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A CONVERGENCE ANALYSIS OF THE EU-15**

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De conformidad con la base quinta de la convocatoria del Programa de Estímulo a la Investigación, este trabajo ha sido sometido a evaluación externa anónima de especialistas cualificados a fin de contrastar su nivel técnico.

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Bologna Process and Expenditure on Higher Education: A Convergence Analysis of the EU-15

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Abstract:

The Bologna Process represents a major example of a political and institutional convergence among Higher Education (HE) policies across European countries. The main fields which are explicitly targeted by such convergence process are: curricula structure, mutual recognition of academic degrees, evaluation procedures. The aim of this work is to evaluate whether it is possible to detect an influence of the Bologna Process on financial resources invested in higher education institutions among the EU-15 countries. We analyse the financial data of HE expenditure in the period 1998-2004 (as the Bologna Declaration was set out in 1998) and, specifically, after the wide implementation of changes in curricula structure in many countries of EU-15 (after 2001). Our approach uses two different techniques: (1) regression models - considering both fixed-effects and random-effects - were used to individuate an eventual “Bologna” effect; (2) then, traditional convergence models (sigma and beta convergence) were employed to analyse this effect in more detail, more specifically to test whether the HE expenditure is converging or diverging in recent years. Our findings suggest that the Bologna Process has had a positive influence on the trend of “expenditure per student” convergence across the EU-15 countries. The estimated speed of convergence is still quite low, and this fact supports a claim for more emphasis on the role of private funding and cost-sharing in terms of European-level policies. However, the EU-15 countries’ different traditions and different socio-economic characteristics are strongly affecting this process, so that the European convergence is towards different steady-levels.

Keywords. Funding – State Higher Education; Funding – Private Higher Education, Higher Education expenditure per student, Bologna Process, educational policy analyses, convergence

JEL Classification. H52; I21, I22, I28.

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“The European Community shall contribute to the development of quality education by encouraging cooperation between Member States”.
Treaty of Amsterdam, 1992, Article 149

1. Introduction³

In recent years, in Europe, there has been an important change in the philosophy of higher education (HE), and in higher education institutions (HEIs) in particular. This change has been rushed by several processes, within the general framework of New Public Management. Most countries have set up new funding mechanisms at national and regional levels. Many institutions have introduced performance indicators, strategic planning, management by objectives, or more specifically, Balanced Scorecard and cost accounting. In many European countries, new governance and leadership models have been introduced to strengthen the autonomy of HEIs and to improve competitiveness and market attractiveness. This new philosophy has been generally accompanied by higher levels of expenditures in HEIs in the last decade.

There are several factors which motivate this study of the evolution of expenditure on HE in Europe. First, the topic is a very relevant one, as the literature has pointed out clearly that education does contribute to economic growth (Chatterji, 1998; Johnes, 2006). As the main task for the EU is to improve its growth dynamic in the next few years, and given the role of education in this context, the theme of adequate financing levels is assuming more importance than in the recent past. Moreover, the EU Commission and researchers recently have also pointed out that resources can play a role in improving equity and efficiency of HE; this is another relevant problem in a period of public finances budget constraints (Clancy, Goastellec, 2007).

Another reason to pay attention to the issue of financing HE is the debate on the role of resources in influencing students' attainment. Indeed, as economic growth is influenced by people's productivity, and given that education patterns are good indicators of working productivity, it is relevant to know whether resources and funds devoted to education are able to influence students' results. Eric Hanushek worked extensively on this theme, concluding that there is no strong relationship between resources and results (Hanushek, 1997). However, other authors instead developed empirical models to

³ Authors thank to José-Gines Mora (Institute of Education, University of London) and other professors and researchers in EAIR 2008 Conference, Copenhagen, Denmark (24-27 August 2008) their value comments.

demonstrate the contrary, and they find a positive and statistically significant link between school resources and educational outcomes (Lee, Barro, 2001).

Secondly, given the importance of the financial dimension for evaluating educational policies, and also to determine the economic growth of a country, it is worth studying the pattern of HE expenditure in the EU. In fact, if the EU would become a real area of collaboration among States, all the obstacles to an excessive diversification in economic growth must be removed; then, it is important to test whether HE expenditure is converging or diverging. The theory on economic growth suggests that economies tend to converge; a number of empirical studies recently tried to verify this prediction empirically. Several contributions focus on government (public) spending, denoting that a convergence process is actually in action (Alvarez-Ayuso *et al.*, 2006; Martin, Sanz, 2003; Merriman, Skidmore, 2004; Puss *et al.*, 2003; Sanz, Velasquez, 2001, 2004). The problem of studying the convergence process of public expenditure across different countries is not only a European one, but it is typical for all “federative” countries such as the US (see Annala, 2003), and also the study of determinants of educational expenditure is known in the literature for many years (Castles, 1989).

Summarizing, from this bulk of literature, the suggestion arising is that looking for convergence along certain lines of public expenditure among European countries can be a useful exercise, because even if, theoretically, the expenditure for certain types of (public or quasi-public) services is likely to be converging, the necessity for empirical assessments is still high.

Thirdly, the context is also characterized by a process of *political* convergence on HE that is the Bologna Process. This term indicates the process started with the Bologna Declaration in 1999, which was subscribed by the Ministries of Education of European countries to standardize several aspects of HE, with the aim of creating a European Higher Education Area (EHEA) by the end of 2010. Until 1999, HE systems in Europe differed across several dimensions: curricula structure, methods of evaluating universities’ activities, procedures for students’ and researchers’ mobility, etc. The Bologna Declaration contains the decision of the European Ministries of Education to start a process of convergence along many of these dimensions, and they decided to review every two years the point at which the process has arrived. For many authors, the Bologna Process is a strong example of a political and institutional convergence in

European policies (Furlong, 2005; Heinze, Knill, forthcoming; Keeling, 2006; Witte, 2008). In developing their theoretical approach, Heinz and Knill (forthcoming) stated that the convergence process is certainly influenced by institutional and socio-economic factors, so that our thesis is that the amount and types of financing HE can actually affect the effectiveness of the Bologna Process. Moreover, the US economic literature in the field of education already showed that financial-specific reforms could affect the distribution of educational resources across states (Downes, Shah, 2006; Murray *et al.*, 1998). Keeping all these elements in mind when looking at the Bologna Process, it is useful to investigate its potential effects in affecting the financial choices regarding levels of expenditure of different European countries.

In this context, the aim of the paper is to analyze whether the Bologna Process has actually had an impact on the expenditures of higher education institutions in the countries involved (in particular, the focus of the paper is on the EU-15 countries⁴). The key-dependent variable used for this purpose is the “annual expenditure per student in Higher Education Institutions (HEIs)”, as recorded by OECD (in the section devoted to methodology, we will give more details). To the best of the authors’ knowledge, there are not in the literature empirical attempts to specifically study the topic of the financial convergence in terms of expenditure per student⁵. One of the aims of the paper is exactly to fill this gap, shedding a new light on the analysis of the Bologna Process.

A panel regression (both in a fixed-effects and random-effects version) has been run using data from 1998 to 2004, modelling the possible determinants of the dependent variable (in particular, the covariates concern the economic conditions of the countries – such as GDP per capita, public funds for HE, etc.). Among the determinants of the dependent variable, a dummy for the Bologna Process is included to test its statistical effect. Then, the evolution of the expenditure per student in HEIs is studied more in detail. Provided that relevancy of the dummy variable (Bologna Process) has occurred, it is attempting to verify that a form of “convergence” has taken place in the expenditure per student among European countries. For this second approach we use the traditional *beta* methods and *sigma* convergence in the whole interval (years 1998-2004).

