Growth and Employment:
Comparative Performance, Convergences and Co-movements

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Abstract

As well-known, starting from the EU White Paper on growth, competitiveness and employment (1993), and continuing with the launch of the European Employment Strategy (1997) and the Lisbon Strategy (2000), two crucial objectives indicated by the European level emerged: (i) the increase of the GDP growth rates and (ii) the improvement of the employment intensity of growth.

The aim of the paper is to discuss and investigate the compared performance, convergence and relationship of the following real variables: per-capita GDP (level and growth) and employment rate (level and growth).

In the last decades an increasing part of the theoretical and empirical economic literature has been dedicated to the real convergence process. In order to better investigate the more recent period, in this paper we first present a brief review of the theoretical and empirical literature on real convergence (Section 2) and of the relationship between growth and (un)employment (Section 3).

In Section 4, using Eurostat (regio) database for the period 1995-2003, a compared investigation of the (levels and changes in) per capita GDP and employment rates in EU-25 countries is followed by a convergence analysis for European aggregations (EU-25, EU-15, EMU-12 and 8-new-EU-members) at the following two (statistical) regional level: Nuts I (σ- and Lowess β-convergence) and Nuts II (σ-, absolute and conditional β-convergence). Besides, a preliminary comparative analysis for EU-15 countries has been dedicated to the co-movements between GDP and employment, and the employment intensity of growth, during the same period 1995-2003.

Some of the main results of the paper highlighted (i) a high heterogeneity in European performance (in terms of GDP level, GDP growth, employment level and employment changes), (ii) the existence of complex "club convergence/divergence" across EU countries and regions, (iii) remarkable differences in the correlation between GDP growth and employment changes, and in the employment intensity of growth.

1. Introduction

In the last decades an increasing part of the theoretical and empirical economic literature has been dedicated to the real convergence process and to the relationship between growth and (un)employment.

Obviously, the existence of a real dynamic convergence is crucial for the studies of "development economics", but it is also important for (an enlarged) European Union, especially considering the regional level. As well-known, in the case of the European Union the convergence among regions is a policy priority (European Union Treaty: "... *the Community shall aim at reducing the disparities between the levels of development of the various regions and the backwardness of the least-favoured regions, ...*", 1992)[1].

Economic growth and (un)employment have been key issues in the European policy debate in recent years. The European Union started to explicitly address (jointly) the two issues with the "*White Paper on Growth, Competitiveness and Employment*" (European Commission, 1993) and the "*Green Paper on Innovation*" (European Commission, 1995); continuing with the launch of the *European Employment Strategy* (Amsterdam Treaty and Luxembourg European Council, 1997) and the "*Lisbon Strategy*" (European Council, 2000)[2]; until the recent "*Sapir Report*" (European Commission, 2004), "*Working together for Growth and Jobs. Next Step in Implementing the Revised Lisbon Strategy*" (EU Commission Staff Working Paper, April 2005) and the reform of the "*Stability and Growth Pact*" (Brussels European Council, 2005).

Without considering the degree of implementation (at European and national/regional levels) of the above documents and policy recommendations, it is obvious that they are the consequence of an unsatisfactory comparative situation of European Union as regards (i) regional disparities in per capita income levels and (ii) GDP growth and (un)employment performance[3].

With reference to the co-movements between growth and (un)employment at European level, we can roughly distinguish four periods: (i) from the beginning of 1950s to the early 1970s high rates of economic growth have been accompanied by low level of unemployment (*catch-up growth*); (ii) during the 1970s and the first half of 1980s growth stagnated and unemployment rate increased dramatically (*eurosclerosis*); (iii) during the decade between mid-1980s and mid-1990s growth rates partly improved but unemployment remained high (*jobless growth*); and, finally, during the period 1995-2004 a decreasing trend in growth rates has been accompanied by a gradual reduction in unemployment and a significant increase in employment (*job-rich low-growth*).

Before focusing our empirical investigation on the most recent period, in this paper we first present a brief review of the theoretical and empirical literature on real convergence (Section 2) and on the relationship between growth and (un)employment (Section 3). We than produce new empirical evidence on growth and employment levels, convergences, co-movements and elasticity in some (aggregations of) EU countries and regions (Section 4).

2. A Brief Review of the Theoretical Debate and Empirical Evidences on Real Convergence

The economic convergence/divergence in per capita GDP across countries and regions has been largely analysed from both the theoretical and the empirical point of view. The theoretical result of "convergence" is derived from traditional neoclassical growth models[4] (e.g. Solow, 1956

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[1] See Title XIV (Economic and social cohesion), article 130a of the EU Treaty.

[2] As well-known, at the Lisbon European Council (March 2000), the European Union set a new strategic goal for the next decade: "*to become the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion*".

[3] The latter is supported by the idea of a systematic relationship between growth and (un)employment.

[4] The neoclassical theory, considering a situation of perfect competition, uses a simple growth model with one sector aggregate function and the aggregate marginal productivity theory of distribution. In particular, the neoclassical growth model is based on the following main assumptions: (i) labour force and labour saving technical progress grow at constant exogenous rate (and all economies benefit from the exogenously given technical progress); (ii) all saving is invested (the existence of independent investment function is derived from Say's Law); (iii) output is a function of

and Swan, 1956) based on the crucial assumption of diminishing returns to reproducible capital[5]. Starting from the hypothesis of identical preferences and technologies across countries, a long-run tendency towards the equalisation of per capita GDP and productivity should be expected and has empirically emerged (e.g. Abramovitz, 1986). So, according to neoclassical growth theory, poor countries will tend to grow faster than richer ones.

The dynamic implication of the above theoretical framework has been empirically investigated, across countries and regions, through both σ-convergence and absolute β-convergence[6]. Sigma convergence emerges when the dispersion of per capita GDP levels declines over time. This type of dispersion is usually measured by the standard deviation of the variable transformed into natural logarithms. Absolute beta-convergence is supported when there is a systematic tendency for countries (or regions) with initially lower levels of per capita GDP to grow faster than those with initially higher level of per capita GDP. In particular, absolute beta-convergence can be estimated using parametric and non-parametric techniques, in order to verify the negative relation between initial per capita incomes and their rates of growth (e.g. Barro, 1991 and Barro – Sala-i-Martin, 1992). From a theoretical point of view, the concept of absolute beta-convergence requires a unique steady-state which can be obtained assuming that technology, saving rate, population growth and depreciation rates are equal across countries. In this framework, the mobility of production factors (capital and labour) across countries (and regions) accelerates the process of absolute beta-convergence on per capita GDP and productivity levels (e.g. Borts, 1960)[7]. So, in the neoclassical framework the role of government policy is (substantially) limited to the promotion of market forces and the provision of macroeconomic stability and, given perfect competition, growth is essentially a reallocative process (Borts – Stein, 1964).

After some ambiguous empirical results on the investigation of absolute beta-convergence in per capita income across countries (Baumol, 1986)[8], many econometric studies tried to test the existence of conditional beta-convergence in addition to absolute beta-convergence (e.g. Barro, 1991; Mankiw – Weill – Romer, 1992). In the conditional beta-convergence analysis, the negative relation between initial per capita incomes and their rates of growth holds only controlling for the different rates of saving (and investment), for the different endowment of human capital across countries[9] and/or considering other variables.

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capital and labour, with the production function characterised by constant returns to scale and diminishing returns to individual factors of production. In particular, in the steady-state, given the hypothesis of diminishing returns to capital, the long-run growth of output is determined by the rate of growth of labour force plus the rate of labour augmenting technical progress. In the long run, a higher level of saving (and investment) is offset by a higher capital-output ratio (or a lower productivity of capital) and, finally, the steady-state of output is determined by the growth of labour force and technical progress. So, in the long-run, all economies converge to a common long-run steady-state growth of labour augmenting technical progress.

[5] In fact, poor countries with low capital-labour ratios are supposed to have a higher marginal productivity of capital and hence they will grow faster than richer ones, given the same level of saving and investment.

[6] It can be demonstrate that the existence of beta-convergence is a necessary but not sufficient condition for the existence of sigma-convergence (e.g. Islam, 2004).

[7] If wages are too high in richer countries (or regions), labour will migrate from the poor countries (or regions). Then, labour will become abundant in the former and scarce in the latter, producing wage adjustments (down-ward and up-ward movement, respectively). Indeed, the wages and the marginal product of capital are inversely correlated and therefore capital will move to labour-intensive sector in low wage (poor) countries (or regions), diminishing the labour migration. The above inflow of capital will generate faster GDP growth in poorer countries (or regions) than in the richer ones. In the long-run, lower factor costs and higher profit opportunities in poor countries favour the convergence process.

[8] Baumol (1986) produced a first analysis based on a sample of 16 OECD countries and he obtained a significant negative (absolute) β coefficient, deriving strong evidence in favour of convergence. However, in a second empirical analysis, Baumol considered a larger sample of 72 countries and he did not find any evidence of convergence. He suggested that, while there is no convergence in the larger sample of countries, there exist "club" of countries within which evidence of convergence can be recorded.

[9] Barro (1991) finds that when the initial measures of human capital are included in the regression model, the β coefficient turns negative and significant.

The research on club convergence has been related to conditional convergence and to the theoretical model of multiple equilibrium.

The empirical studies on convergence have been conducted also at regional level. Sala-i-Martin (1996) presents a comprehensive study of convergence across regions of Japan, Germany, the UK, France, Italy, Spain, Canada and among the US states.

The theoretical and empirical debate on real convergence (e.g. George – Oxley – Carlaw, 2004; Islam, 2004) produced different interpretation of convergence that can be summarised in the following dichotomies: (i) beta-convergence vs. sigma-convergence; (ii) absolute convergence vs. conditional convergence; (iii) global convergence vs. local or club convergence; (iv) convergence within an economy vs. convergence across economies; (v) per capita GDP-convergence vs. productivity-convergence; (vi) deterministic convergence vs. stochastic convergence; (vii) linear convergence vs. non-linear (complex) convergence.

So, research on convergence has proceeded in many directions and using many different definitions and methodologies. In my opinion, the original idea of using convergence analysis as a test for validity of alternative growth theories has not been very fruitful. On the contrary, convergence studies produced many different interesting empirical results and theoretical stimulus (i) furnishing new stylised facts regarding cross-countries (and regions) regularities, such as "persistence" and "bi-modality", favouring, for example, the use of new models of multiple equilibrium, (ii) highlighting the existence of remarkable productivity or technological differences across countries (and regions), increasing the theoretical studies on the determinant of technology differences and diffusion, (iii) finding further evidences on the importance of institutional factors, developing the theoretical research on the role of institutions and the determinants of institutional changes, (iv) stressing the importance of investment, especially human capital an R&D investment, favouring the improvement of the (initially too simple) aggregate growth models.

Concluding this part dedicated to a brief (and incomplete) review of the theoretical debate and empirical evidences on real convergence, it is useful to mention some recently published papers that highlight how some instruments of the empirical convergence analysis (sigma- and beta-convergence) have been used for investigating national and regional dynamics in employment variables (Marelli, 2000 and 2004; Perugini – Signorelli, 2004).

The joint analysis of the results of convergence investigations (across countries, across regions and for some European club of countries/regions) on both per capita GDP and employment can be useful for producing evidences inclusive of another important "real" variable, i.e. employment, with potential effect from the theoretical point of view.

3. Existence and Stability of a Relationship between Growth and (Un)Employment

In the period 1995-2004 EU-15 countries have been characterised by lower GDP growth rates compared to US, with a worsening in the second half of the period, accompanied by a remarkable and generalised net job creations[10] (*rich-job low-growth*) and reductions in unemployment rates. It should be noted that in the previous 25 years the European countries experimented a worsening of employment performance (increase and persistence of unemployment), also during the more favourable economic cycles (*job-less growth*). In order to favour the approach to the investigation of the recent increase in the "employment intensity" of European growth, in this Section we briefly review the theoretical and empirical literature on the existence and stability of a relationship between growth and (un)employment.

First of all, it should be noted that an increase in employment could be accompanied by both decrease and increase in unemployment: the latter will occur when the labour participation grows faster than employment. Symmetrically, a decrease in employment can be accompanied by both

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[10] The employment growth in EU-15 during the period 1997-2002 consisted in the net job creation of more than 12 million new jobs. It should be noted that the above increase was largely made up of permanent contracts (79% of total net job creation).

increase and a decrease in unemployment: the latter will occur when the labour participation decrease more than employment. For the same reasons, also a decrease in unemployment can be accompanied by both increase or decrease in employment, as an increase in unemployment can be accompanied by both decrease and increase in employment. So, also the relation between employment and unemployment is not simple and stable and we cannot use indifferently the two variables[11].

Some preliminary questions are related to the definition of the (main) direction of causality: (i) is it the per capita GDP growth (for example over a certain threshold) that increases employment (or reduce unemployment)? Or (ii) is it the increase in employment (or the reduction in unemployment) that increases the per capita GDP growth? Or (iii) both per capita GDP and (un)employment changes depend (mainly or exclusively) on many other variables and a (simple and direct) causal relationship does not exist[12]?.

