0,32, in 1987, to 0,35, in 1994.

As far as the rate of unemployment is concerned, the case of Spain should also be pointed out, but in this case due to its extraordinary and persistent high level, which only in the last few years has been registering a dramatic drop.

Proceeding with our aim of achieving to an adequate diagnosis of real convergence experiences for less developed EU members, we will now take into account the factors that seem the most suitable to assess their relative capability for having a self-sustained growth. As we argued in section 3, for that purpose it seems appropriate to evaluate each country's relative endowment in the factors that, according to the soundest theoretical and empirical evidence, are the main determinants of growth in the medium and long term: the stocks of technological and human capital. Their measurement, however, still poses many problems. Yet, we think it is possible to obtain a good proxy for both of them.

As for the stock of technological capital, there is a wide consensus in considering that it can be reasonably approached by the accumulation of the R&D spending following the perpetual inventory method<sup>11</sup>. We have, therefore, applied this method to the series of data of R&D provided by the OECD since 1973, using as a deflator that of Gross Fixed Capital Formation and assuming a depreciation rate of 10%.

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<sup>11</sup> The use of the R&D expenditures as an indicator for the technological development has received two kinds of criticism. On the one hand, it has been claimed that R&D spending is an overstated measure of the efforts in technological activities in view of the high rates of failures that are likely to occur in R&D projects. On the other hand, others have argued its understatement, because it does not include the payments for imports of technology.

As regards the estimation of human capital stock, it should be pointed out that the best procedure used up to now is that followed in Barro and Lee (1993 and 1996). That is to say: to approach the human stock of a country in terms of the level of training of its working-age population according to the years of schooling at all levels of education. This is, therefore, the method that essentially we will follow here. However, we will introduce an improvement trying to overcome the criticisms that the Barro and Lee (1993 and 1996) estimates have received, namely: not taking into the consideration the likely differences of quality across the Education Systems of the countries. Consequently, our estimated series of human capital stock introduce a correction, based on data on the cross country differences in education expenditure per student at every level of teaching, in an attempt to get data in terms of the same quality standard.

The estimated values for these two real convergence indicators for Spain, Portugal, Ireland, Greece and USA –all of them in relation to those of the EU average; EU= 100- in the years 1980 and 1999 are presented in the same FIGURE 4 and in more detail in FIGURE 5. From examining these figures, and as regards technological capital, we deduce, among other things, that all the cohesion countries, with the exception of Ireland, are far-removed from the EU average (which in turn is lagged in relation to USA). The gap deficit has, however, diminished significantly, excepting the case of Ireland, over time. This is explained by the stronger rate of investment in R&D in the most backward member countries during most of the period of reference and by the slowdown in R&D spending in some countries, such as Germany, which have a bigger stock of technological capital.

[FIGURE 5 around here]

As for the stock of human capital, in which the deficit in the EU in relation to the USA is certainly large, the cohesion countries also show a significant but decreasing gap (excepting in Greece) in relation to the EU average. Among the laggard countries we should underline the special efforts made by the Spanish economy.

In overall, the differentials found in the level and path of the stocks of technological and human capital stocks across the four cohesion countries appear to confirm the hypothesis of the endogenous growth theories, which stress the important role of those factors for growth and economic real convergence of countries.

In any event, looking for additional insights into the real convergence patterns in those countries, we will now analyze their endowments in physical capital. Although here we will consider all kinds of physical capital, we will focus on the varieties that, according to previous studies (which were mentioned in section 3), have a greater impact on growth due to their significant positive externalities on the productivity of companies: transport and communications and above all the Internet infrastructures.

We have proceeded, first of all, to estimate the stocks of private physical capital of Spain, Portugal, Ireland, Greece, the EU and USA, on the basis of the accumulation of the respective series of private Gross Fixed Capital Formation (GFCF), conveniently deflated and depreciated, under the Perpetual Inventory Method. Then, the stocks of public capital have been obtained by applying the same procedure to the corresponding series of public GFCF. Finally, the transport infrastructure endowment of each country has been estimated by calculating the arithmetic mean of the availability of kilometers of “standard motorway” per square Km. and per capita<sup>12</sup>.

The values estimated for all those kinds of physical capital endowment are shown in FIGURE 6. Its examination discloses new features about the catch-up experiences of the countries in question. Thus, as expected, the physical capital endowment, especially that of a public nature and even more so that taking the form of transport infrastructure, is larger in the those member countries that have been more successful in narrowing their *per capita* GDP to

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<sup>12</sup> The kilometers of “standard motorway” were calculated by using the kilometers available in each type of motorway, under the following criterion: 1Km. of motorway was assumed to equal 16 Km. of state roads, 32 Km. of provincial roads and 64 Km. of local and urban roads.

the EU average. As for the dynamic of investment, the case of Spain proves quite impressive for its particularly good performance.

[FIGURE 6 around here]

Once we have explored the levels and trends in capital stocks both tangible and intangible, underlying the *per capita* GDP catch-up processes of the laggard EU members it is time to take a step forward. Specifically, it seems interesting to analyze the likely contribution of international technological spillovers.

Indeed, as was mentioned in *section 3*, recent growth literature has not only emphasized the importance of domestic R&D and human capital investments, but also that of the international diffusion of technology, through different channels. Thus, in addition to the most conventional and direct channel, the international contracts for transfer of technology, new models have stressed two other indirect ways for international diffusion of technology, due to the assumed existence of knowledge spillover effects: trade and foreign direct investment. Consequently, in these models, given a level of domestic stock of technological and human capital, the processes of opening up and integration of a country will tend to raise its rates of growth.

Following this line of reasoning, we will pursue our analysis of real convergence for the four target countries by trying to approach the relative importance of their capability to benefit from foreign technological innovations through the three channels mentioned above.

In view of the fact that those countries have concentrated their imports of goods and technology as well as their direct investment inflows in the OECD countries, we will consider this area as the origin of all their knowledge spillovers through each of these ways. To begin with, we have estimated the extent of technological spillovers coming from technological imports on the basis of the accumulation of the series of technological payments under the perpetual inventory method. As for the spillovers incorporated in the direct

investment inflows, we have calculated a weighted average of each of the OECD member countries using as weights the stocks of foreign capital received from each of them. Finally, technological spillovers through imports of goods have been estimated by an analogous procedure but here using as weights the imports coming from each one of the OECD countries. More details about the data sources and the procedure used for the measurement of these spillovers are provided in BOX 2 below.

### **BOX 2. MEASUREMENT OF THE INTERNATIONAL TECHNOLOGICAL SPILLOVERS BY CHANNELS**

- **Foreign Capital (TSfc):**

$$TSfc_{it} = \sum_{j=1}^n \frac{Fc_{jt}^i}{GDP_{it}} \frac{Tk_{jt}}{Phk_{jt}}$$

where,

*Fc*: Stock of foreign capital in country i from country j. The values of this variable were obtained from OECD: International Direct Investment Statistics Yearbook. Given the disparities found between data for the source and host countries, the statistics had to undergo a data-editing process.

*Tk*: Stock of technological capital. The data of each country was estimated on the basis of the accumulation of R&D expenditure under the perpetual inventory method (with a lag of two years) and assuming a 10% depreciation rate, based on data obtained from OECD: Main Science and Technology Indicators; Basic Science and Technology Statistics; and Research and Development Expenditure in Industry.

*Phk*: Physical capital. The data of each country was estimated on the basis of the accumulation of investment flows under the perpetual inventory method. The series on the GFCF (Gross Fixed Capital Formation) and their deflators are those which figure in OECD: National Accounts, Vol. 1, Main Aggregates. The depreciation rate is 5,4% and was obtained from EUROSTAT (1997).  
i and j are referred to the host and the source country of the flows of foreign capital.

n is the number of countries considered. In this case all OECD countries.

- **Good Imports (TSm):**

$$TSm_{it} = \sum_{j=1}^n \frac{M_{jt}^i}{GDP_{it}} \frac{Tk_{jt}}{GDP_{jt}}$$

where,

*M*: Imports of country *i* from country *j*. The data on bilateral trade flows were drawn from the IMF: *Direction of Trade Statistics Yearbook*. To overcome the problem of the lack of coincidence between the trade data from the standpoint of imports (fob) and of exports (fob), the arithmetical mean between both of them was calculated.

- **Technological imports (TStm):**

$$TStm_{it} = \frac{Mtm_{it}}{GDP_{it}} = \frac{Mtm_{it-1}(1-d)\frac{p_{it}}{p_{it-1}} + tm_{it}}{GDP_{it}}$$

where,

*Mtm*: Accumulated technological imports from 1973, calculated by the perpetual inventory method.

*tm*: technological imports per year obtained from IMF: *Balance of Payments Statistics Yearbook*, EUROSTAT: *Balance of Payments Quarterly Statistics* and OECD: *Basic Science and Technology Statistics*.

*d*: Depreciation rate. In this case the depreciation rate is 10% as in Mohnen et al. (1986) and Bernstein and Nadiri (1989).

*p*: Deflator of Gross Fixed Capital Formation obtained from OECD: *National Accounts. Vol. I: Main Aggregates*

The results obtained in our estimation of the importance of those three channels of diffusion of foreign technologies are represented in FIGURE 7. As expected, in the light of their relatively lower stocks of technological capital from a domestic origin, technological change in the four less developed EU countries seems to have been based to a great extent on the diffusion of foreign innovations.

[FIGURE 7 around here]

A short glance at the different channels reveals some interesting features. Apart from the leading role of imports in all countries, the most salient feature is, in our view, the extraordinary importance of foreign direct investment in Ireland and also, although to a lesser degree, in Spain and Portugal. Moreover, as it has been argued in other places (see OECD, 1999 and Barry, 1999) foreign direct investment has played a crucial role not only in the technological modernization but also in the transformation of the Irish economy. The traditional scarcity of inward investment flows in Greece makes the rather poor performance of this country as regards labor productivity easier to understand.

A more descriptive analysis of the trends of direct investment inflows in each country - which have given rise to cumulative data graphically reported in FIGURE 7- reflects that in the case of Ireland the bulk of them have taken place since the beginning of the 90s, (see FIGURE 8), that is to say, since the eve of the formation of the European Single Market. The major share of those capital inflows come from USA and are concentrated in a rather small number of sectors which exhibit a salient export performance. All those facts suggest, therefore, that Ireland has been chosen as a base to supply all the EU market.

[FIGURE 8 around here]

It is interesting to denote that this inward direct investment boom seems to have been on the basis of the clear reorientation of both productive and trade structures towards skilled-labor and technology-intensive sectors observed in the 90s in the Irish economy. In this sense, it is of interest to note that, as reported in FIGURE 9, the trend in foreign direct investment and that corresponding to the share of technology-intensive sectors have gone in parallel. In addition, in OECD (1999) it is documented in more detail that inward investment has been vital in the creation of an export-oriented, skilled-labor-intensive sector, concentrated in areas such as electronics, pharmaceuticals and corporate services.

[FIGURE 9 around here]



Another revealing proof of the important efforts made by the Irish economy to develop intensive technology sectors, specifically those related to the Internet, is its relatively good endowment infrastructure in this field in relation to the EU standards. The set of telecommunication and Internet infrastructure indicators reported in FIGURE 10 is rather eloquent in this sense: Ireland's figures are in all cases very close to the EU average and in some of them even above. Here it is important to underline the outstanding position of Ireland as regards the provision of secure web servers, given that this is an electronic commerce indicator. It seems, therefore, that Ireland is more aware than the average of its EU partners of the importance a country's telecommunications infrastructure for its economic development.

[FIGURE 10 around here]

As regards the other EU cohesion countries, their position in the ranking, which results from the comparison of their respective telecommunication and Internet facilities, is rather familiar: Spain is in the first place and Greece in the last one.