⁴ We use data from Education at a Glance (OCDE, several years). In this paper, we had to choose EU-15, because data for EU-19 are not available for all the considered period.

⁵ A contribution by Diebolt and Jaoul-Grammare (2006) studied the convergence of higher education loads in European countries, but it did not focus on the effects of specific policies on this process.

Moreover, to observe whether the Bologna Process has influenced the convergence, the interval has been divided into two sub-periods (1998-2000; 2001-2004), making the same convergence analysis for each period.

The paper is organised as follows. In the next section, the Bologna Process is described as to its essential characteristics. Section 3 contains an analysis of the indicators of financial resources invested in HE between 1998 and 2004. Section 4 described the methodological approach, while section 5 illustrates the results. Section 6 concludes and it also derives policy implications from our work.

2. The Bologna Process

The Bologna Process started with the Bologna Declaration in 1999, which was signed by the Ministries of Education of 29 European countries. The scope of this Declaration is to implement a European Higher Education Area with common characteristics by the end of 2010. The basic idea was to implement a common set of reforms, at a national level, to create homogenous institutional characteristics at the European level⁶. The different countries developed, from 1999, modifications of their legislations, curricula structure and adjustments of their systems to manage to arrive at 2010 with a situation that assures the recognition of the studies and the mobility of staff, students and graduates.

The implementation of the EHEA has created tremendous interest all around the world – indeed, it is the strongest experience of HE systems harmonization which has been carried out in the last years. The idea, which was foreseen initially for the EU, has fully overcome the expectations.

The development of the Bologna Process, which presents different characteristics in each country, relies on a set of key objectives decided in the first Declaration in Bologna on 1999, which are:

- Adoption of a system of easily readable and comparable degrees, also through the implementation of the Diploma Supplement;
- Adoption of a three-cycle degree system: undergraduate, graduate and doctoral degrees (Bachelor/Master structure/Ph.D);

⁶ Since 1999, the Ministries of Education planned meetings every two years to assess the development of the process. The meetings are attended not only by the Ministries, but also by representatives of the European Commission, and interest groups (e.g., the European Rectors' Conference, the Association of European Universities, student unions, etc.). At present, the partners incorporated into the process are 45 countries as a whole.

- Establishment of a system of formative credits (European Credit Transfer System), based on learning outcomes and student workload;
- Promotion of European co-operation in quality assurance.

In our idea, the Bologna process has underlined the importance of students and HEIs in the realisation of the EHEA. First, a very important characteristic which is underlying the whole philosophy of the EHEA is that the “core” of the learning process is the student. Second, building on the diversity of HEIs, these institutions have to implement the necessary resources to continue to fulfil their traditional purposes: learning, research, creativity and knowledge transfer.

However, this initial Bologna Process, like the creation of a “true” EHEA, is transforming all the dimensions of this project, not only the education perspective but also the financial and economic perspective and the social dimension. In our point of view, this is the most important process taking place in Europe in the last few years because it is a real process of integration with “students” as the basis of these challenges (and HEIs that play an important role). And, at the end, it is a process to promote social policies in Europe: it is not only a link between HEIs and society; it is a link between University students and society.

That is why we, therefore, underline the importance not only of educational convergence but also of financial convergence (in this case, expenditure per student). Both types (educational *and* financial) are necessary to reach a genuine convergence on HE in the whole EU-15. So far, the selected variable in the empirical part of this paper has been the annual expenditure on HEIs per student, based on our agreed that the two key pieces are students and HEIs. This variable connects the real expenditure with the dimension of the institutions and of HE systems, showing reliable information on the relative efforts of each European country. The next section will present a glance at the most common data about financial resources devoted to HE.

3. An analysis of the indicators of financial resources invested in HE 1998-2004

One important indicator used in all the international comparisons is the annual expenditure on HEIs as a percentage of Gross Domestic Product (GDP). It is a global measure of the effort that each European country devoted to HEIs, including public and private expenditure.

Table 1 allows us to identify three groups of countries in 2004:

- The Scandinavian countries - Denmark, Finland and Sweden – with an indicator equal to at least 1.8% of GDP;
- An heterogeneous group of countries –France, the Netherlands, Austria, Belgium, Spain and Ireland (with an indicator close to the UE-15 mean, e.g. 1.2% and 1.3%);
- Finally, a third group of countries with a percentage well under the mean - Germany, the United Kingdom, Greece, Portugal and Italy, with percentages from 0.9% to 1.1%.

If we analyse the evolution between 1998 and 2004, a small growth in terms of GDP has taken place on the average in the EU-15 countries (from 1.2% of GDP to 1.3%). Again, we can group the countries, but adopting a 4-tier classification:

- countries which have experimented a great change in terms of effort (Belgium, Denmark and France);
- a group of countries which have had a small growth (Finland, Germany, Italy, the Netherlands, Spain and Sweden);
- a third group of countries without any variation (Portugal and the United Kingdom);
- finally, a fourth group of countries which have suffered a worsening in their HE expenditure/GDP ratio (Austria, Greece and Ireland).

Another relevant aspect is the distribution of the expenditure in HEIs between public and private sources. In this respect, Table 2 and Figure 1 show that Italy, the United Kingdom, Spain and the Netherlands are the countries where private funding is the highest (over 22%). In addition, the countries which presented a smaller percentage of private sources have tended to increase it slightly (Denmark, Portugal and Austria), and those in which the private sources were greater have also increased, with the only exception being the UK, where the level of private funding was disproportionately high in 1998.

Another indicator (Table 3) concerns the resources invested in HE as a proportion of all expenditure on education (all levels). In the case of the EU-15 countries, the percentage of expenditure on HEIs over the total expenditure on educational institutions is 23.9%, whereas the number of students enrolled in tertiary education relative to the total of

students is 16.2%. This fact is logical if we consider that the higher educational level is the greater proportion of expenditure in all the European countries. Actually, if the quotient between both percentages is considered, the percentage of expenditure on HEIs is 1.47 more times that the percentage of students enrolled in this level of education ($23.9/16.2=1.47$). It becomes very interesting to compare how, in three years, this situation has changed from 2001 (this is the oldest data available). In this year, the UE-15 countries have assigned to HE 1.54 a greater proportion of expenditure than the percentage of HE students enrolled.

In the cross-country analysis (Figure 2), we can observe how Greece, Finland, Ireland and Spain are above the mean in the two variables, whereas Austria, France, Germany, Belgium, Portugal and United Kingdom are below the mean in both. Italy (19%) is placed in quadrant III with a percentage of expenditure on HEIs below the mean and a percentage of students above the mean⁷. On the contrary, Sweden, the Netherlands and Denmark have percentages of expenditure above UE-15 mean, but with percentages of students lower than the mean. So it is important to detect what the effort of one country in their HEIs is. If we want to answer that question it is necessary to compare expenditures in relation to the dimension of these institutions, that is to say, number of students enrolled. And indeed, in all the countries there has been an important correlation with demographic variables, which establish the population that can study at the tertiary level. So, in the international comparison, the most frequently used indicator is expenditure on HEIs per student. This indicator measures with more accuracy the attention that is dedicated to the student, and that can offer quite a good proxy to measure and to compare the quality of HE among countries. Moreover, as we have seen, one of the key elements of the Bologna process is the students.