As well-known, the theoretical discussion of the (implicit or explicit, direct or indirect, simple or complex) causal link between output (or effective demand) and unemployment (or employment) has been particularly important in the history of economic research[13]. Considering the aim of this paper, we just present a brief review regarding the last three decades.

Okun (1970) defines a coefficient corresponding to the rate of change of real output associated to a given change in the unemployment rate, focusing on an estimation of potential GDP. So, in this seminal paper unemployment was seen as the exogenous and real GDP as the dependent variable. In many empirical researches estimating the Okun coefficient the causality is mostly assumed to be in the opposite direction, i.e. changes in output may explain the variation of employment or unemployment. Prachowny (1993) considers the theoretical foundation of the Okun's law and derives empirical evidences for the US, supporting the view that the Okun equation is a useful proxy in macroeconomics. Erber (1994) estimates the Okun equation for a number of OECD countries, finding a significant negative correlation between unemployment and growth. Padalino and Vivarelli (1997) find that the Okun relation is still valid in G-7 countries and that the growth-employment link in manufacturing is stronger than for the total economy. Blinder (1997) counts the relation between unemployment and growth among the principles of macroeconomics in which "we should all believe", but he also argued that a simple relation between the percentage change of output and the absolute change in the unemployment rates is "atheoretical, if not indeed antitheoretical". Baker and Schmitt (1999) estimated Okun coefficient for a panel of OECD countries and they found that (i) employment intensity of growth has been in the 1990s higher than in previous periods, and (ii) foreign growth is a determinant variable for domestic employment dynamic. Lee (2000) estimated Okun equation for all OECD countries and stressed that the relationship is not stable over time and is different across countries, but he concluded that the impact of growth on employment is still valid. He also used several methods to calculate the output elasticity of employment or unemployment. Solow (2000) argued that a good deal of the European unemployment is due to lack of demand: he used the Okun relation and quantified the recent output gap for Germany in the neighbourhood of -6%. Flaig and Rottman (2000) criticize the Okun coefficient literature for neglecting the influence of relative prices. In fact, they argue that the employment intensity of growth is strongly related to real labour cost and, hence, estimating a simple Okun equation is not appropriate due to not correct specification. Revenga and Bentolila (1995) explained that different employment intensity of growth can partly depend on differences in labour market institutions.

Notwithstanding the different empirical results, all the various studies suggest that the link between (un)employment and growth is still a useful macroeconomic rule of thumb.

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[11] For a theoretical and empirical discussion on unemployment rate and employment rate, see Roncaglia (2004).

[12] See the well-known (extreme) case of spurious correlation.

[13] Rodano (2004) realised an analysis of the labour market in the history of economic thought, focusing on some of the above questions.

In final part of Section 4 some preliminary evidences on per capita GDP growth elasticity of employment are presented, with a particular attention to differences across countries and over time in recent years.

4. Growth and Employment: New Evidences for European Countries and Regions

In this Section we present empirical evidences and results on (i) long-run dynamics in per capita GDP and employment in Europe compared to United States, (ii) compared performance and convergence dynamics on per capita GDP and employment in EU-25 countries and regions, (iii) employment intensity of growth in EU-15 countries.

4.1. Europe vs. United States: Long-run Dynamics in GDP Growth and Employment

Comparing the average annual changes in per capita GDP (PPP) in Europe and United States, and distinguishing the long period 1870-2000 into five periods (Figure 1), the lower European growth emerges as relatively recent evidence (period 1992-2000), already occurred in the first two periods (1870-1913 and 1913-1950) but not resulting for the other two post-War periods (1950-1973 and 1973-1992). In particular, in the second post-War period the annual average growth rate of Western Europe was higher than US rate by +1.7; it declined to a still positive +0.4 after the 1973 oil shock and, finally, it became a gap of -0.9 in the most recent years 1992-2000[14].

Figure 1 – Long-run per capita GDP Growth in Europe and United States (1870-2000)
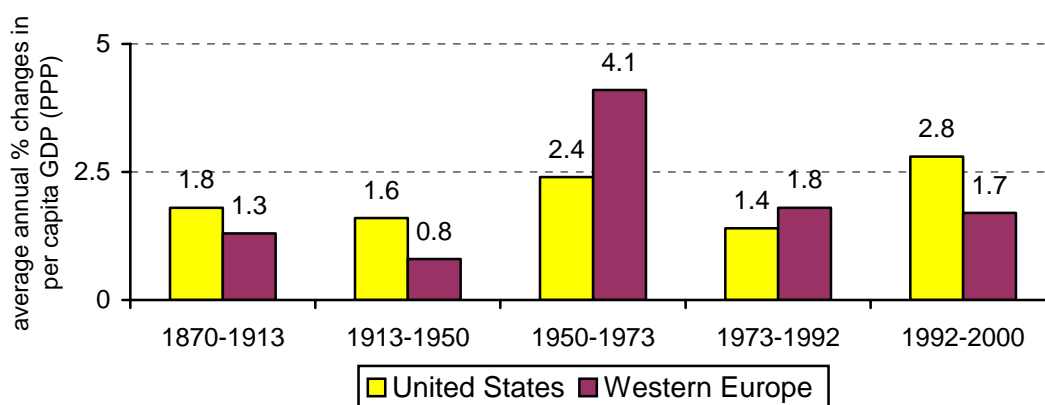
Source: Valli (2002), p. 20. Valli elaborates data mainly produced by Maddison (1995 and 2001), GGDC (2001), IMF and World Bank. Western Europe include also Ireland, Spain, Portugal and Greece.

The differences and changes in per capita GDP and employment can be investigated by distinguishing the level of per capita GDP in the following components.

$$GDP/P = GDP/H \times H/E \times E/WAP \times WAP/P$$

where: GDP/P = GDP/population = per capita GDP
GDP/H = GDP/hour worked = labour productivity
H/E = hour worked/employment = annual average in working hour per employed
E/WAP = employment/working age population (15-64) = employment rate
WAP/P = working age population/population

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[14] It is obvious that a partial dependence of the results on the arbitrary distinction in periods exist. However, the long-run trend is not significantly modified by this periodisation.

In order to produce an immediate and simple comparison between EU-15 and US, all the variables are expressed as percent of US values in the two years 1970 and 2000 (Figure 2). In this period the per capita GDP convergence between the two areas was very weak and the European per capita GDP remained around 70% of that of US. Remarkable changes occurred in the compared labour productivity measured by the GDP divided by the total hour worked: EU-15 productivity increased from 65% to more than 90% of United States productivity. In the same time, the average working hours per employed (initially similar between EU-15 and US) experimented a significant relative drop in EU-15 up to 85% (of that of US). A third remarkable relative change occurred in the employment rate: starting from a situation of better performance in EU-15 in 1970 (an employment rate of 3.6% higher than in US), the EU-15 evidences in 2000 an employment rate of 87.6% of that of US, highlighting the well-known much higher net job creation of the US economy.

Figure 2 – Compared per capita GDP and "Employment" in US (=100) EU-15 (1970 and 2000)
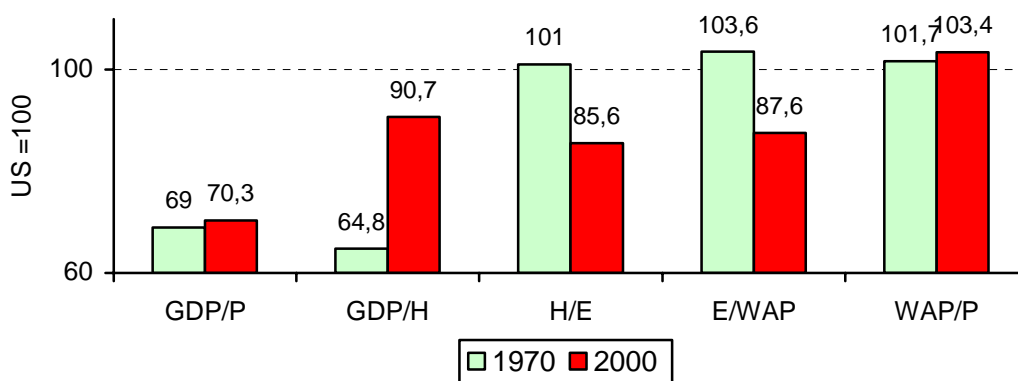
Source: Annual Macroeconomic Database (AMECO) based on ESA 95 national accounts.

The GDP growth can be distinguished in two components: changes in the annual number of hours worked (changes in employment and/or in average working hour per employed) and changes in GDP per hour worked (labour productivity changes).

$$\Delta\ GDP = \Delta\ H + \Delta\ GDP/H$$

During the 1970s, EU-15 experimented an annual GDP growth rate similar to the US rate (3.0 against 3.2), but it was accompanied by a much higher increase in labour productivity (+3.5 against +1.4 of US) and a decrease in "employment" (-0.5 against +1.8 of US).

During the 1980s and the first half of 1990s the European gap in annual GDP growth rate increased, the annual changes in productivity remained higher in EU-15 compared to US, the net job creation of US economy continued while, in the first half of 1990s, the European "job-less growth" of the 1980s became "net job destruction".

As for the more recent period (1995-2003) in the 12 EMU member states the persistence in the gap in annual GDP growth rate has been accompanied, for the fist time, by a lower increase in labour productivity (+1.5 against +2.2 of US), while the annual changes in hours worked was similar (+0.7 against +0.9 of US).

Figure 3 – GDP growth, "Employment" and Productivity in US and EU-15 (1970-1980)
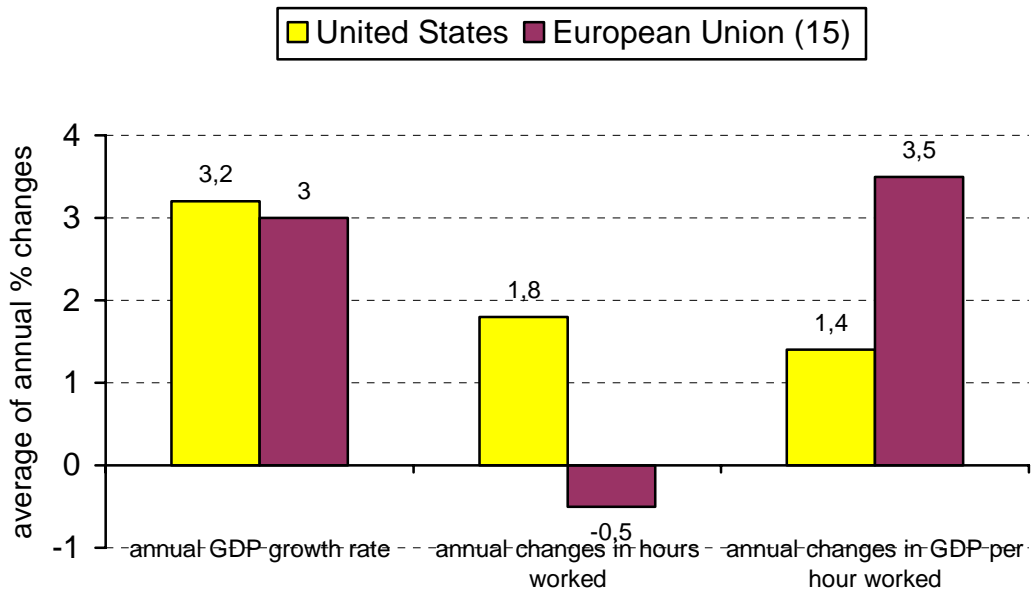
Source: Annual Macroeconomic Database (AMECO) based on ESA 95 national accounts (West Germany included); Employment Outlook, OECD.

Figure 4 – GDP growth, "Employment" and Productivity in US and EU-15 (1980-1990)
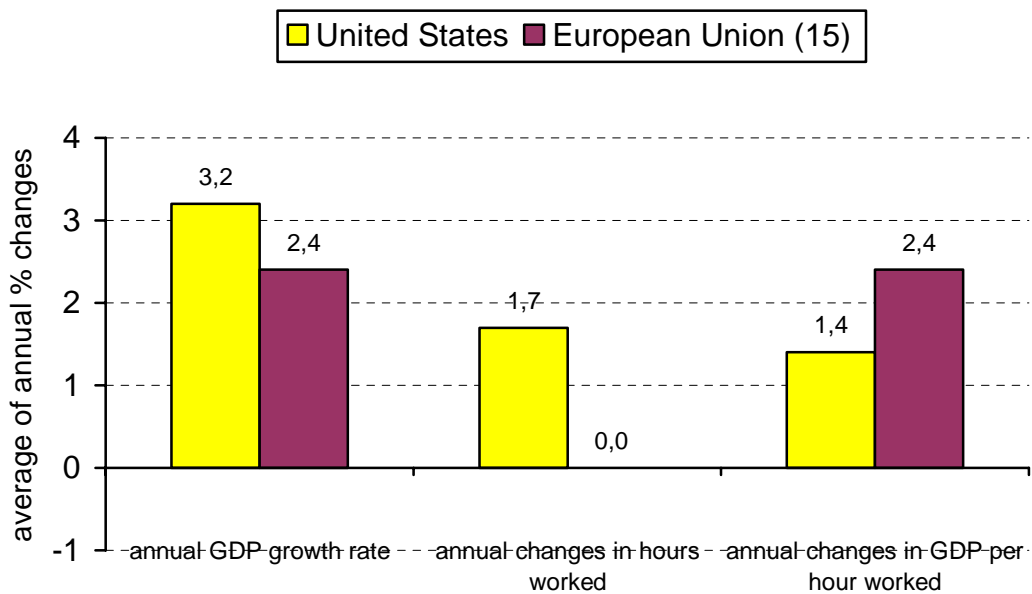
Source: Annual Macroeconomic Database (AMECO) based on ESA 95 national accounts (West Germany included); Employment Outlook, OECD.