One additional piece of relevant information for understanding the disparities observed among the real convergence patterns of the four countries is the different course that has been followed by their main macroeconomic indicators. Certainly, as discussed in section 3, the increasing globalization of international markets has heightened the importance of macroeconomic stability as a condition for economic growth and consequently for real convergence. Moreover, for the EU members a set of rather demanding criteria of macroeconomic stability were established in the founding Treaty on European Union - known as the Maastricht Treaty- to decide which countries qualified for accession to the European and Monetary Union.

In that respect, we have considered it of interest to report –in TABLE 2- the trends of the most important macroeconomic indicators included in such

criteria for the four cohesion countries, for the UE average and for USA over the period in question.

[TABLE 2, around here]

As seen in that table, prices have undergone a very significant process of moderation, most notably during the last part of the period. Logically, a similar process has taken place in interest rates. As regards the budget deficit, the consolidation efforts that have been made in all countries are generally concentrated in the last 90s<sup>13</sup>. The case of Ireland deserves special mention in that, despite having the highest deficit in the 80s, now it is the only one of the four having a budget surplus. What is more, apart from eliminating its budget deficit the Irish economy has been able to greatly diminish its public gross debt substantially, in clear contrast with what has happened in the case of the Greek economy. In addition, it should be pointed out that Greece has waited more than any of its counterparts to correct its large fiscal imbalance. Consequently, the macroeconomic performance of the EU cohesion countries, in overall, suggests that macro-policies are of considerable importance for growth performance and real convergence success.

Needless to say, diagnosis of the real convergence achievements in the EU cohesion countries would be very limited if it did not discuss the contribution of the EU regional policy. We will devote, therefore, the last part of this section to a brief consideration of this important issue.

Although in the first years of the European integration regional policy was considered a rather insignificant issue, since the first enlargement in 1973 - when Denmark, Ireland and United Kingdom joined the Union- regional policy has been gaining in importance within Community policy, so that today it absorbs about one third of the EU budget. The main purpose of EU regional policy is to improve the long-term growth prospects of the less prosperous

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<sup>13</sup> For a largely documented analysis on the fiscal policies in Spain and the rest of the fifteen EU members since mid 80s see Martin (2000: chap. 5).

regions. Consequently, the most benefited countries are the four less developed members, which are the target of our analysis. The bulk of the actions, which should be co-financed by national public funding, are devoted to enhance human capital endowments and infrastructures.

According to the periodical reports prepared by the Commission (see EC, 1999 for the latest) and other available studies (Martin, 2000: chap. 11 and others refereed there in), EU regional policy has exerted a positive effect on the narrowing the *per capita* income gaps across member countries. In this context, the ranking of the most benefited countries in terms of the net revenues received from the EU budget as a share of their respective GDP are: Ireland, Greece, Portugal and Spain (see TABLE 3). This ranking somehow provides another reason to explain the outstanding economic performance of the Irish economy, but at the same time it adds an additional open question on the explanation of the Greek case. Nevertheless, in view of our previous analysis of the catch-up experiences of the four cohesion countries it is quite safe to conclude that: EU regional policy can contribute to regional convergence but not to the extent as to compensate for the absence of a stable, growth-promoting macroeconomic environment.

[TABLE 3, around here]

In short, from our analysis of the real convergence patterns of the four less developed countries in the EU we can conclude that during the period in question all of them have managed to advance in terms of real convergence with respect to the EU. We have found, however, that the process of convergence has been rather different both in degree and in nature across countries. Ireland is the country with the most successful *per capita* GDP catch-up result, followed by Spain, Portugal and, albeit to a lesser extent Greece. Our findings suggest that their growth may have benefited from membership of the European Union, but also that the progress of each of the country is greatly determined by its own growth strategy.

As for the nature of the real convergence process, the most salient differences have to do on the one hand with equity and on the other with the composition of the capitalization efforts. Thus, Portugal and above all Ireland have shown, in comparison with the other countries, little ability to make compatible growth with social protection. Moreover, in a clear contrast with its counterparts, the share of social protection expenditures in GDP of the Irish economy has recorded a significant reduction over the period. Thus, it is now noticeably below the EU average. This feature of the growth pattern of Ireland is also supported by the relatively high value of its Gini index for income inequality.

Regarding the across-countries differences in the strategies of capitalization, the most prominent ones are summarized as follows. First, we should mention the extraordinary importance of direct investment inflows in the case of Ireland. Indeed, the capability of the Irish economy to attract capital from abroad clearly stands out even with relation to the other EU cohesion countries, Spain and Portugal, which have also been very attractive for foreign investors. In fact, the attraction of direct international capital, mostly from the United States, together with the emphasis placed on the development of human capital seem to be the most important factors in the Irish story of rapid growth and *per capita* GDP convergence. It is reasonable to think, however, that the growth strategy followed by Ireland -greatly based on developing human capital and harnessing international spillovers- would not have probably been successful in the absence of a good endowment in domestic R&D and public infrastructures. In addition, it is worth mentioning the heavier emphasis of Ireland on the provision of telecommunication and Internet infrastructures.

Secondly, we should underline the more intensive and better distributed (among all kinds of capital assets) efforts of capitalization that the Spanish economy has made in an attempt to overcome its higher shortcomings at the beginning of the period.

Finally, as far as the likely implications of EU membership, we should note the positive role which seems to have played the EU regional policy, particularly in the case of Ireland.

Considered in overall, the real convergence stories of the four less developed EU members offer, albeit with striking differences between them, a rather successful example of a catch-up process in the framework of an ambitious regional integration process. Thus, interesting lessons may be drawn for the CEECs that are likely to join the EU in the near future. This is, in fact, the subject of the next section of our paper.

## **5. Lessons for the Central and Eastern European candidates**

This section discusses the main lessons that can be drawn from the catch-up experiences of the four less-developed EU members for the ten CEECs that have already started accession negotiations, namely: Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic and Slovenia. However, before this discussion, it offers a broad picture of the economic performance of the CEECs since their almost overlapping transition and EU accession processes.

Over the last decade –since the collapse of the communist system and the dissolution of the Council for Mutual Economic Assistance (CMEA)- the CEECs have made tremendous progress in establishing a democratic market economy, in the framework of the process of EU accession, which began with the signing of the European Association Agreements (EAs) between the CEECs and the EU<sup>14</sup>. Progress has been, however, rather uneven among the ten. Hungary, the Czech Republic, Poland, Estonia and Slovenia have been making the most progress, so that they were the first group of candidates to begin (in March, 1998) the round of negotiations prior to membership. Nevertheless, later on, at the Council of Helsinki (in December, 1999) the other CEECs also began

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<sup>14</sup> The EAs were signed on the following dates: Czechoslovakia, Hungary and Poland (December, 1991); Romania (February, 1993); Bulgaria (March, 1993); Czech and Slovak Republics (October, 1993) Estonia, Latvia and Lithuania (June, 1995); and Slovenia (June, 1996).

full negotiations. Since then, therefore, the scope and the pace of the enlargement have been determined by the advances of each candidate in attaining membership requirements<sup>15</sup>.

As shown in TABLE 4, since they began their transition process the majority of the CEECs have grown at much higher rates than their future EU partners, in spite of the important contraction in output that they suffered in the early years of transition. Consequently, most of the ten candidates have shortened the gap between their *per capita* GDP with that of the EU. Nevertheless, the *per capita* GDP of the CEECs, even when expressed in PPS, is still very much lower than the EU average. The growth recovery of the CEECs has largely been due to improvements in labor productivity, which, until recently, have been accompanied by a deterioration in unemployment rates.

[TABLE 4, around here]

The transition to the market system and open trade, together with considerable amounts of foreign capital in the form of foreign direct investments (FDI), have been key factors in increasing the labour productivity and the output of the CEECs. In fact, trade of goods and services has experienced such rapid growth over the last decade that many CEECs are now more open to trade than the EU. Similarly, in some of the most advanced candidate countries the share of cumulative FDI inflows over GDP is higher than in the EU (see TABLE 5).

[TABLE 5, around here]

In addition, trade and FDI have greatly contributed to generating a dramatic change in GDP composition: the weight of agriculture has been largely reduced in favour of industry and services. In this sense, redirection of exports from the CMEA to the EU markets accompanied by industrial restructuring and

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<sup>15</sup> These requirements are the so-called Copenhagen criteria (adopted in June, 1993), namely: (i) to achieve stability of institutions guaranteeing democracy, the rule of law, human rights and respect for and protection of minorities; (ii) to have a functioning market economy as well as the capacity to cope with the competitive pressure and market forces within the Union; and (iii) to

the novo private activities, both involving foreign investment, have been the main driving forces of the changes in the patterns of specialization of the CEECs, which reflect a convergence trend towards those of the EU. More specifically, due to the strategies of the multinationals there has been a shift in exports of some CEECs – particularly in Hungary, the Czech Republic and Estonia- away from unskilled labour-intensive goods toward high-skilled, labour-intensive and technology-based products (see World Bank, 2000 and references therein).

In short, many empirical studies have found that trade and above all FDI appear to have been crucial in promoting industrial restructuring, technological upgrading of products, improvements in productivity, export growth and hence, overall economic growth in the CEECs.

In turn, it seems that the process of EU accession has played an important role in attracting FDI to the CEECs (EBRD, 1999). However, given the differential performance exhibited by the ten CEECs, it is clear that participation in the EU integration process alone is not sufficient: there are other factors that should be important in attracting FDI. In this respect, in Kaminski and Riboud (2000) it is argued that the case of Hungary – the country that up to now has received the highest FDI inflows in both GDP and *per capita* terms- illustrates some of the additional factors that are important for attracting FDI. Thus, in addition to the emphasis that Hungary placed on foreign investors during its privatization process, the significant progress in macroeconomic stabilization, structural reforms and institutional developments have proved to be essential factors for explaining its brilliant performance in attracting FDI. On the other hand, the poor experiences in macroeconomic stabilization and structural reforms exhibited by Bulgaria and Romania -the countries that have received the smallest FDI inflows in *per capita* terms and suffered the worst economic performance- somehow support the same diagnosis.

Last but not least, differences in growth performance and hence in *per capita* GDP levels across the ten CEECs appear to be related to differences in their investment efforts in technological and human capital. In other words, although trade and FDI have probably been serving as a vehicle for international technological spillovers, domestic investment in R&D and in education seem to have been essential ingredients in enabling some CEECs to move to higher growth and income convergence.

Indeed, although data limitations preclude a detailed analysis of those issues (as the one done for the EU members) in the case of the CEECs, the indicators reported in TABLE 6 suggest that the growth performance of the candidates is somehow associated with their respective efforts in R&D and education, which for many of them appear to be quite close to the EU standards.<sup>16</sup> In contrast, data on Internet and transport infrastructure shows, with very few exceptions, the relatively weak position of the CEECs.

[TABLE 6, around here]

In conclusion, our review of the progress made by the CEECs since their almost overlapping transition and EU accession processes suggests that the upcoming accession could contribute significantly to improving their prospects of growth and income convergence towards EU levels. Thus, the experience over the last decade has illustrated that the ongoing process of integration into the EU has helped to attract FDI to the CEECs, which, in turn, has contributed to the growth and the technological and skill upgrading of output and exports. However, the experience of the CEECs has also shown that the differentials found across their economic performance since their accession process began has to be explained on the basis of additional factors which have more to do with their own economic policies. In this respect, the progress in macroeconomic stabilization, structural reforms and institutional development,

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<sup>16</sup> It should be noted, however, that such an indicator of human capital endowments does not take into consideration the significant differences that seem to exist in the quality of education systems between the CEECs and the current EU members.



on the one hand, and investment efforts in R&D and education, on the other should be emphasized.

Having said that, it is time to go back to the better known cases of the less developed EU members, which we analyzed in greater depth in the previous section, in order to draw additional and sounder lessons for the CEECs about the most suitable policies for achieving sustained growth and real convergence towards the higher standard of living of the EU.