Table 4 shows the changes in expenditure on HEIs per student in equivalent USD⁸. Note that this variable has been growing in the period considered (35%, UE-15 mean). Also, it can be observed that the degree of dispersion has been falling between 1998 and 2004. However, the differences among countries continue, being more than triple (Sweden, with expenditure per student of USD 16,218 and Greece with only USD 5,593 per student). The gaps among countries are generally related to different levels of

⁷ In this case, Italy traditionally has a large number of students in Higher Education Institutions (as there is no selection of students at the beginning of their courses), whereas the expenditure in absolute terms is equivalent to other Mediterranean countries; thus, the ratio expenditure for students is one of the lowest in UE-15.

⁸ The data are expressed in equivalent USD instead of EUR because OECD data uses this metrics.

public/private mixtures in financing HE, and this fact also reflects differences in institutional structures and traditions. For this reason, in the empirical part it will be very interesting to study the convergence or divergence of this financial indicator through a well-known neo-classical beta and sigma convergence analysis.

One of the causes can be explained by analyzing another indicator (table 4 and figure 3), which is expenditure on HEIs per student relative to GDP per capita⁹. One pattern is found in Sweden, Denmark, Austria, Finland, Germany and the Netherlands (with an indicator over 40 in 2004). The pattern is very different in Greece, Italy, Ireland, the United Kingdom and Spain, where the expenditure on HEIs per student relative to GDP per capita shows an index smaller than 36 in 2004. In fact, Portugal, Greece, Spain and Italy are countries with the smallest GDP per capita in the context of the EU-15 countries (in the reference period). Due to this factor of “relative poverty” and the low proportion of resources invested in HE, the value for this indicator is not surprising.

Figure 4 shows the relationship between the expenditure on HEIs per student and the GDP per capita. There is a clear difference among countries. On one hand, we find the Mediterranean countries (quadrant IV: Portugal, Spain, Italy, Greece and France), all with expenditure on HEIs per student and the GDP per capita inferior to the EU-15 mean. On the other hand, the rest of the countries (quadrant II: Finland, Germany, Belgium, United Kingdom, The Netherlands, Austria, Denmark, Sweden) with superior indicators above the mean. Finally, Ireland loses points in terms of GDP per capita but it has expenditure per student below the mean. This fact could be due to the rapid growth of the GDP of this country in this period which has not been reflected in the expenditure on HEIs per student.

After this analysis, we have determined that, among all the revised indicators, the most interesting one that shows the background of the Bologna Process is expenditure on HEIs per student. This process of European convergence in HE has implied an increase in the international competitiveness of the European HEIs and has opened a framework of opportunities for students, graduates, staff and society as a whole. Nevertheless, we

⁹ This indicator presents some disadvantages: if the population of the country increases, the index grows, although the expenditure has not grown. If the economy of the country undergoes a process of growth, measured by the GDP, the index falls, without the need to vary within the period.

are aware of the simple assumption set out here: the effect of the Bologna process in the “real convergence” in some indicators of expenditure cannot be easily isolated of other effects that have taken place in the HE systems of each country, more specifically because in this selected period very few countries have begun to implement the new system of easily readable and comparable degrees and to establish the system of formative credits (*European Credit Transfer System*, ECTS), among others, Italy. However, many countries have implemented the Diploma Supplement and have given many steps to the “spirit” of the new Process.

4. Methods and data

4.1. Methodological approach

The issue of the effects of the Bologna process on the indicator “Expenditure per student” is analyzed here with a twofold approach.

First, a panel regression has been run (both adopting fixed-effects and random-effects hypotheses) modelling the expenditure per student as dependent on five covariates: GDP per capita, percentage of population who attained tertiary education, expenditure for tertiary education as a percentage of GDP, public funds for tertiary education as a percentage of the total resources devoted to education and a dummy for Bologna Process (after its wide application, which was after 2001). The resulting models are, then¹⁰:

$$H_{it} = \alpha_1 GDP_{it} + \alpha_2 POP_{it} + \alpha_3 TERT_{it} + \alpha_4 PUBFUND_{it} + \alpha_5 BOL \quad (1)$$

Where i indicates the i_{th} country and t the t_{th} year, and

H = Expenditure per student in HEIs;

GDP = GDP per capita;

POP = percentage of population who attained tertiary education;

TERT = expenditure for tertiary education as percentage of GDP;

PUBFUND = public funds for tertiary education as percentage of the total;

BOL = a dummy for the Bologna process (indeed, it does not have indexes¹¹).

¹⁰ Each model is adopting both fixed effects and random effects because it is difficult to establish *a priori* whether the country effects are random or fixed in the different years. More discussion on this point is provided in the results.

¹¹ We have made the simple supposition that Bologna Process and the most important challenges on Higher Education Policies in Europe have begun in the 2000s, taking a dummy which takes value 0

In the second part of the paper, a neo-classical convergence analysis was conducted. The β -convergence (absolute converge¹²) contrasts if a situation of relative delay among several countries, at a certain time, tends to be reduced over the years. For β -convergence analysis, equation (2) proposed by Sala-i-Martin (1996) has been used.

$$\frac{1}{T} \ln\left(\frac{H_{i,t}}{H_{i,j}}\right) = \alpha + \left[\frac{1 - e^{-\beta T}}{-T} \right] \ln(H_{i,j}) + \mu_{i,t} \quad (2)$$

Where H is the annual expenditure per student in HEIs; i is each one of the countries; t is the last year of the period; j is the first year of the period and:

H = the annual expenditure per student in HEIs;

T = the total number of years of the observation period;

β = the speed of convergence;

$\mu_{i,t}$ = the random error.

Convergence will exist if parameter β considered in the equation (2) is positive and statistically significant, which supposes a negative relationship between the rate of growth of the variable between years j and t and its initial level. Therefore, if coefficient β ¹³ is significantly positive, it will indicate that a process of convergence in HEI has existed, in the sense that the countries with lower expenditure per student in HEIs levels have grown to higher rates than the countries with better levels.

Nevertheless, in many situations an *absolute convergence* cannot take place since there are different structural conditions between the different countries, so that they do not converge at a unique equilibrium point. In these cases, we use what Sala-i-Martin (1996), Barro and Sala-i-Martin (1992) and Mankiw, Romer and Weil (1992) denominated *conditional convergence*¹⁴, to differentiate it from the absolute one. The formula for conditioning a convergence study is introducing regional or additional

before 2001 and value 1 after 2001. We are aware that this 2001 dummy has “problems” in the sense that Bologna Process is occurring with a different timing among countries.

¹² Absolute convergence is defined as a situation in which all the countries in the sample converge to the same steady stage.

¹³ Furthermore, the size of coefficient β represents the speed of convergence; that is, the speed with which the level of expenditure per student for the countries whose “low” levels approaches that of countries with “high” levels.

¹⁴ This convergence test allows adding some determinants, thus the test is conditional. Conditional convergence makes allowances for underlying factors that may condition the degree of convergence that can occur.

explanatory variables in the regression (3), that the structural differences of each country consider. In this case, the regression to estimate would be:

$$\frac{1}{T} \ln\left(\frac{H_{i,t}}{H_{i,j}}\right) = \alpha + \left[\frac{1 - e^{-\beta T}}{-T} \right] \ln(H_{i,j}) + \lambda \psi_{i,t} + \mu_{i,t} \quad (3)$$

Where

H = the expenditure per student;

$\psi_{i,t}$ = the GDP per capita, a variable that determines the existence of differences between the regions that lead them to different steady states.