Figure 5 – GDP growth, "Employment" and Productivity in US and EU-15 (1991-1995)
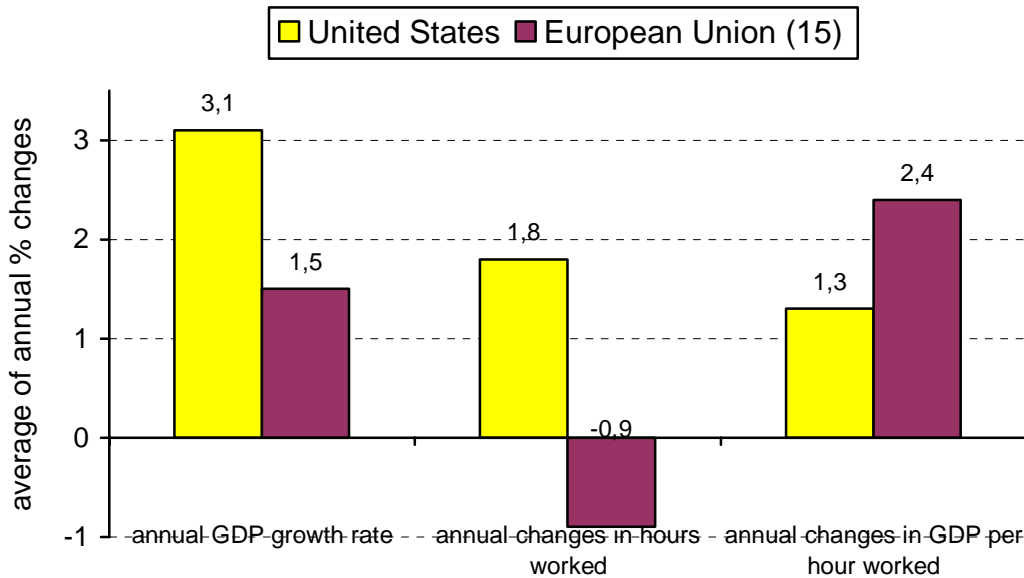
Source: Annual Macroeconomic Database (AMECO) based on ESA 95 national accounts; Employment Outlook, OECD.

Figure 6 – GDP growth, "Employment" and Productivity in US and EMU-12 (1995-2003)
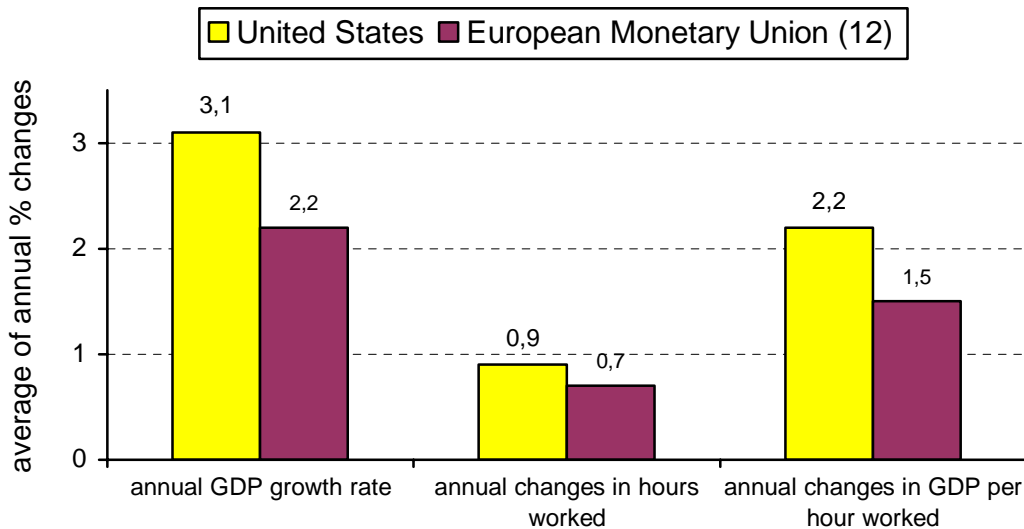
Source: Annual Macroeconomic Database (AMECO) based on ESA 95 national accounts; Employment Outlook, OECD.

The comparison between European Union and United States is useful for highlighting some relative (long-run) tendencies and differences between the two areas, but the significant differentiation between European countries cannot be ignored. So, for the period 1995-2003, we also consider the national differences in GDP growth rates, annual changes in hours worked and annual changes in GDP per hour worked, distinguishing the EU-15 countries and maintaining the comparison with US. Five European countries (Ireland, Luxembourg, Greece, Finland and Spain)

had an annual GDP growth rate higher than US. The annual changes in total hours worked were higher in six EU countries (Luxembourg, Ireland, Spain, Netherlands, Finland and Italy) compared to US. Finally, only four EU countries (Ireland, Greece, Sweden and Finland) had an annual change in GDP per hour worked higher than in US.

Table 1 – Ranking in GDP growth, "Employment" and Productivity in EU-15 and US (1995-2003)

annual GDP growth rates		annual changes in total hours worked		annual changes in GDP per hour worked	
Ireland	7.8	Luxembourg	3.4	Ireland	5.0
Luxembourg	5.2	Ireland	2.8	Greece	3.1
Greece	3.6	Spain	2.6	Sweden	2.3
Finland	3.6	Netherlands	2.0	Finland	2.3
Spain	3.3	Finland	1.3	**United States**	**2.2**
United States	**3.1**	Italy	1.0	United Kingdom	2.2
United Kingdom	2.8	**United States**	**0.9**	Portugal	2.1
Netherlands	2.5	Belgium	0.9	France	2.0
Portugal	2.5	Denmark	0.8	Luxembourg	1.8
Sweden	2.5	United Kingdom	0.6	Austria	1.6
Denmark	2.1	Greece	0.5	Germany	1.6
Austria	2.1	Austria	0.5	Denmark	1.3
France	2.1	Portugal	0.4	Belgium	1.2
Belgium	2.1	Sweden	0.2	Spain	0.7
Italy	1.5	France	0.1	Netherlands	0.5
Germany	1.2	Germany	-0.4	Italy	0.5

Source: OECD Productivity Database.

4.2. Compared Performances and Dynamics of per-capita GDP Growth in EU

In this part we analyse, across European Union countries, the existing difference, the persistence and the convergence in per capita GDP expressed in PPP.

Comparing the situation in 1995 and 2002 for EU-15 countries, it is remarkable the "relative growth" of Ireland that gained ten positions in the ranking, UK improving of four positions, Finland of two (positions), and Luxembourg that maintained the first position of the ranking. On the opposite, Germany and Italy experimented the highest "relative decline" (loosing respectively six and three positions) and their per capita GDP shifted below the EU-15 average. Excluding the above countries, a weak degree of persistence in the ranking emerged for the remaining ones.

Comparing the situation in 1995 and 2002 for EU-25 countries[15], it should be noted that Estonia, Latvia, Hungary, Lithuania, Slovenia, Slovakia and Malta experimented a "relative growth", with respect to EU-25 average. In the opposite situation, Czech Republic and Cyprus had a "relative decline". A generally (weak) degree of persistence of the initial ranking emerged.

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[15] In addition to EU-15, we consider the ten European countries that became EU members on May 2004.

Table 2 – ranking in per capita GDP (1995 and 2002) (PPP, EU-15=100)

1995		2002		relative growth*		Δ ranking
Greece	65.1	Portugal	70.1	Luxembourg	+33.1	=
Portugal	66.0	Greece	71.1	Ireland	+31.7	+10
Spain	79.0	Spain	86.4	United Kingdom	+8.0	+4
Ireland	89.5	Germany	99.3	Finland	+8.1	+2
Finland	95.5	Italy	99.6	Spain	+7.4	=
United Kingdom	99.7	EU-15	100.0	Greece	+6.0	+1
EU-15	**100.0**	France	103.2	Portugal	+5.1	-1
France	104.0	Finland	103.6	Netherlands	+3.0	-1
Italy	104.2	Sweden	104.9	**relative decline***		
Sweden	106.8	Belgium	106.7	Denmark	-0.7	-1
Germany	107.8	United Kingdom	107.7	France	-0.8	-1
Belgium	108.5	Netherlands	111.6	Belgium	-1.8	-2
Netherlands	108.6	Denmark	112.0	Sweden	-1.9	-1
Denmark	112.7	Austria	112.2	Austria	-4.4	-1
Austria	116.6	Ireland	121.2	Italy	-4.6	-3
Luxembourg	161.3	Luxembourg	194.4	Germany	-8.5	-6

Source: Eurostat.
Note: * Differences between the per capita GDP in 2002 (as percent of EU-15 GDP average in 2002) and the per capita GDP in 1995 (as percent of EU-15 GDP average in 1995).

Table 3 – ranking in per capita GDP (1995 and 2002) (PPA, EU-25=100)

1995		2002		relative growth*		Δ ranking
Latria	29.8	Latvia	39.0	Luxembourg	+33.9	=
Lithuania	34.1	Lithuania	42.4	Ireland	+33.6	+9
Estonia	35.5	Poland	45.6	Estonia	+11.1	+1
Poland	40.8	Estonia	46.6	Latria	+9.2	=
Slovakia	44.5	Slovakia	51.3	Hungary	+9.0	=
Hungary	49.6	Hungary	58.6	Lithuania	+8.3	=
Slovenia	68.4	Czech Republic	67.6	Finland	+7.6	+3
Malta	69.7	Malta	74.3	United Kingdom	+7.4	+4
Czech Republic	70.0	Slovenia	75.3	Spain	+7.1	=
Greece	72.1	Portugal	76.7	Slovenia	+6.9	+2
Portugal	73.1	Greece	77.7	Slovakia	+6.8	=
Cyprus	85.4	Cyprus	82.9	Greece	+5.6	+1
Spain	87.5	Spain	94.6	Poland	+4.8	-1
Ireland	99.1	**EU-25**	**100.0**	Malta	+4.6	=
EU-25	**100.0**	Germany	108.7	Portugal	+3.6	-1
Finland	105.8	Italy	109.0	Netherlands	+1.9	-1
United Kingdom	110.4	France	112.9	**relative decline***		
France	115.2	Finland	113.4	Belgium	-1.4	-2
Italy	115.3	Sweden	114.8	France	-2.3	-1
Sweden	118.2	Belgium	116.7	Czech Republic	-2.4	-2
Germany	119.4	United Kingdom	117.8	Denmark	-2.4	-1
Belgium	120.1	Netherlands	122.1	Cyprus	-2.5	=
Netherlands	120.2	Denmark	122.5	Sweden	-3.4	-1
Denmark	124.9	Austria	122.7	Italy	-6.3	-3
Austria	129.1	Ireland	132.7	Austria	-6.4	-1
Luxembourg	178.7	Luxembourg	212.6	Germany	-10.7	-5

Source: Eurostat.
Note: * Differences between the per capita GDP in 2002 (as percent of EU-25 GDP average in 2002) and the per capita GDP in 1995 (as percent of EU-25 GDP average in 1995).

The convergence analysis of per capita GDP (PPP) is carried out first across EU countries and than across EU regions, considering the following aggregations: EU-25, EU-15 (before May 2004 enlargement), EMU-12 (adopting euro), 8 CEC-NM (eight out of ten new EU members, i.e. excluding Malta and Cyprus).

As for the analysis at national level, both sigma-convergence and Lowess beta convergence were considered. Sigma-convergence consists of analyzing the evolution of the dispersion of per capita GDP (we use the standard deviation of the variable transformed into natural logarithms), while Lowess (locally weighted scatterplot smoothing) is a non-parametric technique for estimating the relationship between GDP growth rates and initial GDP levels, and can (graphically) reveal the existence of beta convergences/divergences or more complex relationships.

Considering the period 1995-2002, as for sigma-convergence (Table 4), the results show a convergence across EU-25 countries and, especially, across 8 CEC-NM (club convergence), while the degree of dispersion of per capita GDP slowly increased in EU-15 and EMU-12.