To begin with, it is important to point out that, all in all, the catch-up experiences of the EU members serve to reinforce most of the lessons which have been drawn from those of the CEECs and to add new ones. Indeed, what we have learnt in our evaluation of the real convergence experiences of the EU cohesion countries can be summarized in the following points:

- Since their entry into the EU the four laggard members have succeeded in bringing their relative *per capita* GDP closer to the EU average, although there are large differences between them. Ireland is the most successful of the four and Greece the least. In all cases, excepting the one of Greece, membership seems to be associated with a speeding up of the catch-up process. So, on this basis, there is little reason to fear that the accession of the CEECs is going to lead to spontaneous income divergence. Nevertheless, the poor performance of Greece during the early years of its membership suggests that joining the EU does not in itself guarantee income convergence.
- In any event, here we have argued the insufficiency of *per capita* GDP as an indicator to provide a good assessment of real convergence and we have, therefore, underlined the need to use other complementary variables that somehow take into account the degree of income inequality. We have argued also the convenience of including additional variables that reflect the capability of the countries (regions) in question for achieving a self-sustained economic growth. Moreover, by assessing the real convergence performance of the EU cohesion countries on the basis of this set of

variables, we have found a more complex but surely also more realistic picture of it, which may provide more fruitful lessons for the CEEC candidates.

- Thus, the evidence, particularly the case of Ireland, suggests that even when there is a brilliant *per capita* GDP catch-up performance some problems of inequality may emerge.
- The evidence of the four supports the idea about the link between macroeconomic stability and income convergence. In this sense, the striking differences found in the evidence available between Greece and Ireland, as for the contribution of EU regional policy to real convergence, indicate that it cannot compensate for the lack of a stable, growth-promoting environment.
- The EU cohesion countries' experiences also clearly support the theoretical predictions of the recent growth literature that emphasizes the crucial role of technological knowledge, human capital and infrastructure for achieving real convergence.
- In addition, our findings are in agreement with the models that suggest that the countries can take advantage of international technological spillovers through imports and FDI, provided they have a good human capital endowment.
- Finally, the importance of the telecommunication and Internet facilities in promoting growth is an additional lesson to be drawn.

## **6. Final remarks**

The lessons provided by the diverse experiences of real convergence of the EU cohesion countries summarized above may be useful for the elaboration of suitable strategies of accession for the CEEC candidates.

Thus, it appears to be clear that although accession is likely to be propitious for the creation of a stable macroeconomic environment that favours investment, it cannot be a substitute for the necessary domestic policies to achieve it. In addition, there is little doubt that domestic efforts to improve human capital endowments and infrastructure are essential ingredients for taking advantage of the potential economic gains of integration in terms of growth and real convergence. Moreover, there are good grounds for believing that the future members should also undertake suitable policies to cope with the problems of income distribution.

Consequently, fiscal consolidation, accompanied by a public finance restructuring that helps to make room for the above-mentioned investments needed to achieving sustained high long-term growth, is one of the main challenges facing the CEECs for a successful integration in terms of real convergence. Moreover, such public finance restructuring should also meet the objective of providing affordable social insurance programmes in the most efficient way and avoiding the creation of work disincentives.

Needless to say, the development of institutions and policies aimed at the improvement of the level of economic efficiency with which resources are allocated should also be considered as an essential piece in the CEECs strategy for a successful accession. Moreover, establishing a functioning market economy is one of the prerequisites of accession that the CEECs need to complete with first.

For undertaking all those reforms of economic institutions and policies the CEECs can count on the financial assistance of the EU, but it seems to be clear that, in order to assure efficient use of this the CEECs need to build up an administrative capacity (with a professionalized civil service) that allows appropriate monitoring and evaluation of public investment projects.

In short, it may be stated that the CEECs have to confront (in fact are already confronting) a huge task in order to meet what, in the end, is the

ultimate economic goal of accession: convergence towards the higher standards of living of their future partners in the EU. But, as the experiences of the less developed EU members suggest so far, in spite of its difficulty this task is likely to be worthwhile.

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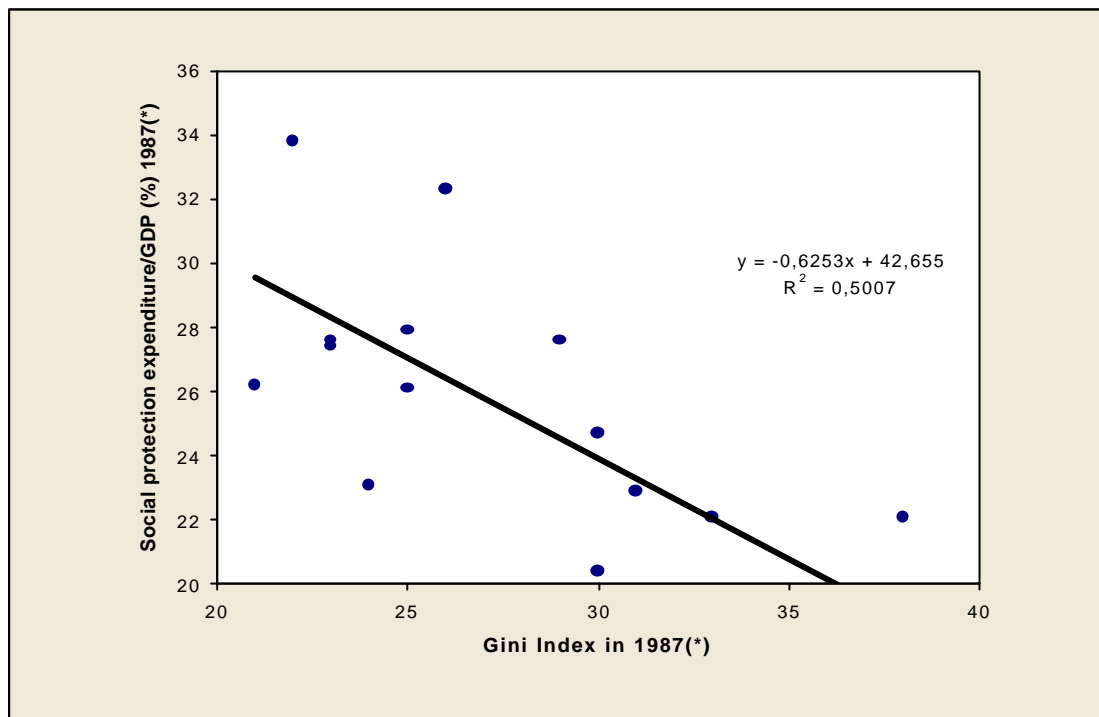
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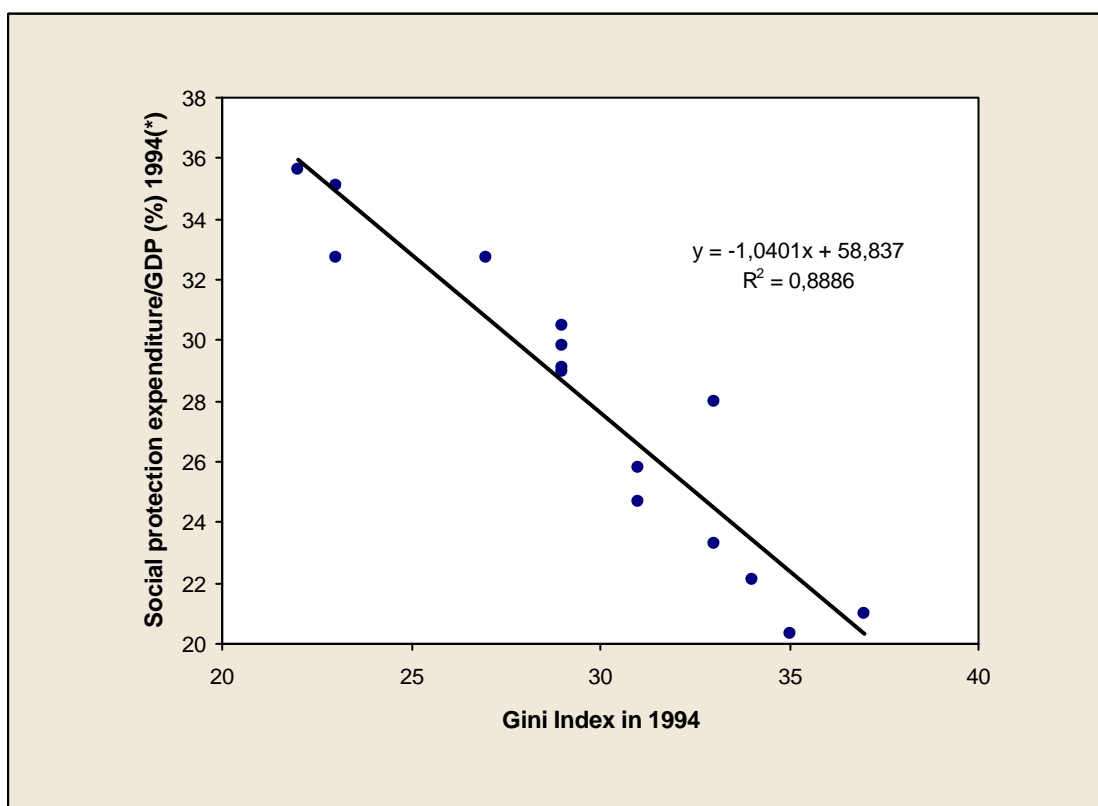


## **FIGURES AND TABLES**

Figure 1. Relation between Welfare expenditure and Inequality in EU countries

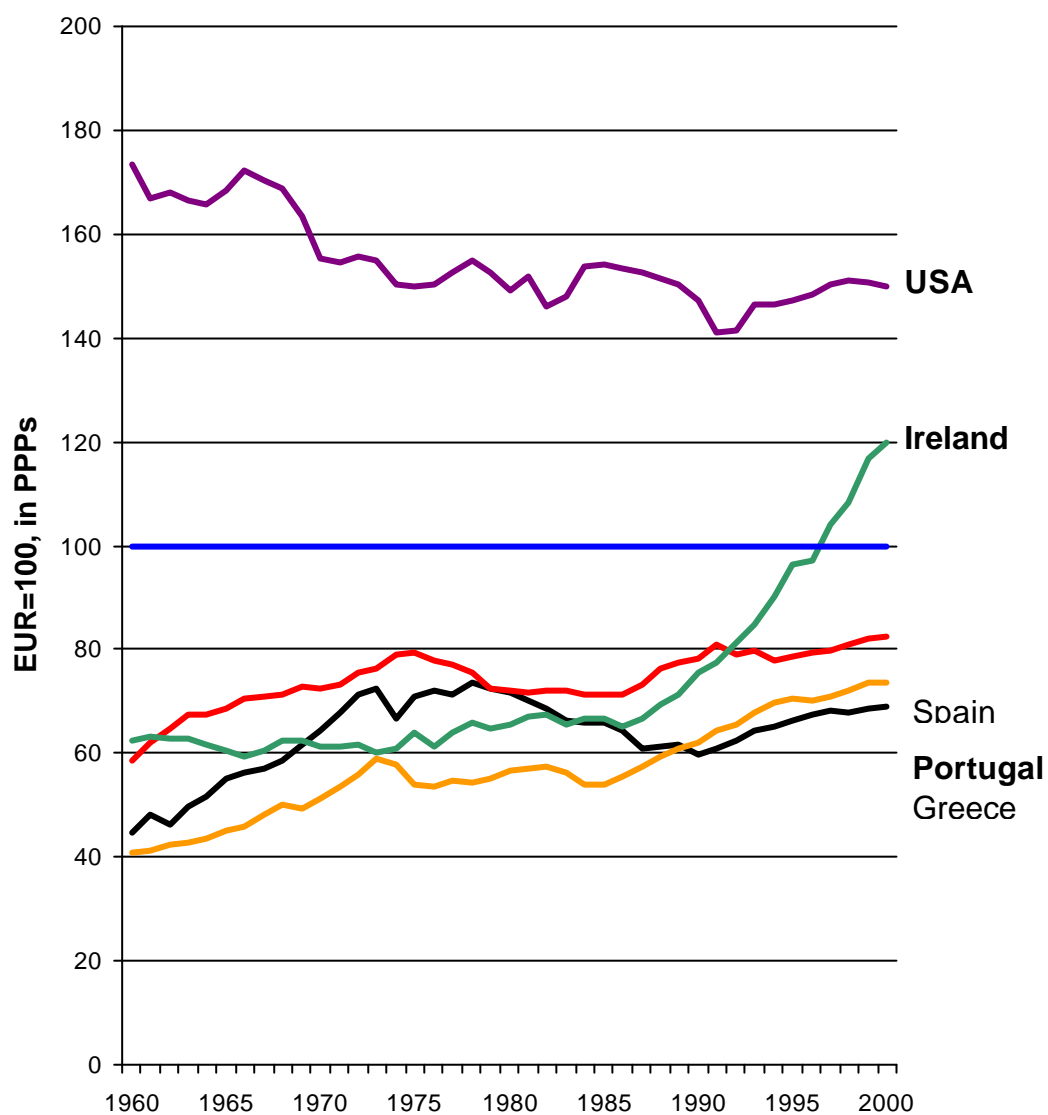


(\*) 1987 or nearest year



Source: EUROSTAT , Luxembourg Income Study, United Nations Development Programme and own elaboration