In this case, the existence of *conditional β -convergence* will be contrasted, if the estimation of the regression (2) presents the following results:

- a) All parameters (α , β and λ) are statistically significant;
- b) The value of β will be positive and more significant than when considering the regression (2);
- c) The goodness of fit (measured by fit R^2) improved;
- d) If, in addition, the estimation of λ is positive, it will indicate that the variable influences positively the growth of annual expenditure per student in HEIs.

In the literature on economic convergence, the most important measure of cross-section analysis of dispersion that has been used essentially is coefficient of variation (Barro & Sala-i-Martin, 1992). This kind of convergence¹⁵, called *σ -convergence*, takes place when dispersion falls over time, that it is to say, inequalities on expenditure per student among countries are reduced throughout the period.

$$CV = \frac{\sqrt{\frac{1}{n} \sum_{i=1}^n (H_{i,t} - \overline{H}_t)^2}}{\overline{H}_t} \quad (4)$$

where

$H_{i,t}$ = the annual expenditure on HEI per student;

\overline{H}_t = the mean of expenditure on HEI per student in year t and n is the number of countries.

¹⁵ *B-convergence* and *σ -convergence* are complementary concepts. In fact, both methods must be used together to verify the hypothesis of reduction of differences in expenditure per students in HEIs.

σ -convergence will exist if the obtained variable is reduced significantly throughout the sample.

4.2. Data

The data used in this paper comes from the annual database of the OECD “Education at a Glance” (several editions). In order to correctly interpret the results of this document, it is necessary to give some details about the data.

First, our data refer to both tertiary-type A (and advanced research programmes) and tertiary-type B programmes, where the distinction is that type A is typically “university higher education”, largely theoretically based and a duration from three to five years or more. Tertiary-type B is “vocational higher education”. The latter is more professionally oriented and with a shorter duration with respect to type A programmes – usually they last two to three years at maximum.

We report here the definition of variables used in the paper, following the statements from OECD, and the precise source (the reference tables are given referring to OECD 2007):

- GDP per capita (in equivalent USD converted using PPPs¹⁶), recorded in the annex (*table X2.1*);
- Percentage of population who attained tertiary education (*table A1.3a*); defined as a percentage of the population between 25 and 64 years old which has attained tertiary-type B education or tertiary-type A and advanced research programmes;
- Expenditure (from public and private sources) on Higher Education Institution as a percentage of GDP, (*table B2.1*);
- Public expenditure on tertiary education as a percentage of total public expenditure (*table B4.1*); public expenditure includes direct public expenditure on HEIs plus public subsidies to households (which include subsidies for living costs) and other private entities.
- Expenditure per student (*table B1.1a*): annual expenditure on Higher Education Institutions per student for all services (including R&D activities) in equivalent US dollars converted using PPPs for GDP based on full-time equivalents;

¹⁶ The definition PPPS stands for Purchasing Power Parity standard.

So far, the selected variable in the second empirical part of this paper has been the annual expenditure on HIEs per student, based on our agreed that the two key pieces are students and HEIs. This variable connects the real expenditure with the dimension of the institutions and of HE systems, showing reliable information on the relative efforts of each European country.

5. Results

5.1. Regression analysis

The results from the panel regressions confirm the existence of an effect due to the Bologna Process (Table 5 – dependent variable: expenditure per student in HEIs). Both the GDP per capita (richness of a country) and the percentage of funds devoted to HE contributes to explaining the “expenditure per student”; nevertheless, the two models in which a Bologna Dummy is included show it’s statistically strong role.

Some statistical notes on the models are due here. First, we ran both a fixed-effects and a random-effects version for each of the two specifications of our models (one with and one without Bologna Dummy). The random-effects specification is due to analyse whether error terms are correlated over time for a given country (analysis of within-variation). All the elaborations result as statistically strong (e.g., the F-statistic for the fixed-effects models reject the null-hypothesis of non-significance).

The estimated coefficients are stable across the different specifications, suggesting that results are firm. This is also considered by the R^2 values, which are relevant – more than 60% of variation between expenditure per student is explained by our models.

Our preferred specifications are the random-effects formulations, because the results of Hausman tests suggest the presence of random effects (4.73, prob. 0.19 and 6.61, prob. 0.15). The preference towards these specifications is also due to a better attitude of fixed-effects models to analyse systemic differences among countries, while we are interested in analysing within-country trends and the process of convergence between them. However, the choice is facilitated because the results are very similar, as stated above.

Turning to the results, it is important to underline that when the Bologna Dummy has been added, the value of F-statistic decreases – it is obvious as the statistical analysis loses degrees of freedom; however, the model still remains statistically valid.

The Bologna Dummy provides good explanatory power for the variability of expenditure per student: the role of constant decreases (it loses its statistical

significance) and so the Bologna Dummy being statistically relevant contributes to better explaining way the expenditure per student phenomenon. It should be noted here that a further confirmation derives from the decrease in RMSE – Root Mean Square Error – values.

Even if this effect is clearly detected here, it is worth noting that it is necessary to deepen the analysis of this effect, because it can have several directions; that is, how the Bologna Process is impacting expenditures. Is there a convergence or a divergence attitude across different European countries?

5.2 Convergence analysis

The results of β -convergence for this period (1998-2004) are also clear (Table 6). Convergence exists in the expenditure per student in HEIs among countries in the entire period (α and β estimated parameters are statistically significant), though the above-mentioned convergence is weak enough (4,7% of speed of convergence). However, taking into account that the Bologna Process could have had some influence on the expenditure per student, we find that, whereas in the first period, until 2001, convergence has not taken place, in the second period (2001-2004), convergence has increased, because the parameters of the model have improved their significance, the R^2 has improved and the speed of convergence has been more rapid.

We also investigated whether convergence in the period 1998-2004 has been affected by national wealth, in this case, GDP per capita¹⁷. A new estimation of the model, including a new variable, has been realized. This variable differentiates between rich and poor countries. The inclusion of GDPpc is only significant in the period 1998-2001 (table 7), because estimated parameters have improved their significance and the goodness of fit increased to 43,75%. As a consequence, this fact implies that the growth rate of expenditure per student had actually been influenced by the level of GDPpc during that period (1998-2001); that is to say, absolute convergence had not taken place towards a unique state, because countries had different initial levels of wealth and these differences have “conditioned” the convergence process (Figure 5). In other words,

¹⁷ We use GDPpc because this variable results significant in all the panel regressions (as we have seen in table 5).

countries have converged to different steady states; that is, GDPpc variable explains cross-country patterns of growth in expenditure per capita in this period.

In addition, a reduction of the dispersion among countries has been produced as a result of σ -convergence (Table 8 and Figure 6) show. However, although the dispersion has been reduced in time, there have been very important differences throughout the whole period. In the first stage, the coefficient of variation increase until 2000, being in this year at its maximum value, 0,33. From 2001 there is a more or less continuous decrease, stabilising at 0,27 in the last year. This fact reinforces that Bologna Process has implied a new approach among European countries in terms of expenditure per student and, at this moment, we can say that we enter in a new period of “stability”.

A final point is a further step to understand if the convergence process has been driven by private or public resources. This is a crucial question, because a general recent tendency in HE around the world is to compress public sources and to increase the participation on funding from private actors (students, families, etc.) (Johnstone, 2003). Given the fact that a convergence process exists, an analysis about the two components of the coefficient of variation was conducted (figure 7). It is evident that in the considered period the convergence process has been due to a reduction in the variation of private sources; in other words, the composition of total funds devoted to HE is changing and the differences between countries are reducing because the proportion of private financing to HE is becoming more similar across European HE systems. The consequence is that also the coefficient of variation of expenditure per student in HEIs is reducing in a faster way due to the role of the private component of this expenditure. To obtain this picture, we calculated the public and private expenditure per student, by applying the percentages reported in table 2; studying the coefficient of variation for the two categories (public expenditure per student, and private expenditure per student) the results show again that the decreasing in the variation occurs in a stronger way for the private component (figure 8). Then our results confirm not only a trend in the convergence between European countries in the expenditure per student, but also that this process has been guided not by public resources but by private ones, coherently with the recent “cost-sharing” theory.