Table 4 – Sigma-convergence on per capita GDP (PPP) across EU countries

	1995	1996	1997	1998	1999	2000	2001	2002
EU – 25	0.4870	0.4734	0.4584	0.4520	0.4611	0.4583	0.4417	0.4266
EU – 15	0.2266	0.2253	0.2258	0.2297	0.2402	0.2494	0.2427	0.2347
EMU-12	0.2512	0.2494	0.2508	0.2564	0.2679	0.2788	0.2717	0.2634
8 CEC-NM	0.3142	0.3071	0.2784	0.2593	0.2654	0.2477	0.2388	0.2313

Source: elaboration on Eurostat data.

As for the Lowess technique, with a 0.8 span, we decided to exclude the small Luxembourg (as well-known characterised by the highest per capita GDP level and one of the highest per capita GDP growth). As highlight in Figure 7, a clear beta-convergence emerged in EU-25 and 8 CEC-NM. As for EU-15 and EMU-12 a weak lowess beta-convergence exists only among the best performing countries.

Figure 7 – Lowess beta-convergence on per capita GDP (PPP) across EU countries
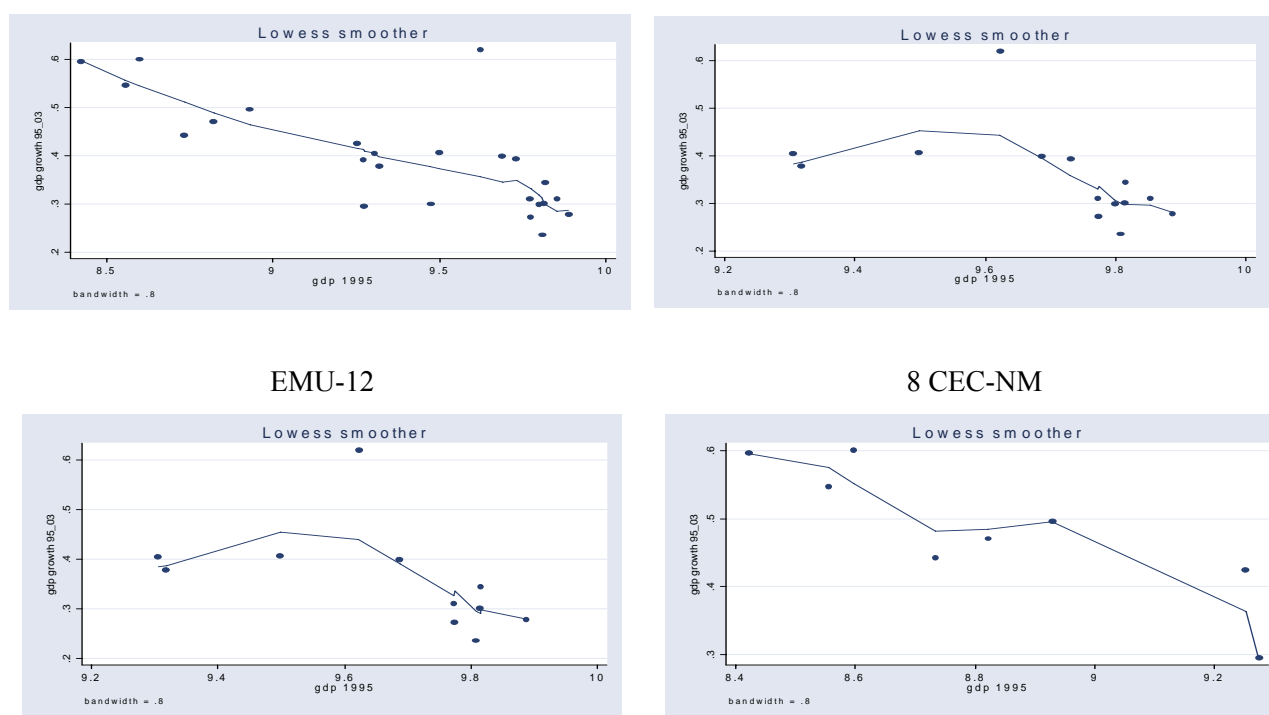
Source: elaboration on Eurostat data.

The convergence analysis across countries may hide different dynamics at regional level. For that reason we produce an empirical investigation of sigma-convergence and parametric beta-convergence for European regions (NUTS II), using the Eurostat-regio database. A sigma convergence emerged considering all the 250 EU-25 regions, while a (weak) convergence across EU-15 and EMU-12 regions can be appreciate only at the end of the considered period. As for 8 CEC-NM the sigma values are quite stable with a tendency toward divergence since 1998.

Table 5 – Sigma-convergence on per capita GDP (PPP) across EU regions

	1995	1996	1997	1998	1999	2000	2001	2002
EU – 25	0.4049	0.3977	0.3884	0.3863	0.3857	0.3864	0.3824	0.3758
EU – 15	0.2692	0.2680	0.2633	0.2648	0.2621	0.2664	0.2644	0.2558
EMU-12	0.2830	0.2810	0.2728	0.2732	0.2695	0.2713	0.2691	0.2580
8 CEC-NM	0.3315	0.3343	0.3212	0.3158	0.3200	0.3193	0.3290	0.3380

Source: elaboration on Eurostat-regio database.

Different information is supplied by the estimates along the lines of the β-convergence approach. In the basic formulation for absolute beta-convergence, the regression model shows the link between per capita GDP growth rates and initial levels of per capita GDP:

$$\Delta \text{ GDP}_{1995\text{-}2002} = \alpha + \beta \text{GDP}_{1995} + \varepsilon$$

Where GDP_{1995} are per capita GDP levels in 1995 and $\Delta \text{ GDP}_{1995\text{-}2002}$ are the rates of changes in per capita GDP over the interval 1995-2003. Parameter β describes the converging (if negative) or diverging (if positive) trend of regional per capita GDP toward the mean[16].

In order to control for sectoral structure, we also consider the conditional beta-convergence, considering the weigh, in terms of share on total added value, of the three sectors (agriculture, industry and services)[17]. Both absolute and conditional beta-convergence are carried out considering the European regions distinguished in the main EU aggregations: EU-25 regions, EU-15 regions, EMU-12 regions and 8 CEC-NM regions.

Considering the period 1995-2003, a significant absolute beta-convergence emerged across the 250 EU-25 regions (Table 6), but also across the regions belonging to EU-15 and EMU-12 (Table 7 and 8). The sign of beta is negative also for the 8 CEC-NM regions but the result is not statistically significant.

As for the conditional beta convergence, controlling for the sectoral composition of added value in 1995, the main statistically significant results highlighted: (i) the expected permanence of the negative signs of beta parameters and the significance of the results with the exclusion of 8 CEC-NM regions aggregation; (ii) the significance and negative signs for the industrial sector for EU-25 regions, EU-15 and EMU-12 regions, i.e. regions with a higher share of industrial added value in 1995 experimented lower per capita GDP growth rates in the period 1995-2003; (iii) the opposite occurred controlling for the initial weight of service sector: regions, belonging to EU-25 and EU-15, with the higher weight of services in 1995 performed better in terms of per capita GDP growth rates in the period 1995-2003 (the result is not significant for EMU-12 and 8 CEC-NM); (iv) as for agricultural sector, the sign is positive and significant only for EMU-12 regions, i.e. regions belonging to Eurozone that present a higher weight of agricultural sector in 1995 experimented higher per capita GDP growth rates in the period 1995-2003 (the not significant results for the other aggregations are accompanied by positive signs for EU-25 and EU-15 and a negative sign for 8 CEC-NM).

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[16] To the aim of the paper, we only consider the sign and the significance of the estimates, without any consideration about the levels of the beta-parameters.

[17] Obviously, in these cases another explicative variable is inserted in the regression model.

Table 6 – Absolute and Conditional Convergence of Regional per capita GDP (PPP) in EU-25

Dependent GDP growth 1995-2002	Coefficient and P-values	Coefficient and P-values	Coefficient and P-values	Coefficient and P-values
GDP 1995	-0.101 (0.000)	-0.089 (0.000)	-0.112 (0.000)	-0.131 (0.000)
Agricultural % AV 1995		0.196 (0.270)		
Industrial % AV 1995			-0.337 (0.000)	
Services % AV 1995				0.323 (0.000)
Constant	1.295 (0.000)	1.169 (0.000)	1.499 (0.000)	1.373 (0.000)
	Observations: 250 Adjusted R^2: 0.158 Prob F: 0.0000	Observations: 250 Adjusted R^2: 0.165 Prob F: 0.0000	Observations: 250 Adjusted R^2: 0.226 Prob F: 0.0000	Observations: 250 Adjusted R^2: 0.216 Prob F: 0.0000

Source: elaboration on Eurostat-regio database.

Table 7 – Absolute and Conditional Convergence of Regional per capita GDP (PPP) in EU-15

Dependent GDP growth 1995-2002	Coefficient and P-values	Coefficient and P-values	Coefficient and P-values	Coefficient and P-values
GDP 1995	-0.108 (0.000)	-0.078 (0.007)	-0.100 (0.000)	-0.122 (0.000)
Agricultural % AV 1995		0.322 (0.082)		
Industrial % AV 1995			-0.277 (0.001)	
Services % AV 1995				0.217 (0.008)
Constant	1.358 (0.000)	1.055 (0.000)	1.369 (0.000)	1.354 (0.000)
	Observations: 209 Adjusted R^2: 0.094 Prob F: 0.0000	Observations: 209 Adjusted R^2: 0.103 Prob F: 0.0000	Observations: 209 Adjusted R^2: 0.139 Prob F: 0.0000	Observations: 209 Adjusted R^2: 0.085 Prob F: 0.0000

Source: elaboration on Eurostat-regio database.

Table 8 Absolute and Conditional Convergence of Regional per capita GDP (PPP) in EMU-12

Dependent GDP growth 1995-2002	Coefficient and P-values	Coefficient and P-values	Coefficient and P-values	Coefficient and P-values
GDP 1995	-0.141 (0.000)	-0.084 (0.007)	-0.130 (0.000)	-0.147 (0.000)
Agricultural % AV 1995		0.563 (0.004)		
Industrial % AV 1995			-0.234 (0.009)	
Services % AV 1995				0.114 (0.204)
Constant	1.670 (0.000)	1.096 (0.000)	1.634 (0.000)	1.655 (0.000)
	Observations: 163 Adjusted R^2: 0.171 Prob F: 0.0000	Observations: 163 Adjusted R^2: 0.207 Prob F: 0.0000	Observations: 163 Adjusted R^2: 0.200 Prob F: 0.0000	Observations: 163 Adjusted R^2: 0.174 Prob F: 0.0000

Source: elaboration on Eurostat-regio database.

Table 9 – Beta-Convergence of Regional per capita GDP (PPP) in 8 CEC-NM

Dependent GDP growth 1995-2002	Coefficient and P-values	Coefficient and P-values	Coefficient and P-values	Coefficient and P-values
GDP 1995	-0.047 (0.438)	-0.097 (0.261)	-0.033 (0.510)	-0.030 (0.728)
Agricultural % AV 1995		-0.684 (0.411)		
Industrial % AV 1995			-0.949 (0.000)	
Services % AV 1995				1.063 (0.000)
Constant	0.818 (0.128)	1.315 (0.108)	1.042 (0.023)	0.779 (0.730)
	Observations: 39 Adjusted R^2: -0.010 Prob F: 0.4377	Observations: 39 Adjusted R^2: -0.019 Prob F: 0.5273	Observations: 39 Adjusted R^2: 0.305 Prob F: 0.0005	Observations: 39 Adjusted R^2: 0.377 Prob F: 0.0001

Source: elaboration on Eurostat-regio database.

4.3. Compared Performances and Dynamics of Employment Rate in European Union

In this part of the paper we carry out a compared employment performance investigation between European countries and a convergence analysis at both national and regional levels.

Traditional economic literature considers unemployment indicators to be the main proxies of labour market performance. Although already in the late 1960s the usefulness of considering also employment dynamics was emphasized (Valli, 1970), only recently many authors have started to prefer the use of employment indicators (e.g. Frey, 1994; Signorelli, 1997; Moro, 1998; Garibaldi – Mauro, 2002; Tronti, 2002; Marelli, 2004a). We argue that, for various reasons, employment

indicators are preferable to unemployment indicators[18]. Besides, the Lisbon European Council (March 2000) defined the total employment rate (calculated on working age population 15-64) as the crucial objective variable to be improved. In particular, the Lisbon Council defined the following main quantitative objective to be obtained by 2010: an overall EU employment rate of 70%[19].