## Figure 2. Per capita GDP (1960-2000)

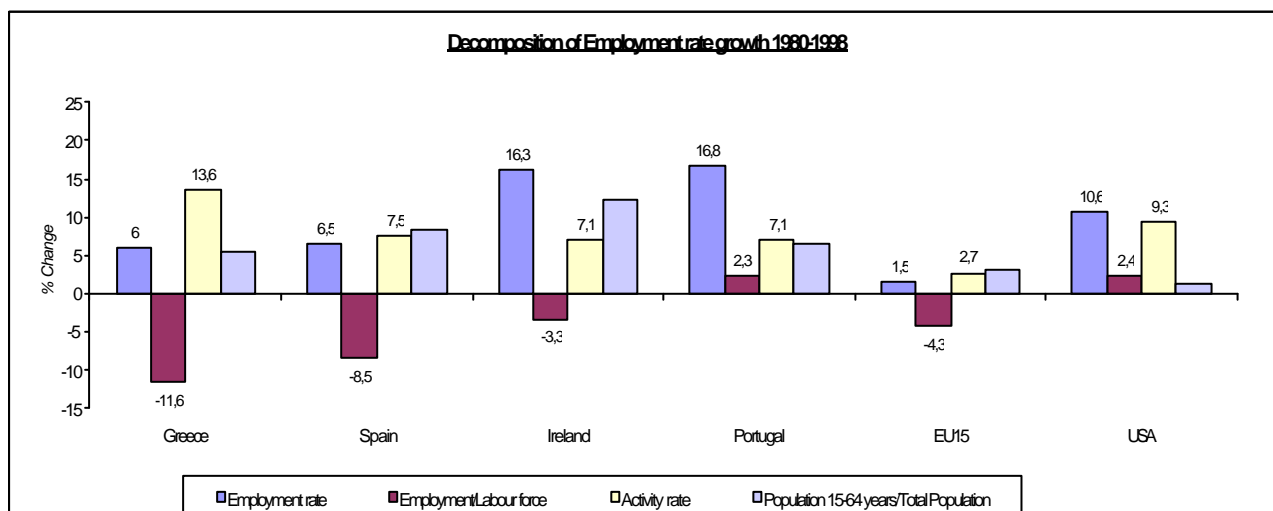
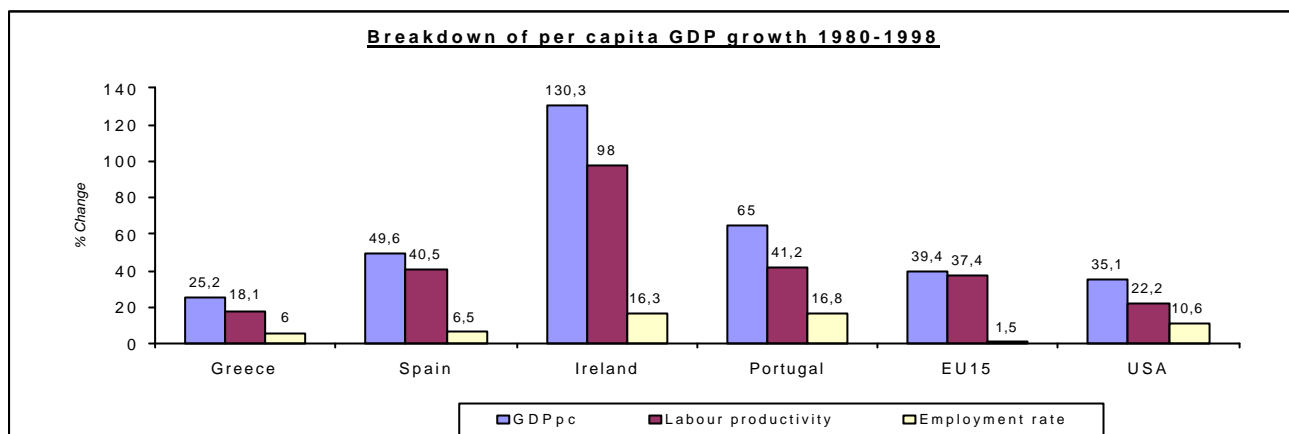


Source: European Commission

	Greece	Spain	Ireland	Portugal	European Union	United States
GDP per capita	100,0	100,0	100,0	100,0	100,0	100,0
Labour productivity	75,1	86,2	85,7	71,0	96,1	67,7
Hourly productivity	60,1	114,1	86,8	88,4	108,9	67,7
Pure hourly growth effect		112,3	111,1	63,4	96,1	73,2
Structural change effect in hourly productivity growth	15,9	20,4	3,9	47,0	28,5	23,5
Residual effect	48,1	-18,6	-28,2	-22,0	-15,7	-29,0
	3,9					
Working time	15,0	-27,9	-1,1	-17,4	12,8	0,0
Employment rate	24,9	13,8	14,3	29,0	3,9	32,3
Employment/Labour force	-38,0	-16,1	-2,9	4,2	-10,5	7,5
Activity rate	44,6	14,2	6,3	12,8	6,6	28,8
Population 15-64 years/Total population	18,3	15,7	10,9	12,0	7,8	-4,0
Pro memoria:						
GDP per capita growth	25.2	49.6	130.3	65.0	39.4	35.1

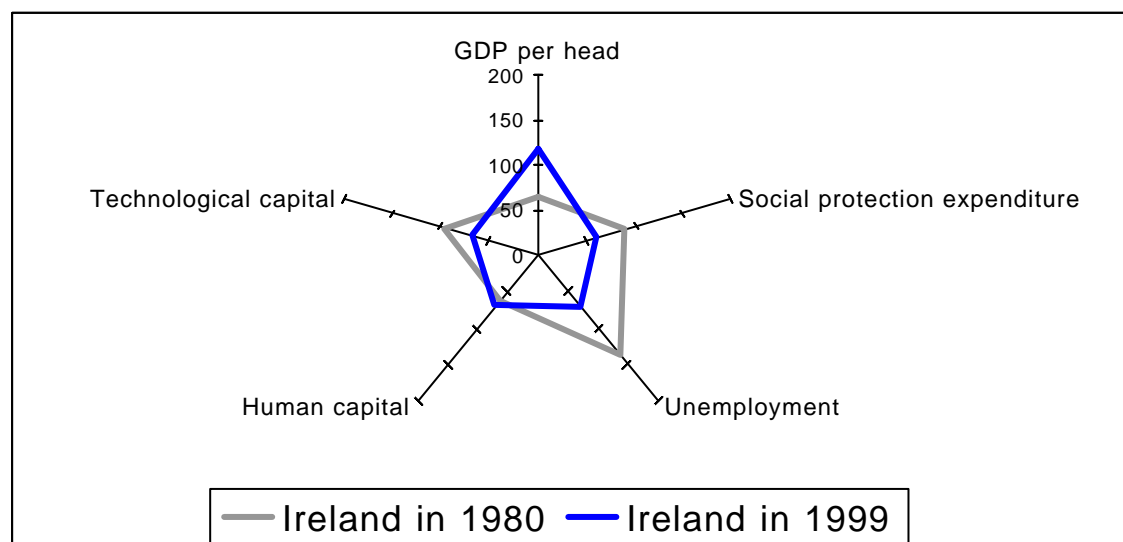
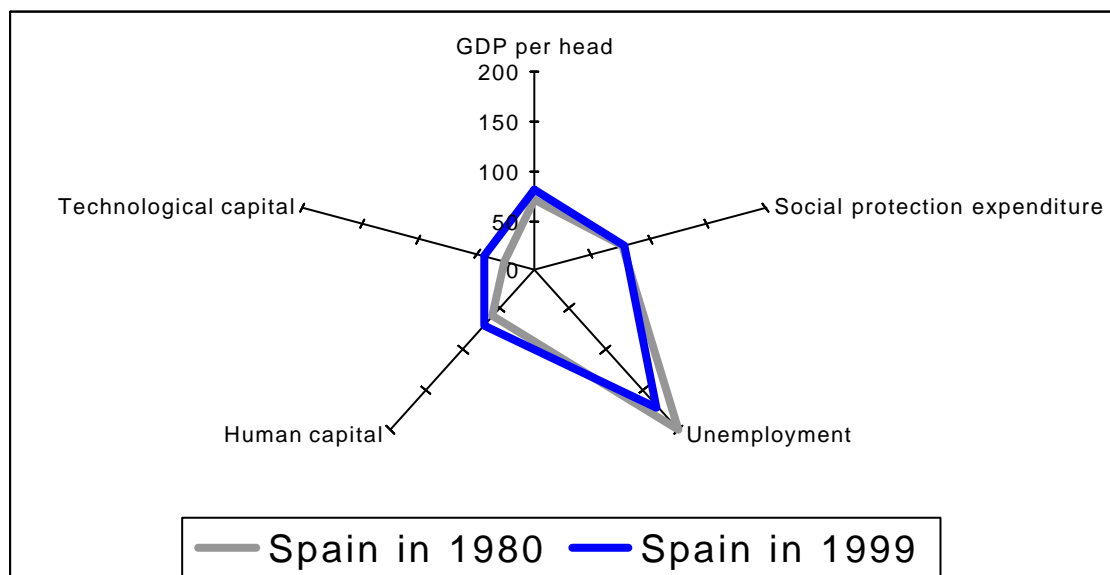
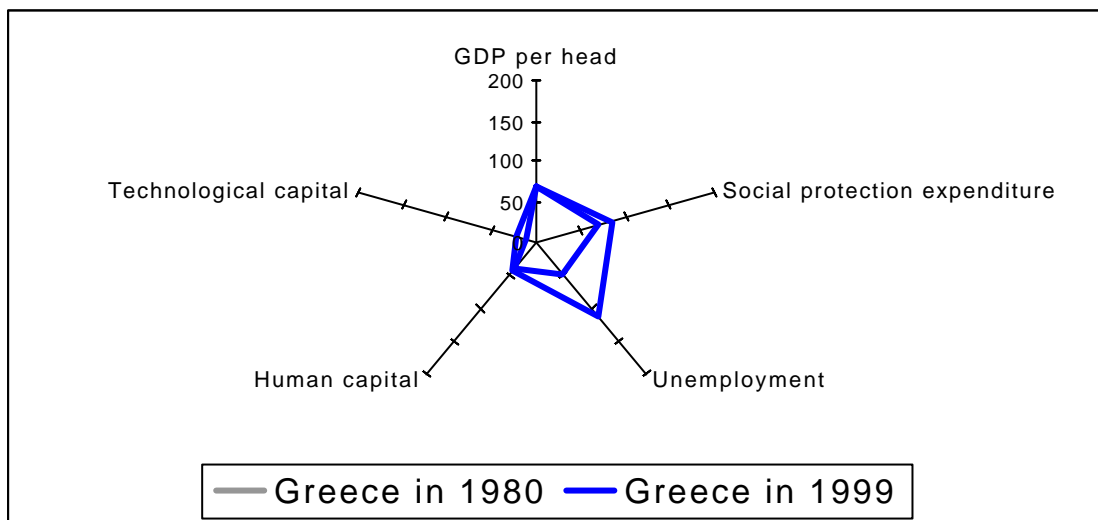
*Source: EUROSTAT, OECD, ILO and own elaboration*