Lastly, the β -convergence analysis for private sources confirms these previous results. Only in the period (2001-2004) (Table 8) absolute convergence exists in the private expenditure per student in HEIs among countries (α and β estimated parameters are statistically significant), and, above all, the speed of convergence is very high (14,67%) and the adjusted R is 73,32%.

6. Discussion and concluding remarks

One of the main goals of the Bologna Process is to create more comparable, compatible and coherent systems of HE in Europe. The changes in HE brought on by economic, political, social and cultural changes in European countries has been necessary for HEIs to survive and to adapt, among other things, to the changes in education models based on European Higher Education Area (such as curricula organization, mutual recognition of degrees, a homogenous measure of student achievement, etc.). All these changes have presented the base for the most important factors that have led the European HEIs to competition in the social dimension (mobility, demographic changes, integration, new social demands for life-long learning and a new legal framework) and, of course in the financial and economic dimension, which is the key objective of this work.

This initial Bologna Process, like the creation of a “true” EHEA, is transforming all the dimensions of this project, not only the education perspective but also the financial and economic perspective and the social dimension. In our point of view, this is the most important process taking place in Europe in the last few years because it is a real process of integration with “students” as the basis of these challenges (and HEIs that play an important role). And, at the end, it is a process to promote social policies in Europe: it is not only a link between HEIs and society; it is a link between University students and society. That is why we, therefore, underline the importance not only of educational convergence but also of financial convergence (in this case, expenditure per student). Both types (educational *and* financial) are necessary to reach a genuine convergence on HE in the whole EU-15.

In this sense, one of the main conclusions of the empirical part of this paper is that changes in overall expenditure on HEIs between 1998 and 2004 are going in the right direction. In fact, using beta and sigma convergence, we show evidence of an approaching process in the composition of HEIs expenditure per student in EU-

countries for this period. We have also identified that this convergence was more marked at the end of the observation period (with greater speed of convergence in the EU-15 countries after 2001). Moreover, conditional convergence has proved that the wealth of the countries (measured by GDP per capita) is still a crucial variable for convergence of the expenditure per student in the period 1998-2001, and then countries have converged to different steady states. In that sense, the “low-level” GDP per capita countries (Greece and Portugal) have been the countries which have supported less growth, while the “high-level” GDP per capita (Denmark and Belgium) are the countries with the most growth.

However, the results must be cautiously interpreted, even if they are statistically significant and coherent with some expectations. First, we are aware that OECD data still have problems of comparability – even though our approach should reduce these problems as our focus is on HE in general terms, so we consider both Type A and Type B tertiary education. Second, the Bologna process is still ongoing; only in 2010 a final judgment about the results can be reached, and in the meanwhile only partial results can be evaluated. Finally, it is difficult to assess a causal relationship between Bologna Process and convergence in financial matters from a methodological point of view. Theoretically, the Bologna Process has been influencing both (1) a direct convergence of European Higher Education systems (from an institutional perspective) and (2) a softer indirect effect of convergence in expenditure per student in HEIs. This work, adopting an empirical approach, sheds a preliminary light on the “indirect” effects of the Bologna Process, not in potential convergence from an economic perspective.

Our future thesis is that one of the main factors that contribute to lowering the differences in expenditure per student in HEIs across the EU-15 countries will be the Bologna Process and the harmonization of curricula structure in all the EHEA countries. This process is still ongoing (even quite slowly), so at the end of the process it will not be necessary to accelerate the “real” financial convergence among European countries: if the analysis is working, indeed, this financial convergence will be a natural result at a certain point of the normal development of the process and, with the considered evidence we can conclude that a mayor part of this convergence will be due to private sources.

In our framework, harmonization of HE must not imply similar levels of expenditure per student because HE systems are not moving towards a unique steady-state. In that sense, in this paper “peer groups” of countries have been identified; the different countries’ preferences with respect to the expenditure levels could be different. It is important to note that the differences in HE funding are also due to different welfare regime approaches traditionally adopted by the different countries – which are long-run factors. For instance, Pechar and Andres (2008) demonstrated that social democratic welfare states devoted longer shares of funding towards HE than their “liberal” welfare or “conservative” welfare counterparts, at least when referring to public financial resources. However, the definition of a minimum level of expenditure per student as a standard for the UE could be a useful task for future regulations. It would be a guarantee for a minimum quality level for HE all around the European Area.

Although we are in the “way of convergence”, the analysis has revealed the need of more different sources to extract towards the EHEA. Indeed, the present levels of investments that HEIs are experiencing are not sufficient to enlarge the big “project” of EHEA, especially in some Mediterranean countries. Consequently, in terms of recommendations for HE policies, the diversification of the funding sources for this level of education is one of the solutions that European countries must consider. The increase of the private funding transferred to HE has turned into a question of strategic decision for some European countries if they want to play an important role in the competitive environment of globalization. In the future, it is encouraging that the debate focuses not on public education versus private education, but that it also moves to the most realistic level of public funding *and* private funding, following the example of Anglo-Saxon countries like the US and Australia. Moreover, recently the necessity of an increasing cost-sharing among different (public and private) participants in HE is also supported by theoretical considerations (Johnstone, 2003). Our results show that this process was initiated and the role of private sources (and fund-raising) in the potential convergence of expenditure per student is improving.

Summarizing, the research in the field of funding HE has a growing interest for policy makers (especially from an international perspective) because it implies a new empirical and comparative analysis of one of the consequences of the Bologna Process – e.g., what the effects on the expenditure per student in HEIs are. This paper gives an

incentive to new further research to deal with these problems: which institutional factors contribute to explaining financial convergence on HE.

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Table 1. Annual expenditure on Higher Education Institutions (HEIs) as a percentage of GDP, 1998 – 2004

COUNTRIES	2004	2003	2001	2000	1998
Austria	1.2	1.1	1.2	1.2	1.5
Belgium	1.2	1.3	1.4	1.3	0.9
Denmark	1.8	1.8	1.8	1.6	1.5
Finland	1.8	1.8	1.7	1.7	1.7
France	1.3	1.4	1.1	1.1	1.1
Germany	1.1	1.1	1.0	1.0	1.0
Greece	1.1	1.3	1.1	0.9	1.2
Ireland	1.2	1.2	1.3	1.5	1.4
Italy	0.9	0.9	0.9	0.9	0.8
Luxemburg	m	m	m	m	m
Netherlands	1.3	1.3	1.3	1.2	1.2
Portugal	1.0	1.1	1.1	1.1	1.0
Spain	1.2	1.2	1.2	1.2	1.1
Sweden	1.8	1.8	1.7	1.7	1.7
United Kingdom	1.1	1.1	1.1	1.0	1.1
EU-15 mean	1.3	1.3	1.3	1.2	1.2

Notes: m: data not available

Source: OECD (2002, 2006 and 2007)