Table 10 - Total Employment rates: rankings in EU-25 (plus Romania and Bulgaria) (2003)

Total Employment Rate		EU objective gap	EU objective = 100
Denmark	75.1	+5.1	107.3
Netherlands	73.5	+3.5	105.0
Sweden	72.9	+2.9	104.1
U.K.	71.8	+1.8	102.6
Austria	69.2	-0.8	98.9
Cyprus	69.2	-0.8	98.9
Finland	67.7	-2.3	96.7
Portugal	67.2	-2.8	96.0
Ireland	65.4	-4.6	93.4
Germany	64.8	-5.2	92.6
Czech Republic	64.7	-5.3	91.9
Luxembourg	63.1	-6.9	90.1
Estonia	62.9	-7.1	90.0
France	62.8	-7.2	89.7
Slovenia	62.6	-7.4	89.4
Latria	61.8	-8.2	88.3
Lithuania	61.1	-8.9	87.3
Spain	59.7	-10.3	85.3
Belgium	59.6	-10.4	85.1
Greece	57.9	-12.1	82.7
Slovak Republic	57.7	-12.3	82.4
Romania	57.6	-12.4	82.3
Hungary	57.0	-13.0	81.4
Italy	56.1	-13.9	80.1
Malta	54.5	-15.5	77.9
Bulgaria	52.5	-17.5	75.0
Poland	51.2	-18.8	73.1

Source: elaboration on Eurostat data, 2004.
Note: Total employment rate for Luxembourg refer to 2002.

With respect to the main "Lisbon objective", only four "old" EU-15 countries have reached total employment rates exceeding 70% (Denmark, the Netherlands, Sweden, the United Kingdom);

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[18] This is because, first of all, there are well-known difficulties and (national) differences in defining the unemployed condition, especially as regards the "active search for a job". Second, unemployment rate depends on participation rate (labour supply), which in turn depends on employment rate (job opportunities). In particular, compared evidence shows that similar unemployment rates are compatible with significant differences in employment rates. The weakening of a negative correlation between growth of employment and a rise in unemployment, due to important changes in labour force participation, is, for example, reported by Boeri and Scarpetta (1996) with regard to regional labour markets in some transition economies. In addition, considering the importance of the fiscal wedge on labour (social contributions and labour income tax), total employment rates are also important indicators of the sustainability of national welfare systems.

[19] In the same European Council a second quantitative objective has been defined: a female employment rate higher than 60%. In addition, the Stockholm European Council (March 2001) added a third goal: (iii) an employment rate higher than 50% (by 2010) for older (55-64) workers. Another important European objective, not defined in precise quantitative terms, regards the emergence of irregular employment from the shadow economy (see, Perugini – Signorelli, 2004).

ten countries (four "old" EU-15, four "new" EU members, plus Romania and Bulgaria) have total employment rates (TER) under 60% (Spain, Belgium, Greece, Slovak Republic, Romania, Hungary, Italy, Malta, Bulgaria, Poland). The remaining countries (seven "old" EU-15 and six "new" EU members) have TER between 60 and 70% (Table 10).

The changes in total employment rates between 1997 and 2003 are all positive for the "old" EU-15 members (especially Spain, Ireland, The Netherlands, Italy and Finland)[20], whereas five "new" EU members (Poland, the Slovak Republic, the Czech Republic, Estonia and Lithuania) plus Romania show a negative variation (Table 11).

Table 11 − Net Job Creation/Destruction: rankings in EU-25 (plus Romania and Bulgaria)

Net Job Creation or Destruction Δ TER 1997-2003	% Net Job Creation or Destruction (Δ TER 1997-2003)* 100/TER 1997
Spain +10.3	Spain +20.9%
Ireland +7.9	Ireland +13.7%
Netherlands +5	Italy +9.4%
Italy +4.8	Hungary +8.8%
Hungary +4.6	Netherlands +7.3%
Finland +4.4	Finland +7.0%
Cyprus +3.5	France +5.4%
Sweden +3.4	Cyprus +5.3%
France +3.2	Luxembourg +5.3%
Luxembourg +3.2	Greece +5.1%
Belgium +2.8	Belgium +4.9%
Greece +2.8	Sweden +4.9%
Bulgaria +2.1	Bulgaria +4.2%
Latvia +1.9	Latvia +3.2%
U.K. +1.9	U.K. +2.7%
Portugal +1.5	Portugal +2.3%
Austria +1.4	Austria +2.1%
Germany +1.1	Germany +1.7%
Malta +0.3	Malta +0.6%
Denmark +0.2	Denmark +0.3%
Slovenia 0.0	Slovenia 0.0%
Lithuania -1.2	Lithuania -1.9%
Estonia -1.7	Estonia -2.6%
Czech Republic -2.6	Czech Republic -3.9%
Slovak Republic -2.9	Slovak Republic -4.8%
Poland -7.7	Romania -11.9%
Romania -7.8	Poland -13.1%

Source: elaboration on Eurostat data, 2004.
Note: 1997-2002 for Luxembourg; 1998-2003 for the Czech Republic, Estonia, Latvia, Lithuania and the Slovak Republic; 2000-2003 for Cyprus, Malta and Bulgaria.

Similarly to per capita GDP, as for total employment rate we realised a convergence analysis across European countries and regions. Both sigma-convergence and Lowess beta convergences were considered, for the period 1997-2003, according to the following groups of countries: Europe-25, Europe 24, EU-15, EMU-12, CEC-10 and 8 CEC-NM.

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[20] It should be noted that the EU-15 employment growth during the period 1997-2002 (more than 12 million new jobs) was largely made up of permanent contracts (79% of total net job creation: 44% females, 35% males). The remaining 21% is represented by temporary contracts (13% females, 8% males). In addition, the same job creation was mainly due to full-time contracts (69% of net job creation: 36% males, 33% females), as opposed to part-time jobs (31% new jobs, 24% females, 7% males) (EU, 2003 and 2004).

The sigma-convergence analysis produced the following main results: (i) a remarkable sigma convergence for the EU-15 and EMU-12; (ii) a diverging trend starting in 1999 for the 8 CEC-NM; (iii) in the other aggregations, the sigma values are quite stable, although a sort of an inverted U-shape emerges for the period 2000-2003 (Table 12).

Table 12 - Sigma convergence of country total employment rates

	1997	1998	1999	2000	2001	2002	2003
Europe 24		0.0964	0.0947	0.0977	0.1006	0.1003	0.0937
Europe 25				0.1050	0.1090	0.1073	0.0987
EU – 15	0.1163	0.1116	0.1080	0.1026	0.1014	0.0961	0.0884
EMU-12	0.1004	0.0974	0.0952	0.0902	0.0896	0.0846	0.0760
8 CEC-NM		0.0633	0.0494	0.0537	0.0623	0.0717	0.0708
CEC-10				0.0717	0.0788	0.0797	0.0744

Source: elaboration on Eurostat data.
Note: Europe 25 = EU-15 plus CEC-10.
*   CEC-10 = 8 CEC-NM plus Romania and Bulgaria*
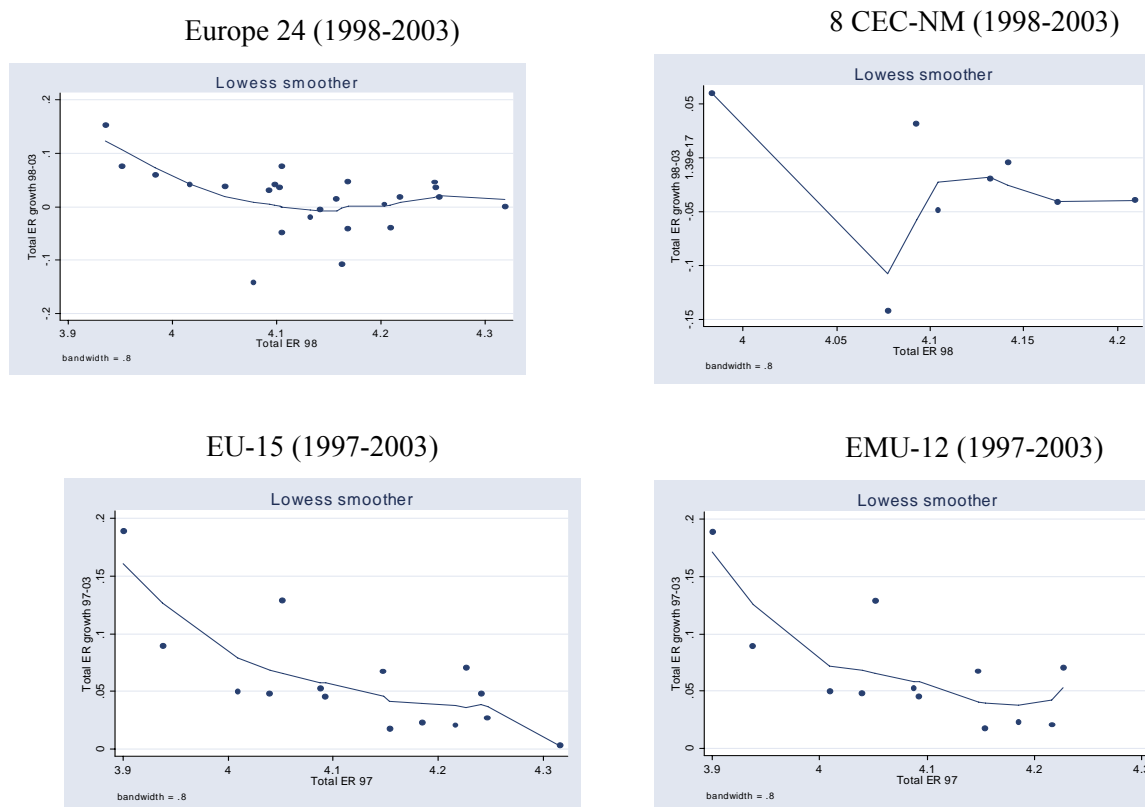*   Europe 24 = Europe 25 excluding Bulgaria.*
*   8 CEC-NM = includes the new (2004) EU members, excluding Malta and Cyprus.*
*   The above aggregations are determined by lack of data in some countries.*

As for the non parametric beta-Lowess technique, a clear beta-convergence emerged in EU-15 and EMU-12 total employment rates (Figure 8): the countries with the worst initial performances (1997) showed the highest employment growth (in 1997-2003). In the Europe-24 aggregation (1998-2003), only some of the worst performing countries in 1998 tend to converge, whereas, considering the 8 CEC-NM, no significant relationship between initial conditions and employment growth emerged.

Figure 8 – Lowess beta-convergence on total employment rates across EU countries

Europe 24 (1998-2003)

8 CEC-NM (1998-2003)

EU-15 (1997-2003)

EMU-12 (1997-2003)

Source: elaboration on Eurostat-regio database.

18

Similarly to previous analysis on per capita GDP, we carried out empirical investigations of sigma-convergence and parametric beta-convergence on employment rates for European regions (NUTS II level of classification), using the same Eurostat-regio data base. As for sigma-convergence, the main results highlighted (i) a weak sigma convergence across Europe-25 regions, (ii) significant sigma convergence for both EU-15 and EMU-12 regions, (iii) a strongly diverging trend for the regions of the eight new EU member states (Table 13).

Table 13 - Sigma convergence of regional total employment rates

	1999	**2000**	**2001**	**2002**	**2003**
Europe 25	0.1377	0.1377	0.1376	0.1373	0.1312
EU-15	0.1376	0.1347	0.1306	0.1255	0.1187
EMU-12	0.1316	0.1309	0.1256	0.1206	0.1131
CEC-10	0.1216	0.1179	0.1202	0.1195	0.1135
CEC-8 NM	0.0924	0.1012	0.1091	0.1244	0.1229

Source: elaboration on Eurostat-regio database.

The main result of the absolute beta-convergence investigation is that in all European aggregations of regions a remarkable and significant convergence dynamics occurred in the period 1999-2003, with the only exception of CEC-NM regions that present not statistically significant results.

Considering the conditional beta-convergence analysis, based on sectoral employment in the initial year (1999), the following main results emerged: (i) across Europe-25 regions, the best performer were those with an initial lower weigh of agricultural and industrial employment and an initial higher weight of employment in services sector, (ii) in CEC-10 regions, the best performing regions had a lower agricultural employment in 1999, (iii) in EU-15 and 8 CEC-NM the results are not statistically significant.

Table 14 – Absolute and Conditional Convergence of regional employment rates: Europe-25

Dependent ER growth 1999-2003	Coefficient and P-values	Coefficient and P-values	Coefficient and P-values	Coefficient and P-values
1999 ER	- 0.122 (0.000)	-0.151 (0.000)	-0.087 (0.001)	-0.266 (0.000)
1999 ER agriculture	-	-0.015 (0.000)	-	-
1999 ER Industry	-	-	-0.025 (0.003)	-
1999 ER Services	-	-	-	0.123 (0.000)
Constant	0.521 (0.000)	0.656 (0.000)	0.440 (0.000)	0.650 (0.000)
	Observations: 262 Adjusted R^2: 0.084 Prob F: 0.0000	Observations: 262 Adjusted R^2: 0.161 Prob F: 0.0000	Observations: 262 Adjusted R^2: 0.111 Prob F: 0.0000	Observations: 262 Adjusted R^2: 0.285 Prob F: 0.0000

Source: elaboration on Eurostat-regio database.