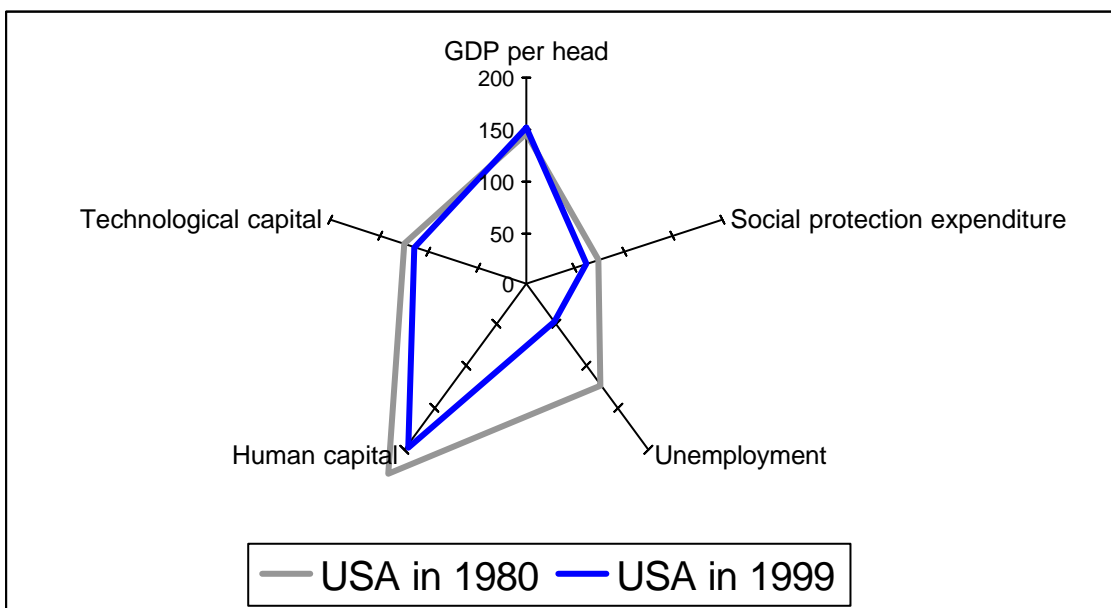
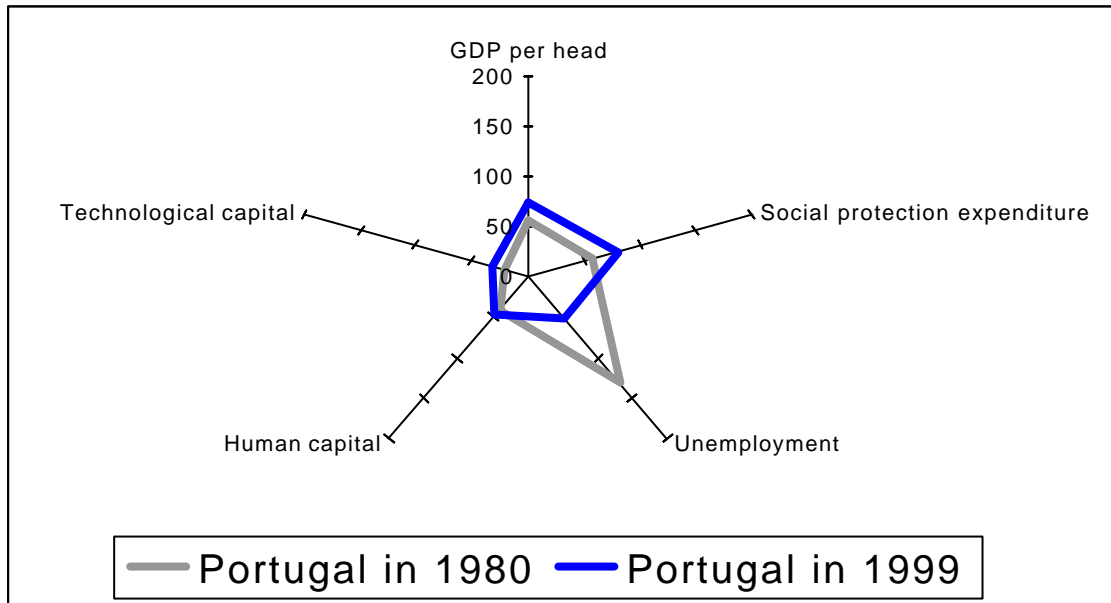
Figure 3. Breakdown of the GDP growth



Source: EUROSTAT, OECD, ILO and own elaboration

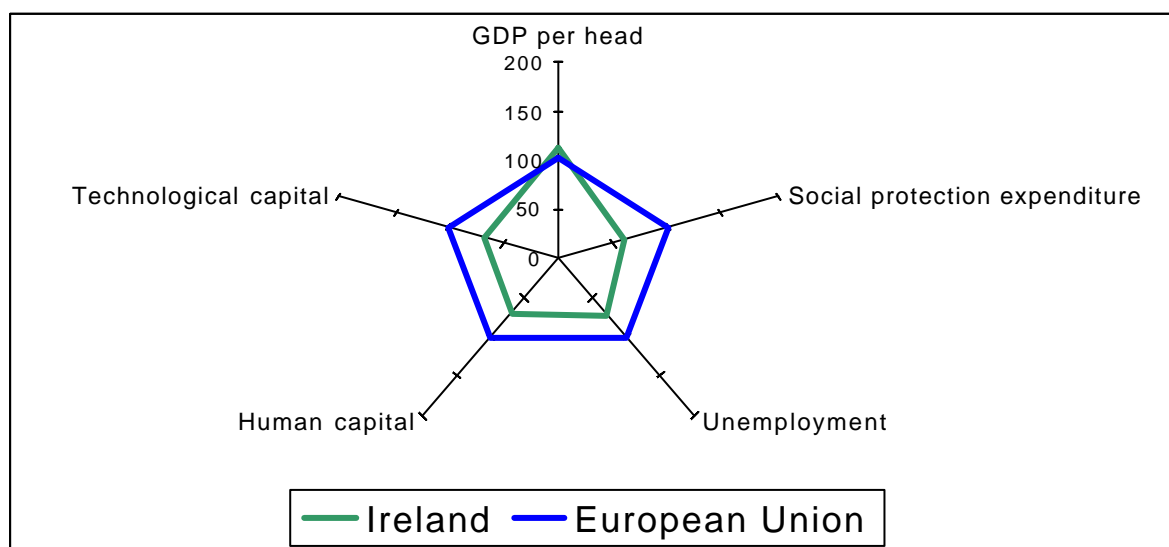
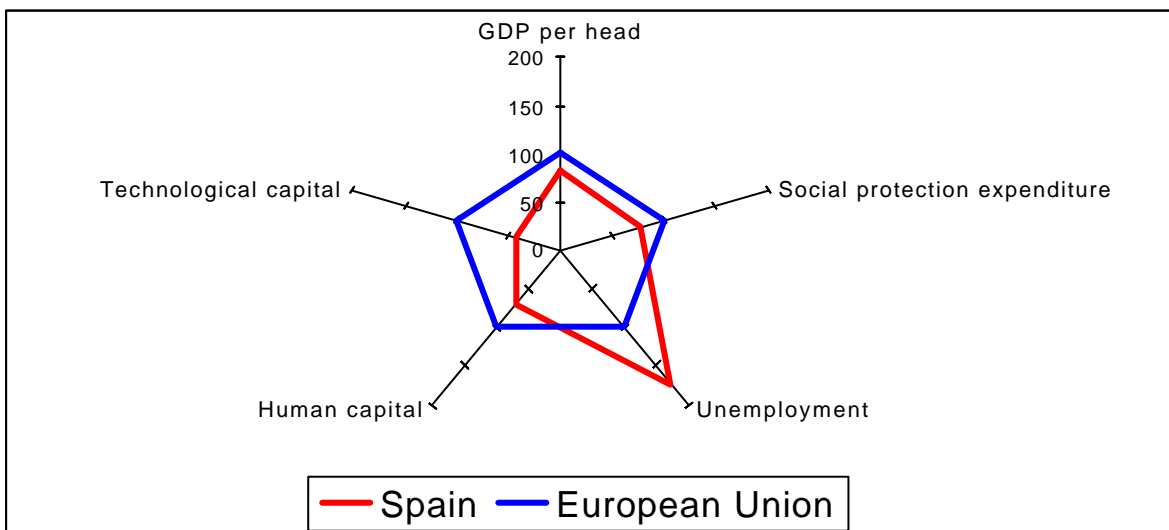
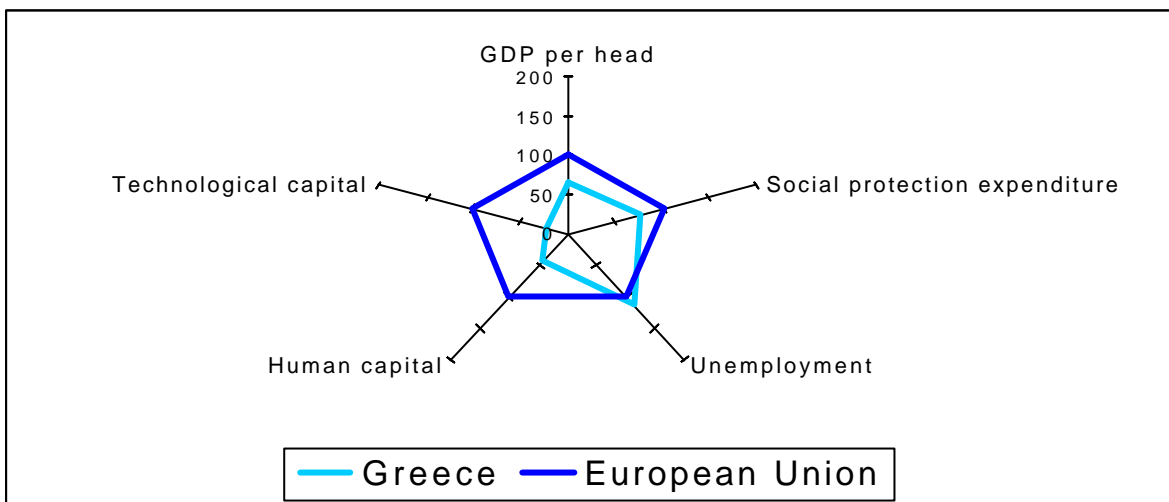
Figure 4. Real Convergence indicators in 1980 and 1999. EU=100