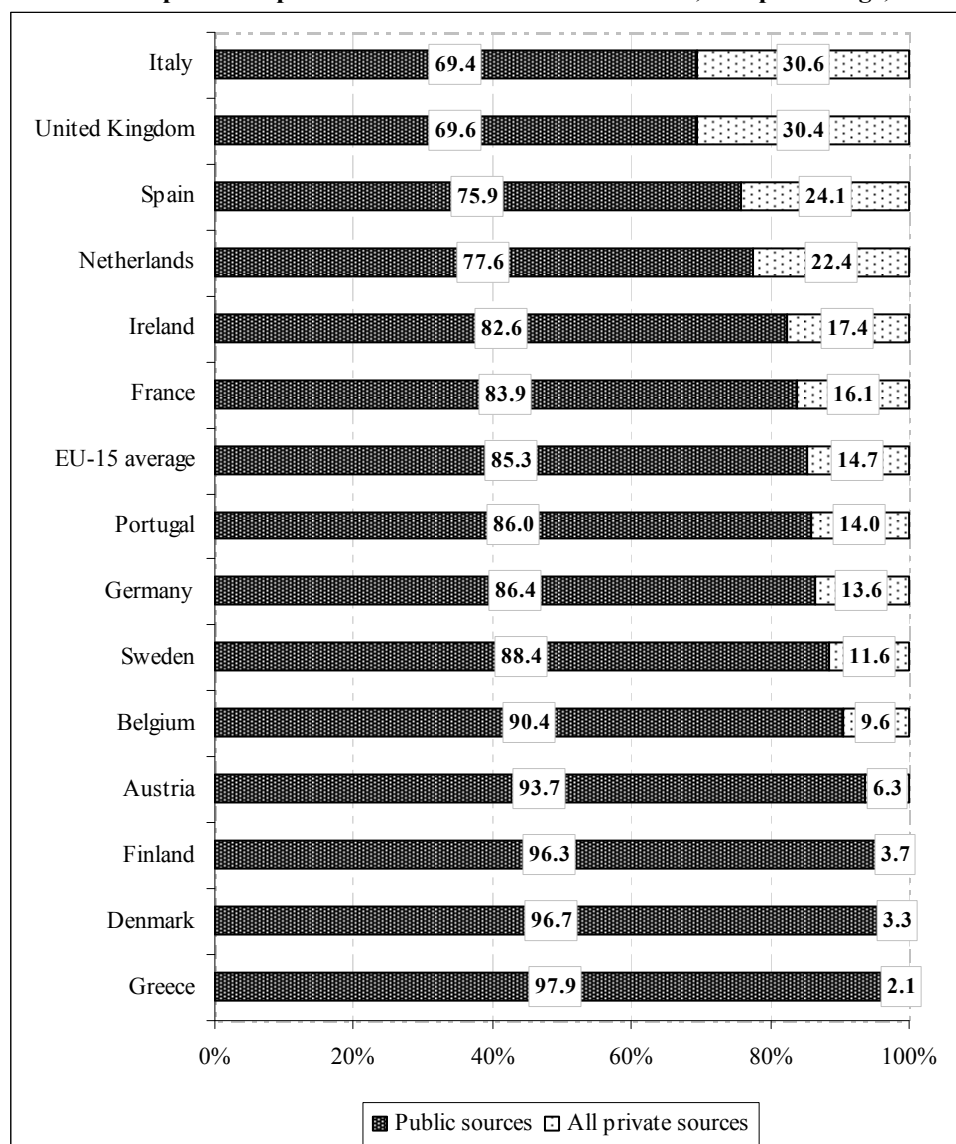
Table 2. Relative proportions of public and private expenditure on educational institutions (%), 1998 – 2004

COUNTRIES	2004		2003		2000		1998	
	Public sources	All Private sources	Public sources	All Private sources	Public sources	All Private sources	Public sources	All Private sources
Austria	93.7	6.3	92.7	7.3	96.7	3.3	98.9	1.1
Belgium	90.4	9.6	86.7	13.3	85.2	14.8	m	m
Denmark	96.7	3.3	96.7	3.3	97.6	2.4	97.2	2.8
Finland	96.3	3.7	96.4	3.6	97.2	2.8	m	m
France	83.9	16.1	81.3	18.7	85.7	14.3	85.5	14.5
Germany	86.4	13.6	87.1	12.9	91.8	8.2	92.1	7.9
Greece	97.9	2.1	97.4	2.6	99.7	0.3	m	m
Ireland	82.6	17.4	83.8	16.2	79.2	20.8	72.6	27.4
Italy	69.4	30.6	72.1	27.9	77.5	22.5	74.7	25.3
Luxembourg	m	m	m	m	m	m	m	m
Netherlands	77.6	22.4	78.6	21.4	77.4	22.6	87.5	12.5
Portugal	86.0	14.0	91.5	8.5	92.5	7.5	92.3	7.7
Spain	75.9	24.1	76.9	23.1	74.4	25.6	89.3	10.7
Sweden	88.4	11.6	89.0	11.0	88.1	11.9	98.5	1.5
United Kingdom	69.6	30.4	70.2	29.8	67.7	32.3	46.8	53.2
EU-15 mean	85.3	14.7	85.7	14.3	86.5	13.5	85.0	15.0

Note: m: data not available

Source: OECD (2000, 2002, 2006 and 2007)

Figure 1. Public and private expenditure on educational institutions, as a percentage, 2004



Source: Authors' elaboration with data from OECD (2007).

Table 3. Distribution of Expenditure on HEIs in relation to number of student enrolled in HE, 2001 – 2004

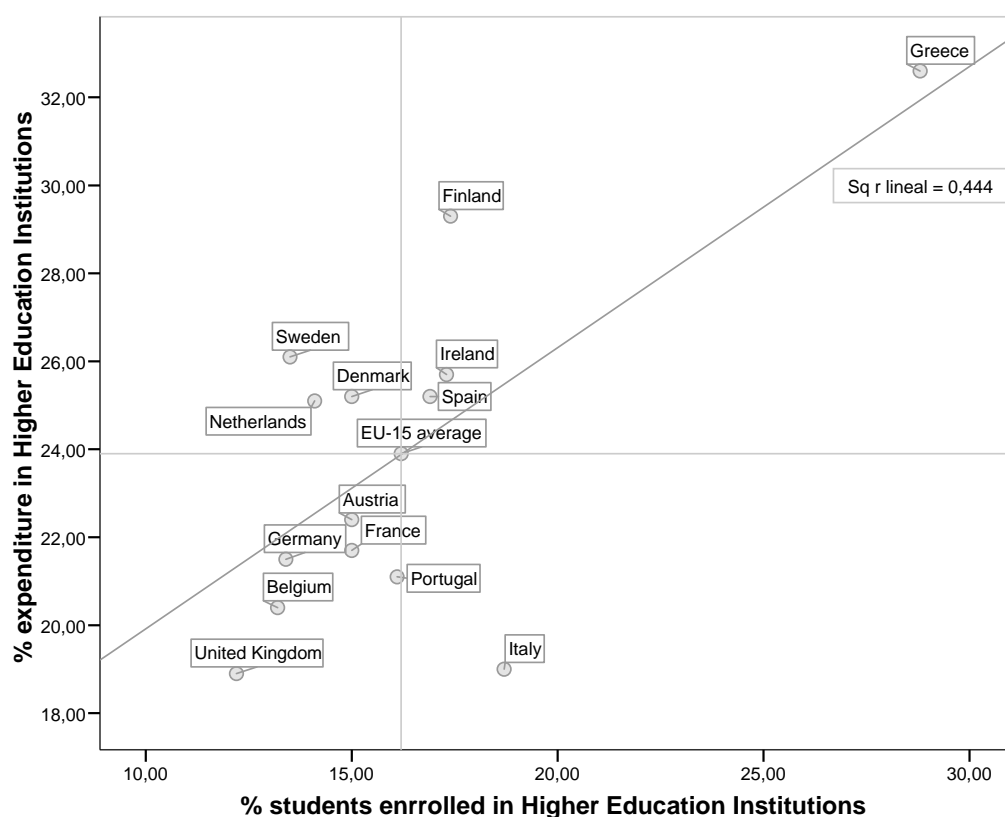
COUNTRIES	2004		2003		2001	
	% EXP	% STUD	% EXP	% STUD	% EXP	% STUD
Austria	22.4	15.0	20.7	14.6	20.8	15.4
Belgium	20.4	13.2	21.3	13.5	21.7	13.4
Denmark	25.2	15.0	24.9	15.1	25.7	14.9
Finland	29.3	17.4	28.9	17.3	29.6	17.2
France	21.7	15.0	21.6	14.7	18.1	13.7
Germany	21.5	13.4	22.6	13.4	19.9	12.4
Greece	32.6	28.8	29.9	27.3	29.2	24.9
Ireland	25.7	17.3	m	m	29.8	16.0
Italia ¹	19.0	18.7	20.7	18.3	19.1	17.4
Luxembourg	m	m	m	m	m	m
Netherlands	25.1	14.1	25.2	13.7	26.3	13.1
Portugal	21.1	16.1	19.2	18.1	18.8	m
Spain	25.2	16.9	25.5	17.1	24.8	17.0
Sweden	26.1	13.5	26.3	13.3	26.0	12.0
United Kingdom	18.9	12.2	18.7	11.6	19.7	11.1
EU-15 mean	23.9	16.2	23.5	16.0	23.5	15.3