Table 15 – Absolute and Conditional Convergence of regional employment rates: EU-15

Dependent ER growth 1999-2003	Coefficient and P-values	Coefficient and P-values	Coefficient and P-values	Coefficient and P-values
1999 ER	-0.173 *(0.000)*	-0.169 *(0.000)*	-0.182 *(0.000)*	-0.183 *(0.000)*
1999 ER agriculture	-	0.002 *(0.414)*	-	-
1999 ER Industry	-	-	0.005 *(0.415)*	-
1999 ER Services	-	-	-	0.009 *(0.634)*
Constant	0.746 *(0.000)*	0.732 *(0.000)*	0.773 *(0.000)*	0.751 *(0.000)*
	Observations: 209 *Adjusted R^2: 0.333* *Prob F: 0.0000*	*Observations: 209* *Adjusted R^2: 0.332* *Prob F: 0.0000*	*Observations: 209* *Adjusted R^2: 0.332* *Prob F: 0.0000*	*Observations: 209* *Adjusted R^2: 0.330* *Prob F: 0.0000*

Source: elaboration on Eurostat-regio database.

Table 16 – Absolute and Conditional Convergence of regional employment rates: EMU-12

Dependent ER growth 1999-2003	Coefficient and P-values	Coefficient and P-values	Coefficient and P-values	Coefficient and P-values
1999 ER	-0.184 *(0.000)*	-0.183 *(0.000)*	-0.198 *(0.000)*	-0.187 *(0.000)*
1999 ER agriculture	-	0.003 *(0.388)*	-	-
1999 ER Industry	-	-	0.006 *(0.396)*	-
1999 ER Services	-	-	-	0.004 *(0.862)*
Constant	0.792 *(0.000)*	0.784 *(0.000)*	0.834 *(0.000)*	0.792 *(0.000)*
	Observations: 163 *Adjusted R^2: 0.314* *Prob F: 0.0000*	*Observations: 163* *Adjusted R^2: 0.312* *Prob F: 0.0000*	*Observations: 163* *Adjusted R^2: 0.312* *Prob F: 0.0000*	*Observations: 163* *Adjusted R^2: 0.309* *Prob F: 0.0000*

Source: elaboration on Eurostat-regio database.

Table 17 – Absolute and Conditional Convergence of regional employment rates: CEC-10

Dependent ER growth 1999-2003	Coefficient and P-values	Coefficient and P-values	Coefficient and P-values	Coefficient and P-values
1999 ER	-0.209 (0.009)	-0.200 (0.007)	-0.231 (0.004)	-0.241 (0.003)
1999 ER agriculture	-	-0.030 (0.002)	-	-
1999 ER Industry	-	-	0.061 (0.098)	-
1999 ER Services	-	-	-	0.062 (0.053)
Constant	0.808 (0.013)	0.829 (0.006)	0.731 (0.023)	0.753 (0.022)
	Observations: 53 Adjusted R^2: 0.109 Prob F: 0.0092	Observations: 53 Adjusted R^2: 0.252 Prob F: 0.0003	Observations: 53 Adjusted R^2: 0.140 Prob F: 0.0087	Observations: 53 Adjusted R^2: 0.157 Prob F: 0.0659

Source: elaboration on Eurostat-regio database.

Table 18 – Absolute and Conditional Convergence of regional employment rates: 8 CEC-NM

Dependent ER growth 1999-2003	Coefficient and P-values	Coefficient and P-values	Coefficient and P-values	Coefficient and P-values
1999 ER	0.117 (0.329)	0.042 (0.728)	0.076 (0.525)	-0.049 (0.763)
1999 ER agriculture	-	-0.027 (0.042)	-	-
1999 ER Industry	-	-	0.066 (0.102)	-
1999 ER Services	-	-	-	0.130 (0.148)
Constant	-0.524 (0.285)	-0.171 (0.730)	-0.537 (0.263)	-0.310 (0.537)
	Observations: 39 Adjusted R^2: -0.001 Prob F: 0.3292	Observations: 39 Adjusted R^2: 0.085 Prob F: 0.0770	Observations: 39 Adjusted R^2: 0.046 Prob F: 0.1608	Observations: 39 Adjusted R^2: 0.031 Prob F: 0.2160

Source: elaboration on Eurostat-regio database.

4.4. Employment Intensity of Growth: Co-movements, Thresholds and Elasticity

As already highlighted, since the "EU White Paper on competitiveness, growth and employment" (1993) the target of increasing the employment intensity of growth has been clearly posed. In this EU document has been also stated that a GDP growth rate of about 2% would be just enough to keep employment constant. If one take this statement (GDP growth threshold) as given, the employment increase in EU-15, during the period 1995-2003, must be taken as a surprise. In

fact an annual employment growth average of about 1.1% (about 14.7 million new jobs, with an increase in total employment rate from 60.1 in 1995 to 64.3 in 2003) has been obtained with an average annual GDP growth rate of just 2.2%.

It is obvious that the analysis of the determinants of employment intensity of growth is of crucial importance[21] for the possible policy implications. However, as a first stage of a more ambitious research project finalised to shed light on the important question whether the empirical regularity between employment and GDP growth is still valid, we present and briefly discuss some preliminary evidences, across countries and over recent years, on (i) the co-movements of real GDP and employment, (ii) the levels and changes in the "GDP growth threshold" permitting employment increases and (iii) the values and changes in elasticity of employment with respect to GDP growth[22].

The descriptive analysis highlighted the following preliminary results: (i) the existence of a strong positive correlation between GDP growth and employment changes is confirmed, especially for EU-15 with respect to US, (ii) a lower threshold of "GDP growth rates permitting employment increases" occurred in EU-15 compared to US (about 0.5 against 2.5 of US), (iii) the correlation coefficient between GDP growth and employment changes is generally positive in EU-15 countries, with the exception of Italy (negative correlation) and Greece (absence of correlation), (iv) the "GDP threshold" is significantly different across EU-15 countries and seems to shift downward over time, (v) the elasticity values of employment with respect to GDP differ remarkably across EU-15 countries and are highly unstable over time.

Table 19 – GDP and Employment annual changes in EU-15 and US (1995-2003)

		1995	1996	1997	1998	1999	2000	2001	2002	2003	correlation coefficient
EU-15	GDP	2.4	1.6	2.5	2.9	2.9	3.5	1.6	1.0	0.7	0.88
	Employment	0.8	0.6	0.9	1.8	1.7	2.0	1.2	0.5	0.3	
US	GDP	2.5	3.7	4.5	4.2	4.5	3.7	0.5	2.2	3.1	0.76
	Employment	2.1	1.7	2.1	2.2	2.0	2.0	-0.2	-0.9	0.9	

Source: elaboration on Annual Macroeconomic Database (AMECO) based on ESA 95 national accounts; Employment Outlook, OECD.

**Figure 9 – GDP and Employment annual changes in EU-15 (1995-2003)**
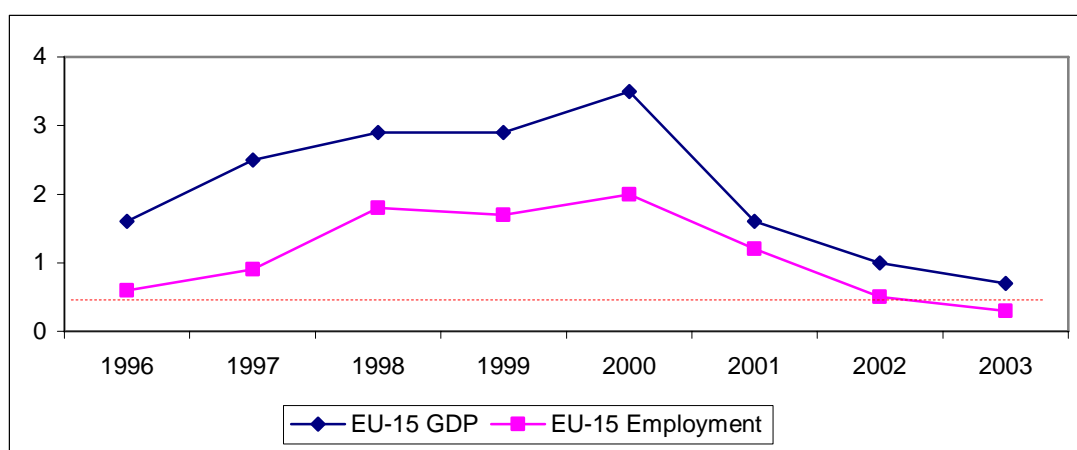
Source: Annual Macroeconomic Database (AMECO) based on ESA 95 national accounts.

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[21] Many studies tried to investigate the main determinants of the employment intensity of growth: real wage dynamics, sectoral employment changes, labour market institutions evolution, etc.
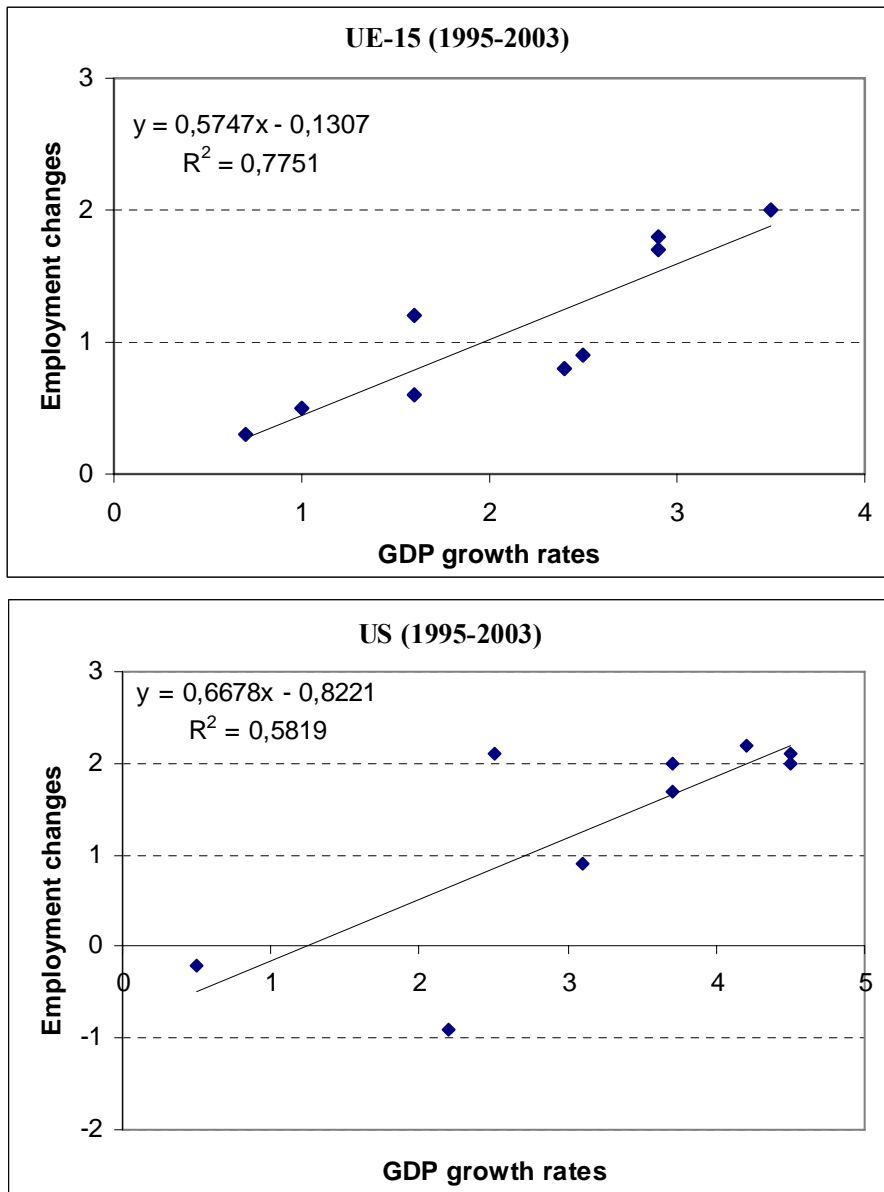
[22] The elasticity has been simply calculated dividing the % rate of change of employment by the % rate of change of GDP.

Figure 10 – GDP and Employment annual changes in US (1995-2003)
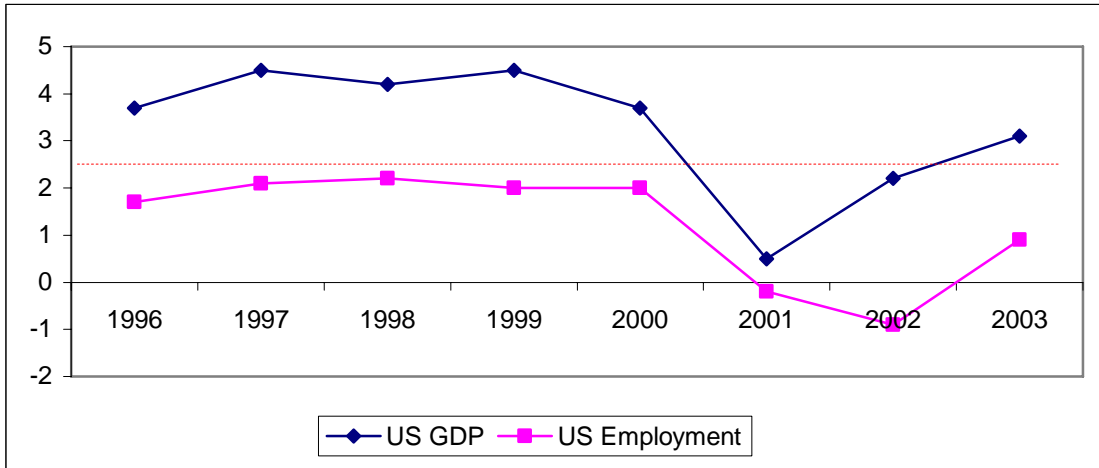
Source: elaboration on Annual Macroeconomic Database (AMECO) based on ESA 95 national accounts.