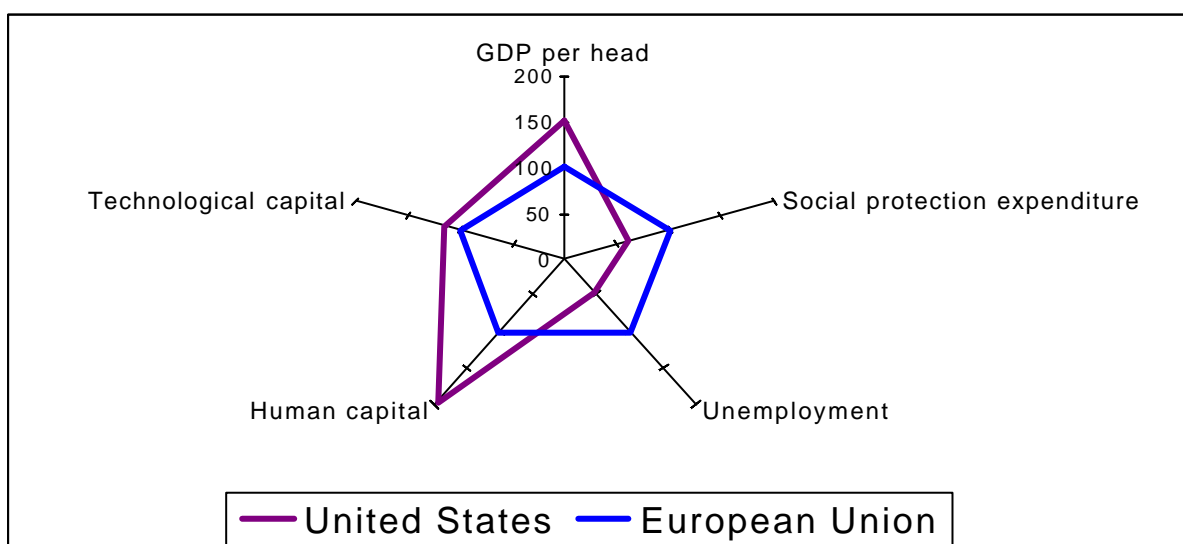
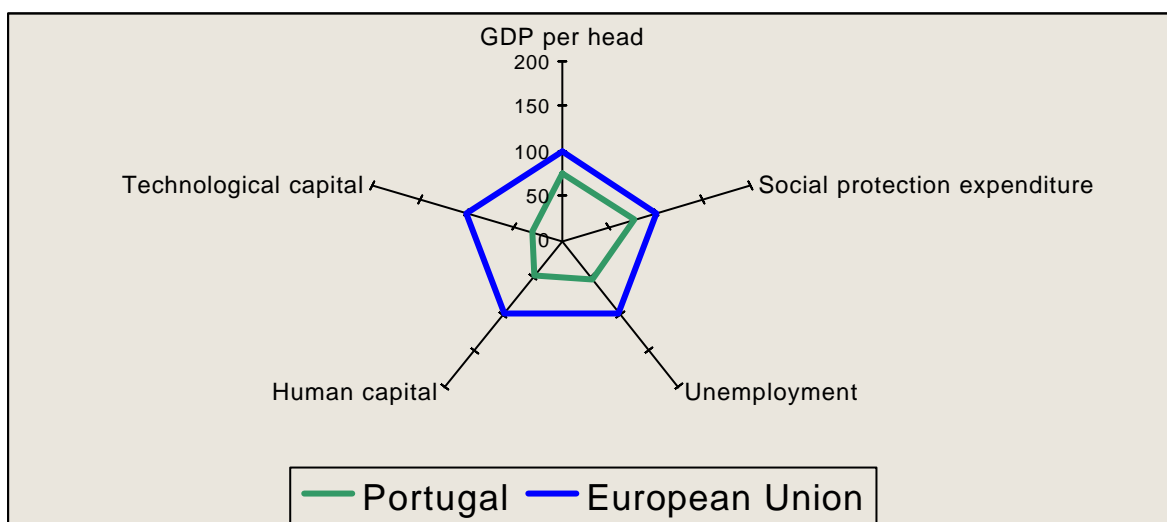


Source: EUROSTAT, OECD, ILO, UNESCO and own elaboration

**Figure 5. Real convergence indicators 1999**







	GDP per head	Social protection expenditure	Unemployment	Human capital	Technological Capital
Greece	67	21,5	10,3	21,2	3,3
Spain	82	21,4	15,9	35,1	6,7
Ireland	112	17,1	6,6	34,6	10,7
Portugal	75	21,8	4,7	24	4,9
European Union	100	27,9	9,2	49,9	15,8
United States	152	17,2	4,2	98,3	18,1

Source: EUROSTAT, OECD, ILO, UNESCO and own elaboration

**Figure 6: Capital endowment**

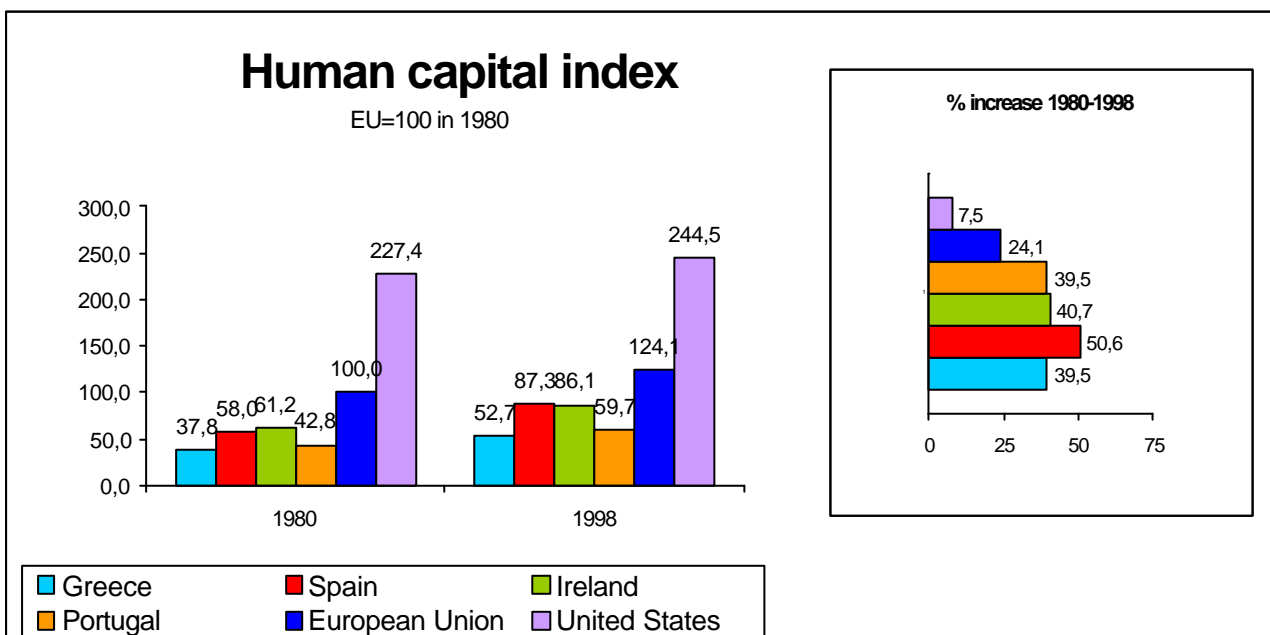
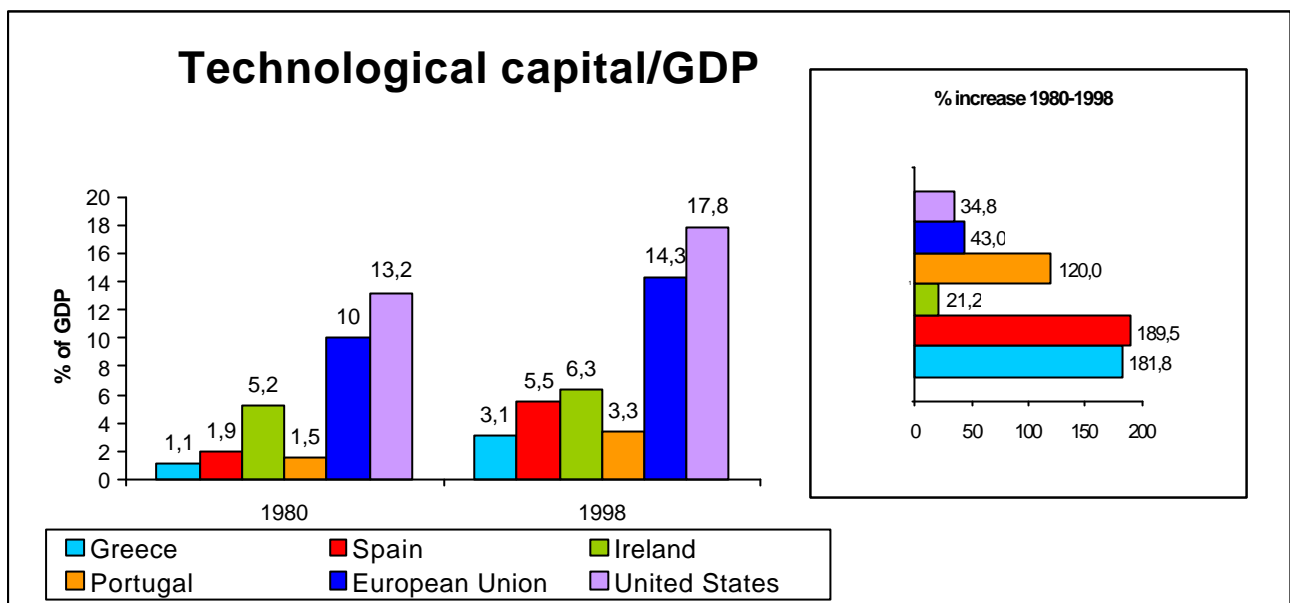
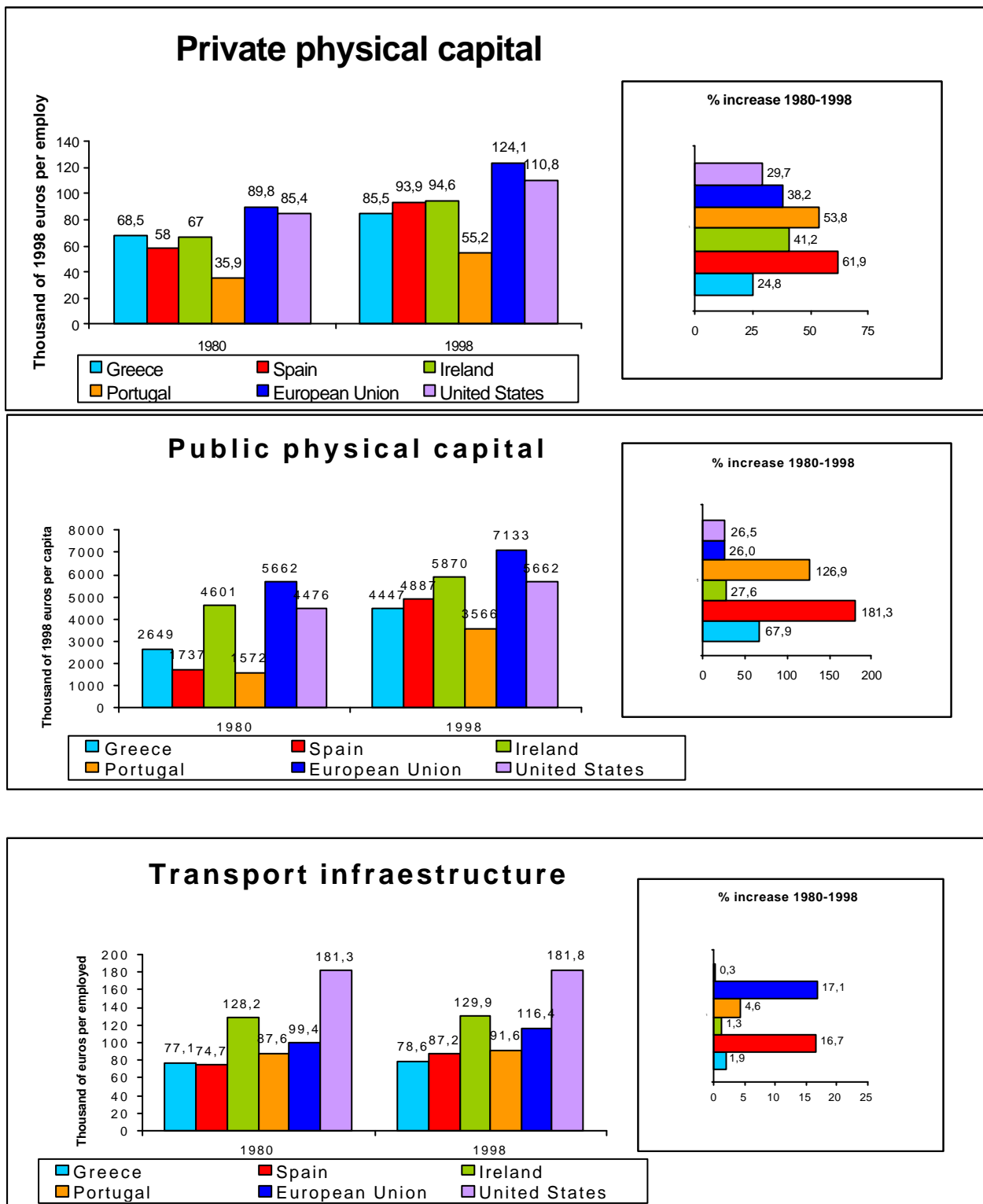
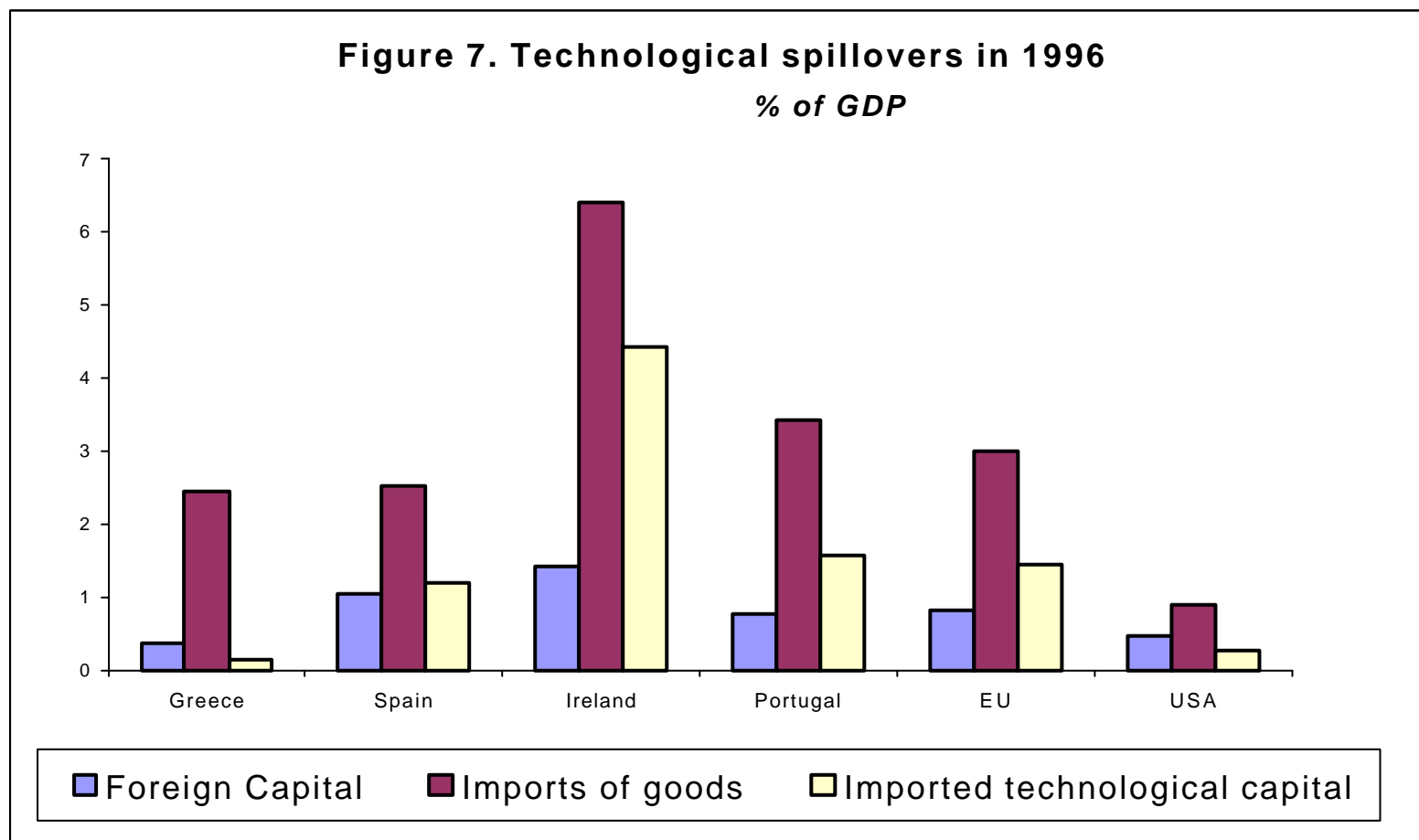