Note: m: data non available

1: only public institutions

Source: OECD (2004, 2006 and 2007)

Figure 2. Relation between the percentage of expenditure in higher education institutions and students enrolled in higher education, 2004



Source: Authors' elaboration with data from OECD (2007).

Table 4. Expenditure on Higher Education Institutions per student (USD) in absolute terms and relative to GDP per capita, 1998 - 2004

COUNTRIES	2004		2003		2000		1998	
	Exp	Exp/ GDPpc	Exp	Exp/ GDPpc	Exp	Exp/ GDPpc	Exp	Exp/ GDPpc
Austria	13,959	42	12,344	40	10,851	39	11,279	48
Belgium	11,842	37	11,824	39	10,771	41	6,508	27
Denmark	15,225	47	14,014	46	11,981	42	9,562	37
Finland	12,505	42	12,047	43	8,244	33	7,327	34
France	10,668	37	10,704	38	8,373	33	7,226	34
Germany	12,255	41	11,594	42	10,898	42	9,481	41
Greece	5,593	20	4,924	24	3,402	21	4,157	29
Ireland	10,211	28	9,341	27	11,083	39	8,522	38
Italia ¹	7,723	28	8,764	33	8,065	32	6,295	28
Luxembourg	m	m	m	m	m	m	m	M
Netherlands	13,846	41	13,444	42	11,934	44	10,757	44
Portugal ¹	7,741	40	7,200	41	4,766	28	m	M
Spain	9,378	36	8,943	36	6,666	33	5,038	30
Sweden	16,218	52	16,073	54	15,097	58	13,224	61
United Kingdom	11,484	36	11,866	40	9,657	39	9,699	46
EU-15 mean	11,332	38	10,934	39	9,413	37	8,390	38