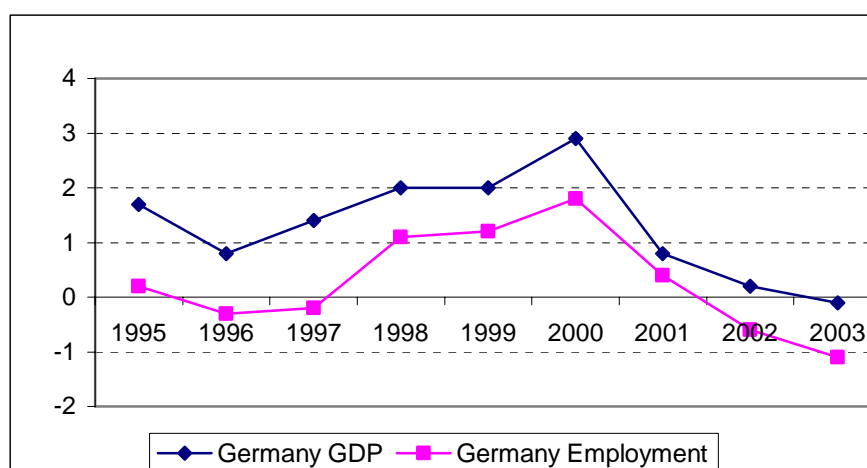**Figure 11 – The Correlation between GDP growth and Employment changes: UE-15 and US**

Source: elaboration on Annual Macroeconomic Database (AMECO) based on ESA 95 national accounts.

Table 20 – Annual GDP Growth rates and Employment changes in EU-15 Countries

|		1995	1996	1997	1998	1999	2000	2001	2002	2003	correlation coefficient
Belgium	GDP	2.4	1.2	3.5	2.0	3.2	3.8	0.6	0.7	1.1	0.44
	Employment	4.1	0.3	0.9	1.8	1.4	1.9	1.5	-0.3	-0.5	
Denmark	GDP	2.8	2.5	3.0	2.5	2.6	2.8	1.6	1.0	0.4	0.76
	Employment	0.9	0.4	0.8	1.6	2.1	0.3	0.3	-0.4	-1.0	
Germany	GDP	1.7	0.8	1.4	2.0	2.0	2.9	0.8	0.2	-0.1	0.93
	Employment	0.2	-0.3	-0.2	1.1	1.2	1.8	0.4	-0.6	-1.1	
Greece	GDP	2.1	2.4	3.6	3.4	3.4	4.4	4.0	3.9	4.3	0.01
	Employment	0.9	-0.5	-2.2	7.5	0.1	0.3	-0.3	0.1	2.2	
Spain	GDP	2.8	2.4	4.0	4.3	4.2	4.2	2.8	2.0	2.4	0.96
	Employment	1.9	1.3	2.9	3.9	3.5	3.5	2.3	1.5	1.9	
France	GDP	1.7	1.1	1.9	3.4	3.2	3.8	2.1	1.2	0.5	0.89
	Employment	0.9	0.4	0.4	1.5	2.0	2.7	1.7	0.7	0.2	
Ireland	GDP	9.9	8.1	11.1	8.6	11.3	10.1	6.2	6.9	1.4	0.62
	Employment	4.1	3.6	5.6	8.6	6.0	4.7	3.0	1.3	1.8	
Italy	GDP	2.9	1.1	2.0	1.8	1.7	3.0	1.8	0.4	0.3	-0.23
	Employment	-0.1	0.6	0.4	1.0	1.1	1.9	2.0	1.8	1.2	
Luxembourg	GDP	1.4	3.3	8.3	6.9	7.8	9.0	1.3	1.7	2.1	0.47
	Employment	2.7	2.6	3.2	4.5	5.0	5.7	5.7	2.8	2.1	
Netherlands	GDP	3.0	3.0	3.8	4.3	4.0	3.5	1.2	0.2	-0.7	0.93
	Employment	2.3	2.3	3.2	2.6	2.6	2.2	1.8	0.9	-0.4	
Austria	GDP	1.6	2.0	1.6	3.9	2.7	3.4	0.8	1.4	0.7	0.50
	Employment	0.0	-0.6	0.5	1.0	1.4	0.8	0.6	-0.2	0.3	
Portugal	GDP	4.3	3.5	4.0	4.6	3.8	3.4	1.7	0.4	-1.3	0.60
	Employment	-0.7	1.6	1.6	2.7	1.9	2.1	1.3	0.3	-0.8	
Finland	GDP	3.4	3.9	6.3	5.0	3.4	5.1	1.1	2.3	1.9	0.74
	Employment	1.8	1.4	3.3	2.0	2.5	2.3	1.5	0.9	-0.4	
Sweden	GDP	4.1	1.3	2.4	3.6	4.6	4.3	0.9	2.1	1.6	0.59
	Employment	1.5	-0.8	-1.3	1.5	2.1	2.4	1.9	0.2	-0.2	
U.K.	GDP	2.8	2.7	3.3	3.1	2.8	3.8	2.1	1.6	2.2	0.73
	Employment	0.9	1.6	1.8	1.2	1.5	1.4	0.7	0.7	0.9	

Source: elaboration on Annual Macroeconomic Database (AMECO) based on ESA 95 national accounts.

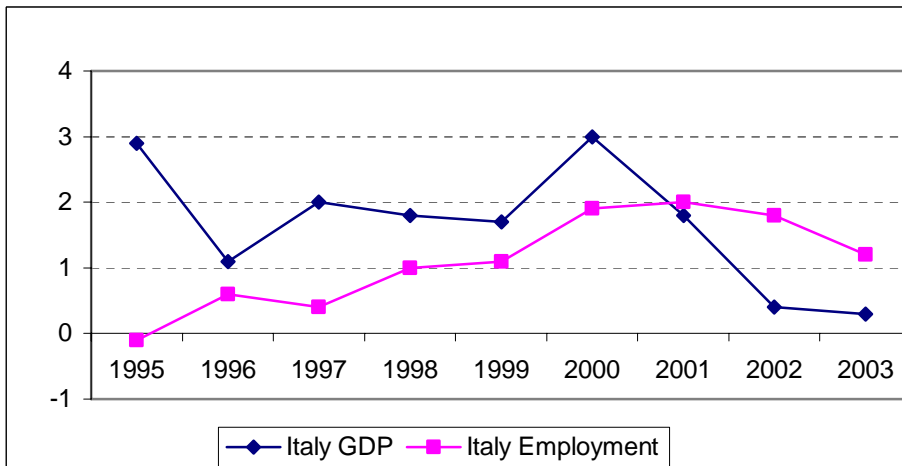**Figure 12 – GDP and Employment annual changes in Germany (1995-2003)**

Source: elaboration on Annual Macroeconomic Database (AMECO) based on ESA 95 national accounts.

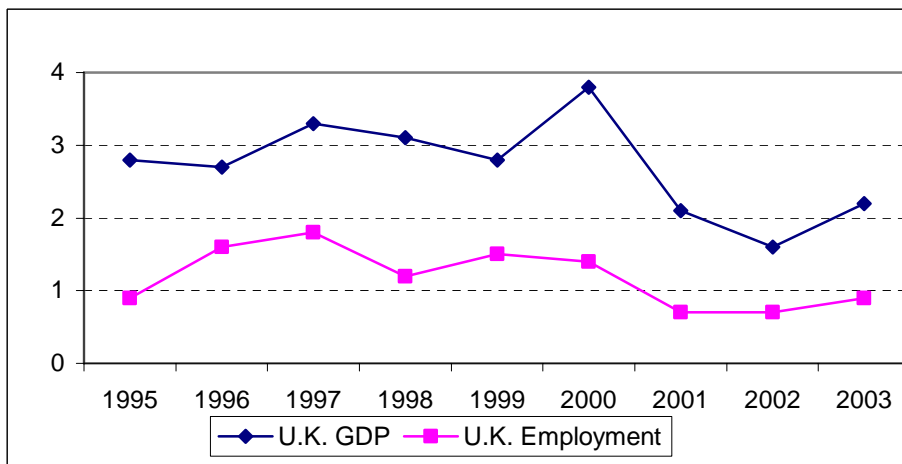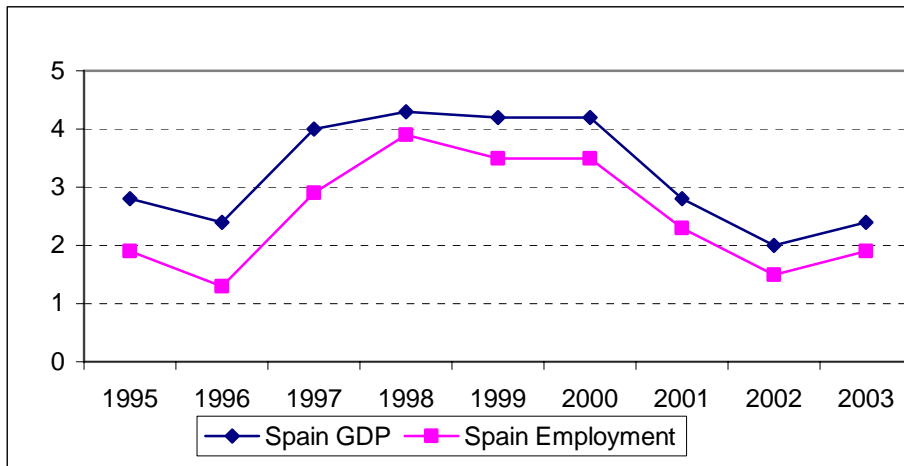**Figure 13 – GDP and Employment annual changes in France (1995-2003)**
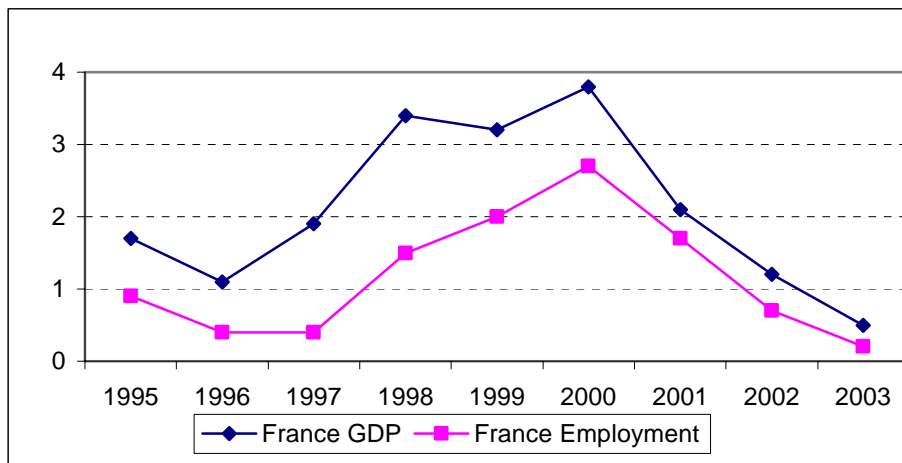
Source: elaboration on Annual Macroeconomic Database (AMECO) based on ESA 95 national accounts.

Figure 14 – GDP and Employment annual changes in Italy (1995-2003)

Source: elaboration on Annual Macroeconomic Database (AMECO) based on ESA 95 national accounts.