Figure 6: Capital endowment (cont.)



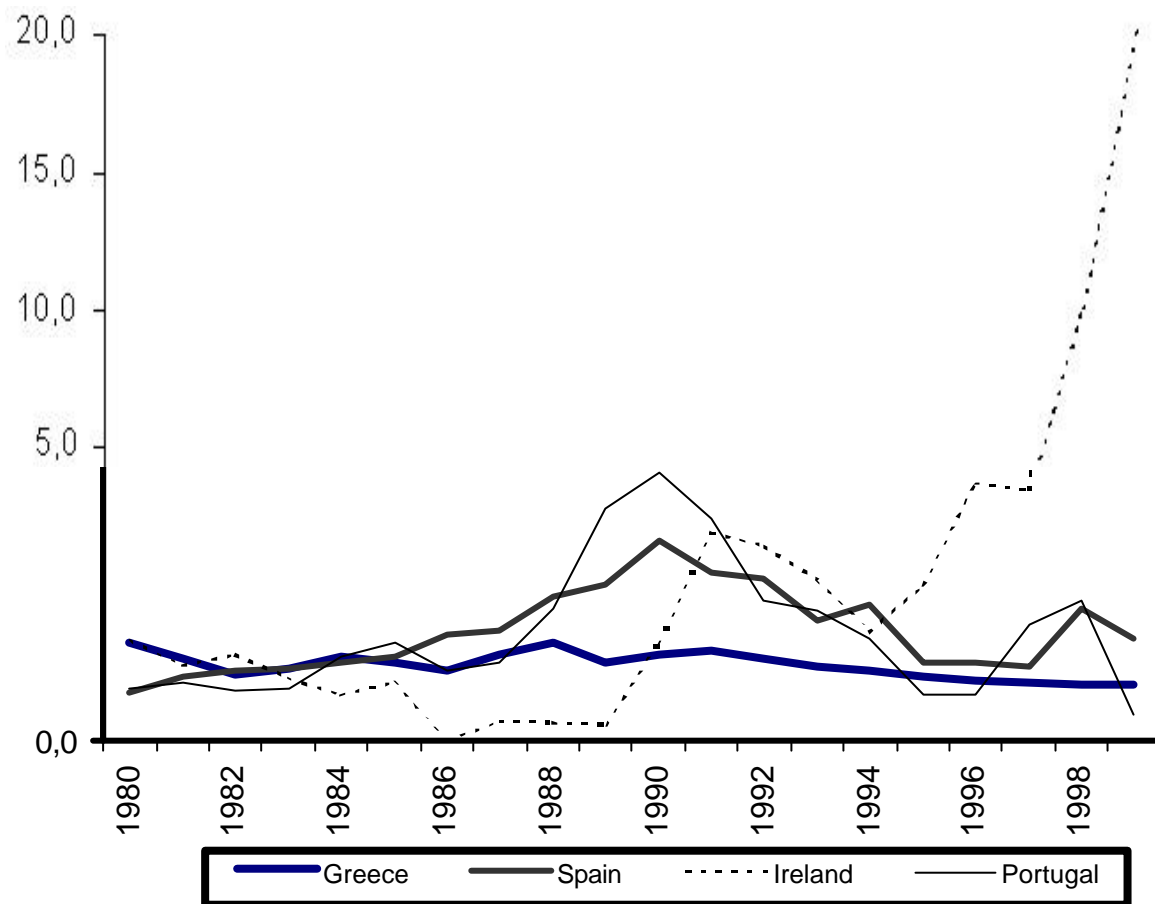
Source: OECD, EUROSTAT, UNESCO, UN-ECE and own elaboration



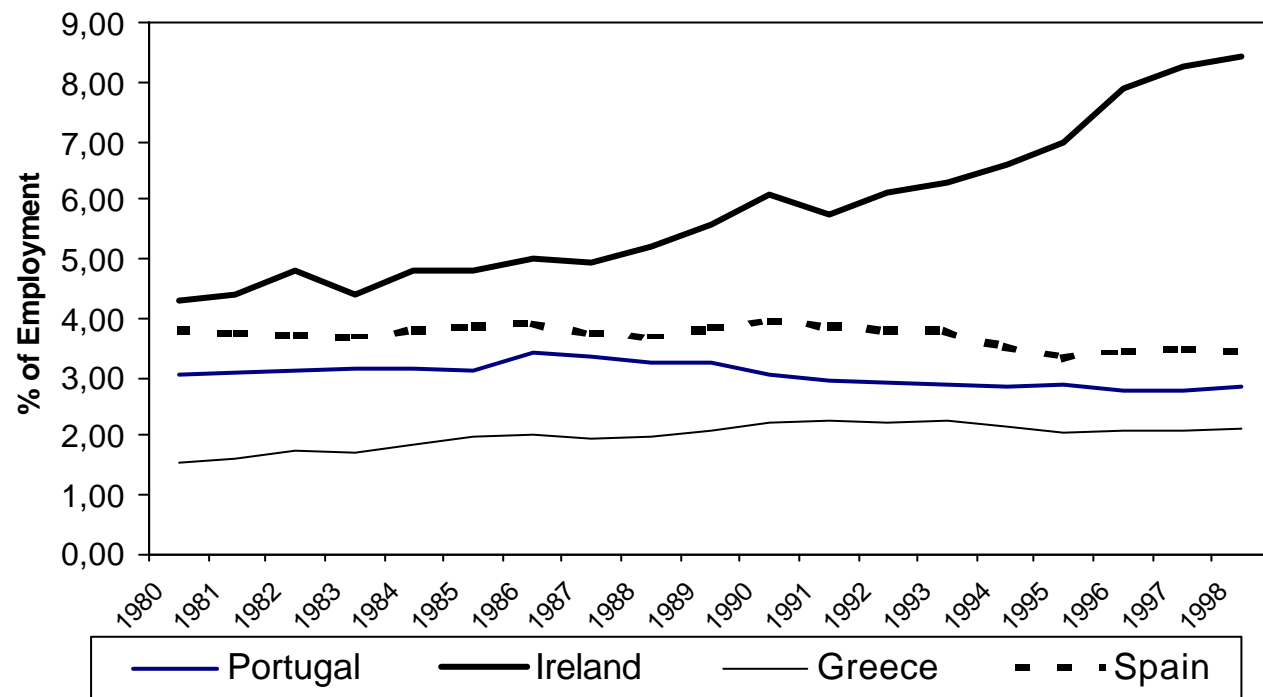
Source: OECD, IMF, EUROSTAT and own elaboration

### Figure 8. Foreign Direct Investment inflows

*as a % of GDP*

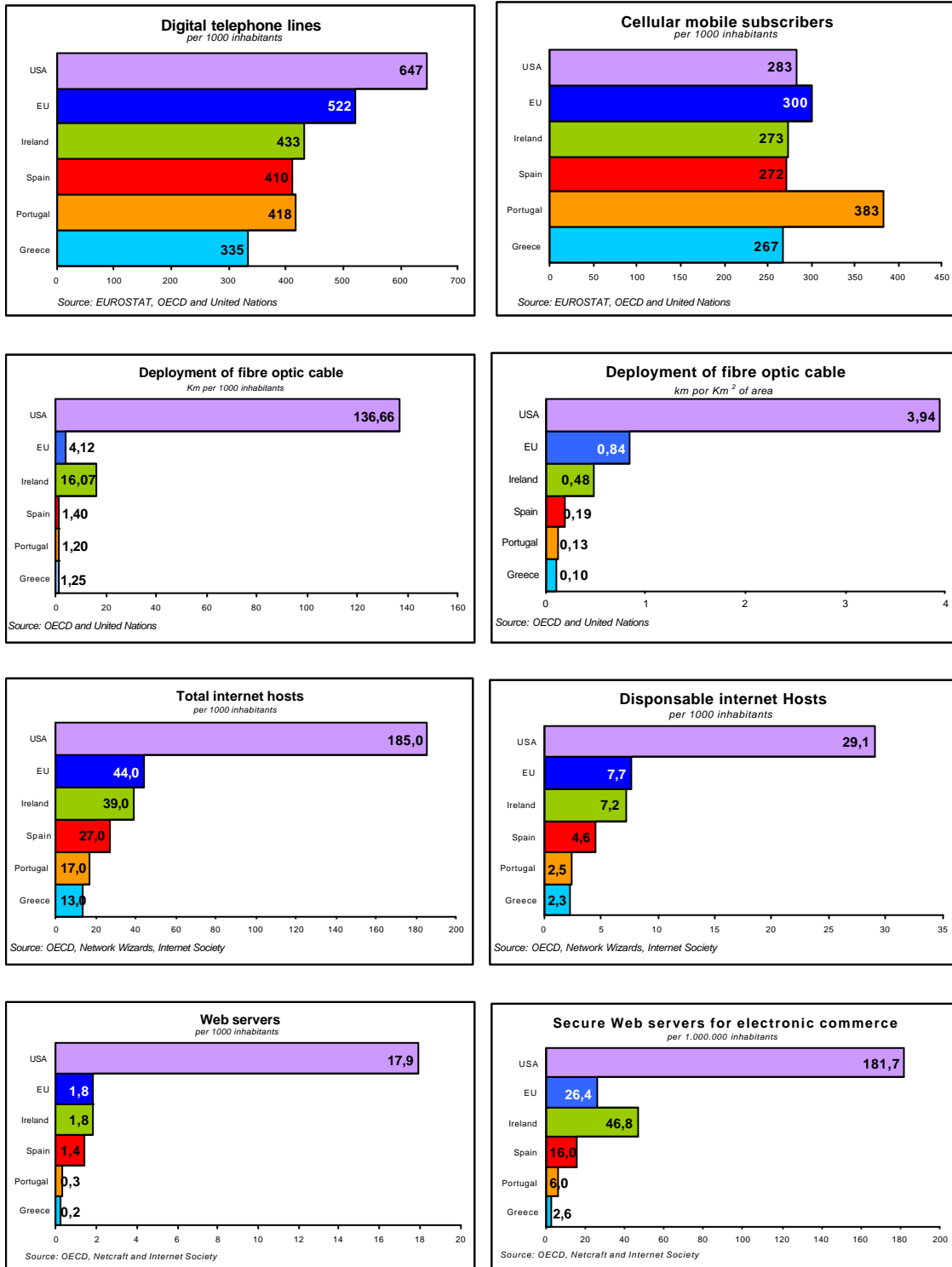


**Figure 9. Share of technology intensive sectors(\*)**



(\*) Chemical products, Office and data processing machines, Electrical goods and Communication services

**Figure 10. Telecommunication and Internet infrastructure in July 2000**



Source: EUROSTAT, OECD, UN, Network Wizards, Internet Society, Netcraft and own elaboration

**Table 2. Key macroeconomic indicators**

	<u>1980</u>	<u>1986</u>	<u>1993</u>	<u>1999</u>
<b>Inflation rate</b>				
Greece	24.7	23.0	14.4	2.7
Spain	15.5	8.8	4.6	2.3
Ireland	18.3	3.8	1.4	1.6
Portugal	16.6	11.8	6.7	2.3
EU	13.1	3.7	3.6	1.1
USA	13.5	1.9	3.0	2.1
<b>Long-term interest rate</b>				
Greece	17.1	15.8	19.3	6.3
Spain	16.0	11.4	10.1	4.7
Ireland	15.4	11.1	6.7	4.7
Portugal	16.7	19.5	9.5	4.8
EU	12.8	9.2	7.8	4.7
USA	10.8	8.1	5.8	6.1
<b>Public gross debt</b>				
Greece	23.9	53.6	111.6	104.4
Spain	17.5	45.1	58.8	63.5
Ireland	70.3	113.8	93.1	52.4
Portugal	32.4	68.0	63.2	56.8
EU	38.4	54.5	65.8	68.1
USA	37.0	52.3	63.4	54.2
<b>Public budget deficit(*)</b>				
Greece	2.6	9.5	13.8	1.6
Spain	2.6	5.7	6.8	1.1
Ireland	12.1	10.5	2.3	(2.0)
Portugal	8.7	5.9	6.1	2.0
EU	3.5	4.2	6.2	0.7
USA	1.7	3.8	3.9	(1.7)

*Source: OECD, EUROSTAT and IMF*

(\*) The data in brackets show a budget surplus



TABLE 3. COMMUNITY BUDGET: NET BALANCE OF THE EU COUNTRIES  
(% of GDP)

Country	1986-88	1989-93	1994-98
Austria			-0,3
Belgium	-0,5	-0,2	-0,4
Denmark	0,4	0,3	0,1
Finland			-0,1
France	-0,1	-0,2	-0,1
Germany	-0,5	-0,6	-0,7
Greece	2,8	4,2	4,2
Holland	0,3	-0,1	-0,7
Ireland	4,2	5,3	3,7
Italy	0,0	-0,1	-0,2
Luxembourg	-1,0	0,7	0,0
Portugal	1,0	2,3	2,9
Spain	0,2	0,5	1,3
Sweden			-0,4
United Kingdom	-0,3	-0,3	-0,3

Sources: European Court of Auditors: Annual Report; European Commission: The Community Budget. The Facts in Figures.

**TABLE 4. MAIN MACROECONOMIC INDICATORS**

	Bulgaria	Czech Rep.	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Slovakia	Slovenia	European Union
Surface (km <sup>2</sup> )	110,910	78,864	45,100	93,030	64,589	65,200	312,677	237,500	48,845	20,256	3,231,000
Population-on January 1999 -annual growth (1990-1999)	8,230.4 -0.70	10,289.6 -0.08	1,445.6 -0.92	10,092.0 -0.31	2,439.4 -1.01	3,700.8 -0.02	38,667.0 0.17	22,488.6 -0.35	5,393.4 0.22	1,978.3 -0.10	375,329.4 0.35
Per capita GDP -PPS per head (1999) -annual growth 1995-1999	4,700 -1.04	12,500 3.25	7,700 8.29	10,700 7.21	5,800 7.77	6,200 6.06	7,800 8.64	5,700 0.44	10,300 7.54	15,000 7.34	21,100 4.64
Real GDP growth -in 1999 -annual growth 1996-2000	2.4 0.7	-0.5 0.0	-1.4 4.2	4.3 4.7	0.5 3.3	-4.0 2.3	4.1 5.2	-3.2 -4.0	1.9 3.7	3.7 3.9	2.4 2.7
Inflation -in 1999 -annual growth 1996-2000	0.4 90.5	2.1 6.1	3.3 6.4	10.1 13.0	2.4 4.8	0.8 3.8	7.3 10.9	45.8 72.5	10.6 9.7	6.2 7.3	1.2 1.5
General government budget balance (% GDP) -in 1999 -average 1996-1999	-0.9 -3.8	-0.6 -1.7	-4.7 -1.2	-3.7 -4.3	-3.8 -1.6	-7.0 -3.9	-3.5 -3.0	-3.3 -4.2	-3.6 -3.4	-0.6 -0.7	-0.7 -2.2
Stock of government debt (% GDP) -in 1999 (1998) -in 1995 (1996)	87.1 110.2	(13.4) 15.3	6.6 (6.2)	60.6 86.4	13.0 (14.4)	30.5	43.9 54.6	29.9	27.6 24.1	(23.8) 18.8	68.1 71.2
Unemployment rate -1999 end-year rate -average 1996-2000	14.6 14.2	9.5 6.7	11.7 10.3	7.0 8.0	13.9 13.9	14.0 14.5	13.0 12.1	6.2 7.4	17.1 13.2	7.7 7.6	9.2 9.8
Current account balance (% GDP) -in 1999 -average 1996-2000	-5.5 -1.7	-1.5 -3.3	-5.7 -8.1	-4.4 -4.0	-10.4 -8.6	-12.1 -10.7	-7.6 -5.2	-3.2 -5.5	-5.7 -7.6	-2.9 -1.5	0.2 0.7

Sources: Economic and Financial Affairs Directorate General of the European Commission (europa.eu.int), World Bank and European Bank for Reconstruction and Development

TABLE 5. SOURCES OF TECHNOLOGICAL SPILLOVERS

	Exports of goods and services		Imports of goods and services		Cumulative Inward Foreign Direct Investment 1991- 1999 (% GDP)
	% GDP (1999)	Annual growth 1989-1999 (current US\$)	% GDP (1999)	Annual growth 1989-1999 (current US\$)	
Bulgaria	44.1	-6.4	51.9	-9.6	18.5
Czech R.	62.7	9.0	63.9	12.6	29.4
Estonia	76.9	9.8	82.6	11.3	33.2
Hungary	52.6	6.4	55.0	8.4	37.5
Latvia	46.7	0.6	57.6	1.6	35.2
Lithuania	39.8	-	50.1	-	19.6
Poland	28.4	11.6	33.6	17.7	12.8
Romania	30.1	4.6	34.6	4.4	15.9
Slovakia	64.8	11.3	69.9	8.3	10.2
Slovenia	55.7	0.6	58.4	4.5	6.3
European Union	34.6	6.7	33.2	6.1	15.2

Sources: World Bank (for the CEECs), EUROSTAT and UN (for the EU) and own elaboration

TABLE 6. FACTORS CONDUCIVE TO REAL CONVERGENCE

	Expenditure for R&D in 1996 (% GDP) (1)	Mean school years in 1998 of the population 15-64 years (3)	Internet connections per 1000 inhabitants in 1999 (2)	Km of motorways in 1999 (2)	
				Per 1000 km2 of surface	Per 10000 inhabitants
Bulgaria	0.57	8.4	3.2	2.92	3.95
Czech R.	1.11	10.0	19.4	6.31	4.84
Estonia	0.57	9.0	18.3	1.91	6.01
Hungary	0.68	10.6	13.6	4.45	4.82
Latvia	0.48	9.1	3.4	-	-
Lithuania	0.70	8.9	-	6.39	11.27
Poland	0.77	11.0	2.6	0.86	0.69
Romania	0.72	9.1	0.6	0.48	0.50
Slovakia	1.05	7.7	7.2	6.02	5.47
Slovenia	1.46	9.9	9.9	19.68	20.09
European Union	1.80	9.1	44.0	15.36	13.22

Source: (1) OECD, (2) European Commission, (3) Own elaboration on the basis of UNESCO, OECD and EUROSTAT data