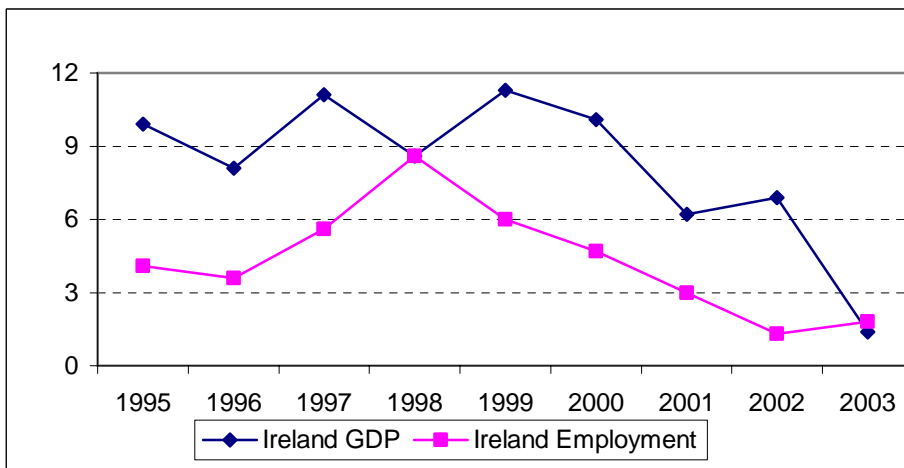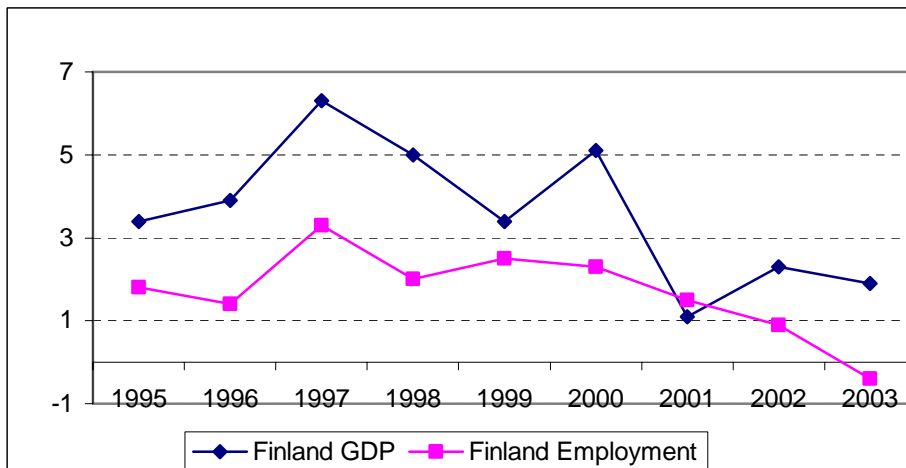**Figure 15 – GDP and Employment annual changes in U.K. (1995-2003)**

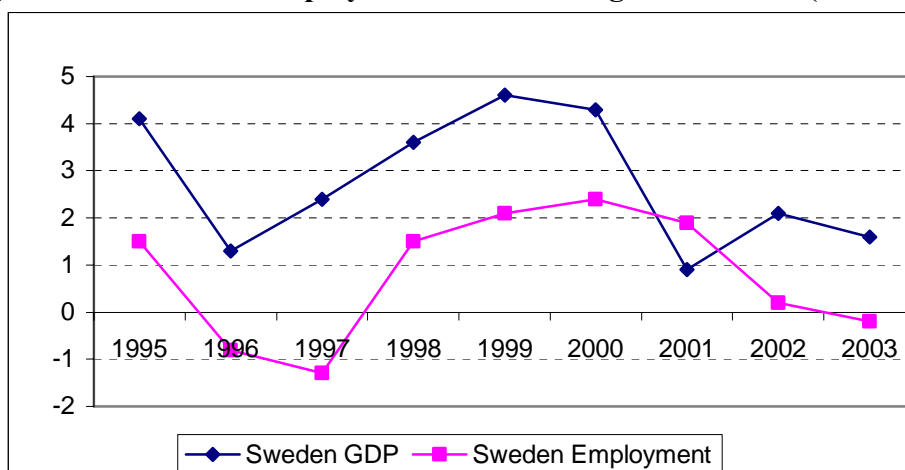*Source: elaboration on Annual Macroeconomic Database (AMECO) based on ESA 95 national accounts.*

Figure 16 – GDP and Employment annual changes in Spain (1995-2003)

Figure 17 – GDP and Employment annual changes in Ireland (1995-2003)

Figure 18 – GDP and Employment annual changes in Finland (1995-2003)

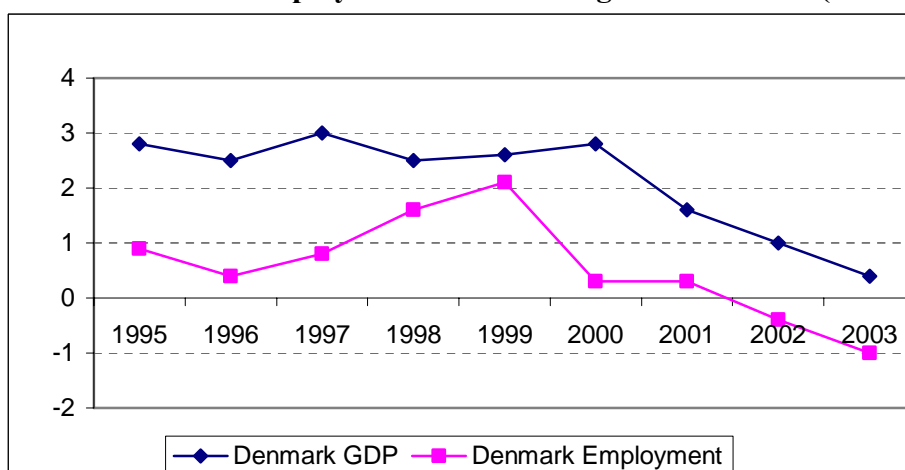**Figure 19 – GDP and Employment annual changes in Sweden (1995-2003)**

Source: elaboration on Annual Macroeconomic Database (AMECO) based on ESA 95 national accounts.

Figure 20 – GDP and Employment annual changes in Denmark (1995-2003)

Source: elaboration on Annual Macroeconomic Database (AMECO) based on ESA 95 national accounts.

Table 21 – Employment Elasticity with respect to GDP in EU-15 countries

	1995	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Belgium	1.71	0.25	0.26	0.90	0.44	0.50	2.50	-0.43	-0.45
Denmark	0.32	0.16	0.27	0.64	0.81	0.11	0.19	-0.40	-2.50
Germany	0.12	-0.38	-0.14	0.55	0.60	0.62	0.50	-3.00	11.00
Greece	0.43	-0.21	-0.61	2.21	0.03	0.07	-0.08	0.03	0.51
Spain	0.68	0.54	0.73	0.91	0.83	0.83	0.82	0.75	0.79
France	0.53	0.36	0.21	0.44	0.63	0.71	0.81	0.58	0.40
Ireland	0.41	0.44	0.50	1.00	0.53	0.47	0.48	0.19	1.29
Italy	-0.03	0.55	0.20	0.56	0.65	0.63	1.11	4.50	4.00
Luxembourg	1.93	0.79	0.39	0.65	0.64	0.63	4.38	1.65	1.00
Netherlands	0.77	0.77	0.84	0.60	0.65	0.63	1.50	4.50	0.57
Austria	0.00	-0.30	0.31	0.26	0.52	0.24	0.75	-0.14	0.43
Portugal	-0.16	0.46	0.40	0.59	0.50	0.62	0.76	0.75	0.62
Finland	0.53	0.36	0.52	0.40	0.74	0.45	1.36	0.39	-0.21
Sweden	0.37	-0.62	-0.54	0.42	0.46	0.56	2.11	0.10	-0.13
U.K.	0.32	0.59	0.55	0.39	0.54	0.37	0.33	0.44	0.41

Source: elaboration on Annual Macroeconomic Database (AMECO) based on ESA 95 national accounts.

5. Final Remarks

The main objective of this paper was to provide new empirical evidences and results about some questions of economic dynamics largely debated in recent years: is there evidence of a convergence process, across countries and/or regions, of basic real economic variables (per capita GDP and employment rates)? Is the relationship between real GDP growth and employment changes progressively vanishing or is rather changing its strength?

After having reminded some results of the recent theoretical and empirical literature, we first compared the GDP performance over the long-run of US and Europe. Considering the post-War periods, European growth rates have been below the US rates only in the most recent period 1992-2000. However, the faster EU economic growth in the previous period 1973-1992 has not been sufficient to lead to relevant convergence of European per capita GDP level with respect to US standard. In the three decades (1970-2000) a strong convergence trend emerged with reference to productivity, largely compensated by the drop in the average of hours worked and in the employment rates. Looking at the most recent data (1995-2003), the productivity growth in EU shifted below the US rate (where also the hours worked increased more), but showing a very diversified scenario across European Union countries.

As regards the real convergence processes, we highlighted a progressive reduction of the across countries disparities in per capita GDP during the period 1995-2002 among the EU-25 countries and 8 CEC-NM, while the diversification does not decrease for the restricted group of EU-15 and for the 12 monetary union members. The same outcomes emerged with regards to the catching up process (beta-convergence) where the EU-15 and EMU-12 show a convergence trend only among the richest countries. The regional level of analyses suggested diffused sigma- and beta-convergence trends (except inside the regions of the 8 new EU members of eastern Europe), with the sectoral structure of the regional economies still playing a relatively relevant role.

As for the employment rate, a generalised improvement in the period 1997-2003 emerged for the large majority of the European countries, the only exceptions being some of the eastern European States still completing their long transition. In addition, a generalised sigma-convergence resulted for the EU-15 and EMU-12 (at both country and regional level), accompanied to a diverging trend starting in 1999 for the 8 CEC-NM (reinforced for the regional level). The catching up process (beta-convergence) occurred across the EU-15 countries (and their regions), while in the eight eastern countries the restructuring process (as witnessed by the conditional convergence estimates) still negatively affects their capacity to converge towards the average EU level.

As for the relationship between the two real variables, a strong (and persistent) positive correlation (co-movements) between employment change and GDP growth emerged in the EU-15 and the US areas. Besides, the (lower) EU growth in the period 1995-2003 has been significantly more effective in creating new jobs with respect to US. The threshold of job-augmenting economic growth is, however, very diversified across European countries, as well as the employment elasticity to GDP growth.

The above empirical results suggested that, although the various growth and employment objectives established by the EU can be considered still very far, some recent European policy innovations cannot be considered neutral to the performance observed.

In particular, although a clear causal link is difficult to determine, the remarkable employment increases observed during the recent years of low EU economic growth have been (probably) favoured by the implementation of the European Employment Strategy (EES), an "open-method of co-ordination" characterised by the definition of clearer quantitative objectives, with greater emphasis on net employment creation rather than unemployment reduction, and by the supply and updating of (general and specific) Employment Guidelines addressed to EU countries encouraging also "institutional" reforms regarding (i) the public and private employment services, (ii) the human capital investments (on-the-job training, life-long learning, etc.), (iii) the level(s) of employment policy implementation and of collective bargaining (decentralisation), (iv) the involvement of social parts and civil society (at national, regional and local level) and so on.

As for the other objective variable (GDP growth rates), the compared analysis highlighted that the poor EU performance in recent years is above all a matter of (labour) productivity, whose weak dynamic had remarkable consequences on competitiveness, especially when important economic actors (like China and India) speeded their integration into the world economy (globalisation). From the (European) economic policy point of view, the above situation call for the set of instruments aimed at fostering productive and organisational innovations (i.e. R&D and human capital investment) and at improving the "external conditions" (i.e. material and non-material infrastructures) able to favour an increase of (total factor) productivity. In this sense, a more effective implementation of the "Lisbon Strategy", launched in 2000 and updated in 2005, is of crucial importance[23]. In fact, until now, the "Lisbon Agenda" has been implemented too slowly, especially in some countries[24] (Table 22).

Table 22 – Number of Lisbon Targets Met in 2005 ("Structural Indicators")*

15 "old" EU countries														
Sweden	DK	UK	Fin.	NL	Aus.	Port.	Germ.	Fra	Spain	Ir.	Italy	Bel	Lux.	Gre.
12	9	7	7	6	5	5	3	3	3	3	2	1	1	0

10 "new" EU countries									
Cyprus	Estonia	Lithuania	Lat.	CH	SK	Poland	Slovenia	Malta	Hungary
5	4	4	2	2	2	2	2	1	1

Source: Centre for European Reform (2005).
Note: * out of 17 quantifiable Lisbon targets.

Besides, it should be noted that the macroeconomic direct impact of the European-level economic policy interventions is conditioned by the weight and composition of EU budget: about 1% of European GDP, of which 0.4% still dedicated to agricultural sector[25]. So, it is important an improvement in the complex governance of the European multi-level economic policies, passing through a more effective implementation of the "open-method of co-ordination" according to the (vertical and horizontal) subsidiarity principle.

Finally, with regards to the co-movements between GDP growth and employment changes, to the (across countries and over time) differences in "GDP growth threshold increasing-employment", and in the employment intensity of growth, further theoretical and empirical progresses are necessary for better understand the relationships and to depict the recent phenomenon of "job-rich low-growth" as structural or cyclical. In any case, some preliminary results address towards a closer integration between employment policies and development policies (especially as regards human capital investment) at all the different institutional levels of policy implementation (European, national, regional and local).

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[23] In order to do that, the implementation of the recent reform of the "Stability and Growth Pact" (March 2005) should be linked to the national progresses towards the Lisbon objectives.

[24] An assessment of the national progresses on the implementation of the "Lisbon Agenda" is contained in Murray – Wanlin (2005).

[25] Considering the positions of the main EU countries, a future increase of the EU budget is not expected. As for the changes in the composition of EU budget, the direction is quite clear, but the progresses are too slow.

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