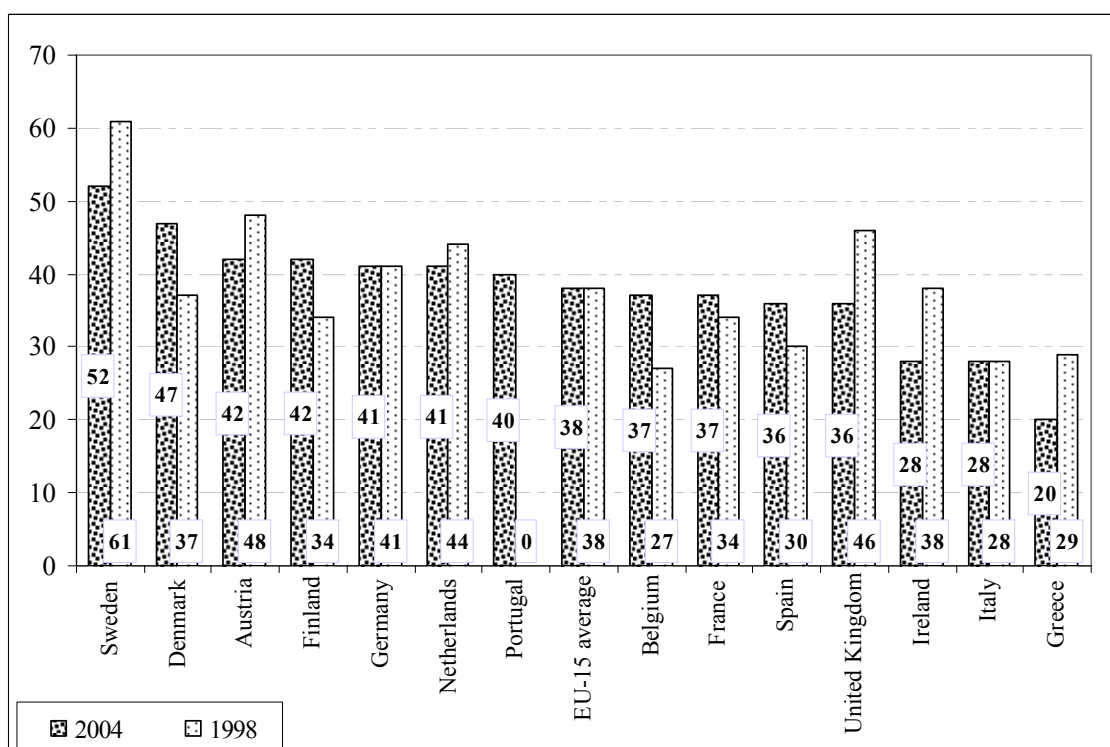
Notes: USD PPPs

m: data non available

1: only public Institutions

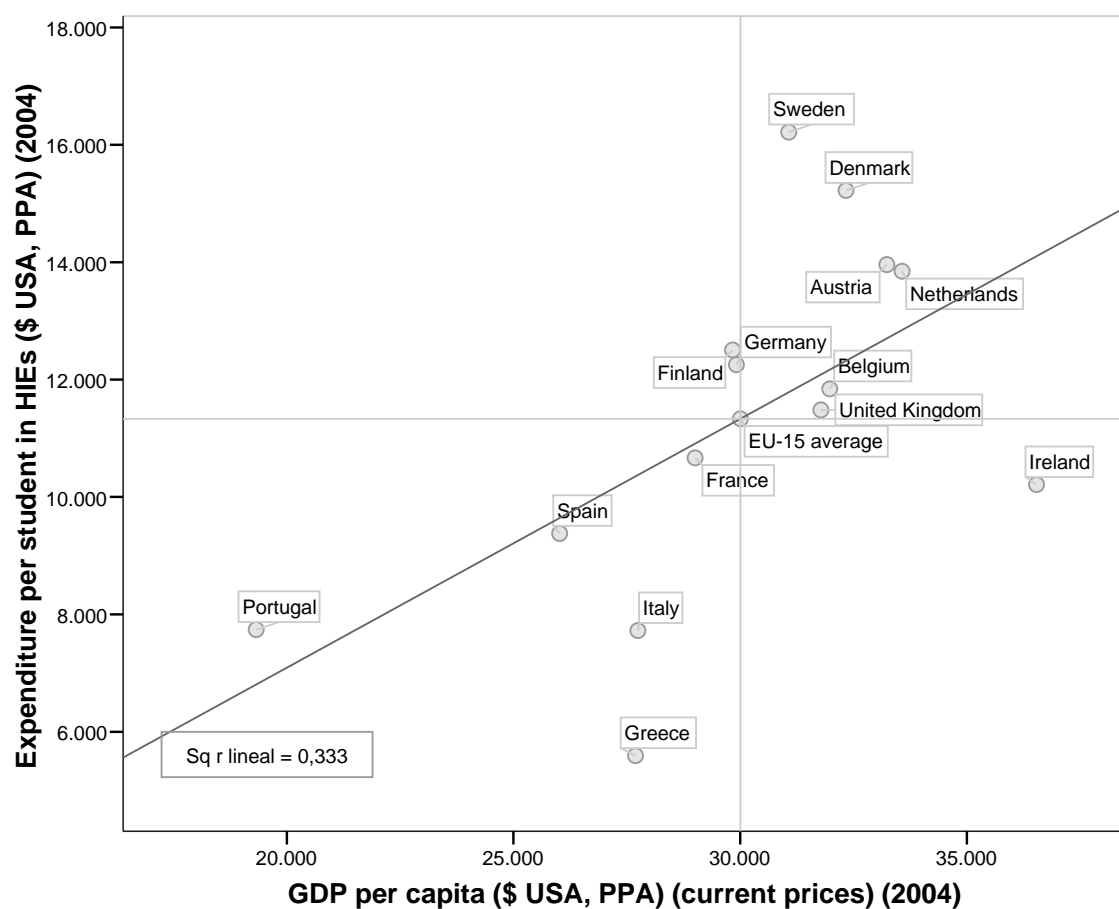
Source: OECD (2000, 2002, 2006 and 2007)

Figure 3. Expenditure on HEIs per student relative to GDPpc (USD), 1998 and 2004



Source: Author's elaborations with data from OECD (2000 and 2007)

Figure 4. Relation between expenditure on HEIs per student and GDP per capita, 2004



Source: Author's elaboration with data from OECD (2007).

Table 5. Results from panel regressions

Variable	Model 1 _ Fixed effects	Model 2 _ Fixed effects	Model 1 _ Random effects	Model 2 _ Random effects
GDP per capita	0.224	0.156	0.253	0.191
	0.044	0.049	0.041	0.047
	0.000	0.003	0.000	0.000
% Population who attained tertiary education	91.860	61.804	62.311	54.232
	54.577	53.189	44.743	44.130
	0.098	0.251	0.164	0.219
Expenditure for tertiary education as %GDP	4,712.771	4,252.536	4,631.556	4,495.252
	1,107.963	1,068.270	960.248	934.613
	0.000	0.000	0.000	0.000
Public funds for tertiary education as %total	3.456	1.676	-3.593	-4.471
	19.695	18.729	18.662	17.965
	0.861	0.929	0.847	0.803
Bologna Process (Dummy)		756.482		630.207
		297.209		282.874
		0.014		0.026
Constant	-4,100.000	-1,400.000	-5,200.000	-1,800.000
	2,409.222	2,516.391	2,100.561	2,184.077
	0.097	0.578	0.102	0.400
N	69	69	69	69
r2	0.613	0.658		
Rmse	697.812	663.105	700.4	666.964
F	20.211	19.201		

Notes: b/s.e./p

Table 6. Results of β -convergence of expenditure per student in HEIs

	1998-2004	1998-2001	2001-2004
β	0.046996* (1.842133)	0.028227 (0.560432)	0.082504** (2.563208)
α	0.424430** (2.462573)	0.315045 (0.760094)	0.713112** (3.092728)
R^2	27.40%	2.77%	41.34%
Adjusted R^2	21.35%	-5.33%	36.46%
β (%)	4.7%	2.8%	8.2%

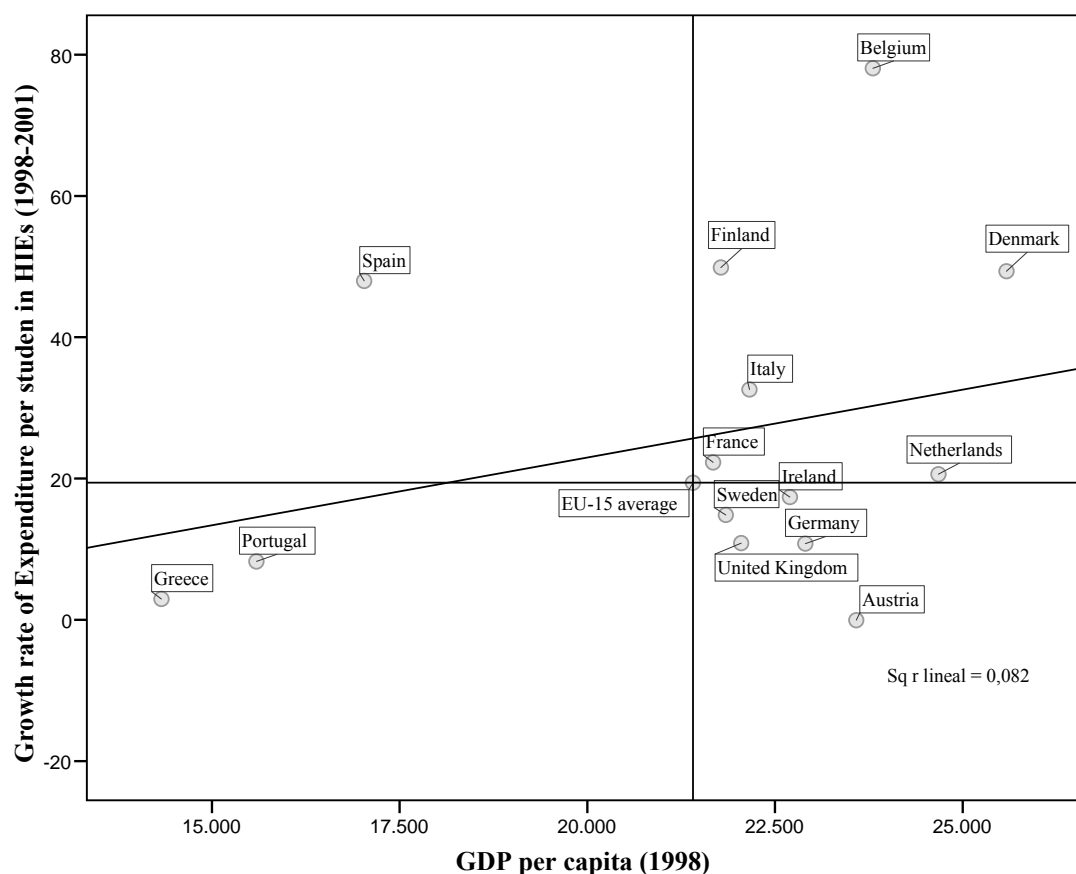
Notes: t-Statistic in parenthesis. The coefficients are statistically significant with a confidence of 90% (*) or 95%(**)

Table 7. Conditional convergence of expenditure per student in HEIs – inclusion of GDP per capita 1998-2001

β	0.251728* (2.126098)
α	1.238494*** (3.038887)
λ	0.0000194*** (3.386701)
R^2	52.40 %
Adjusted R^2	43.75 %
$\bar{\beta}$	25.17%

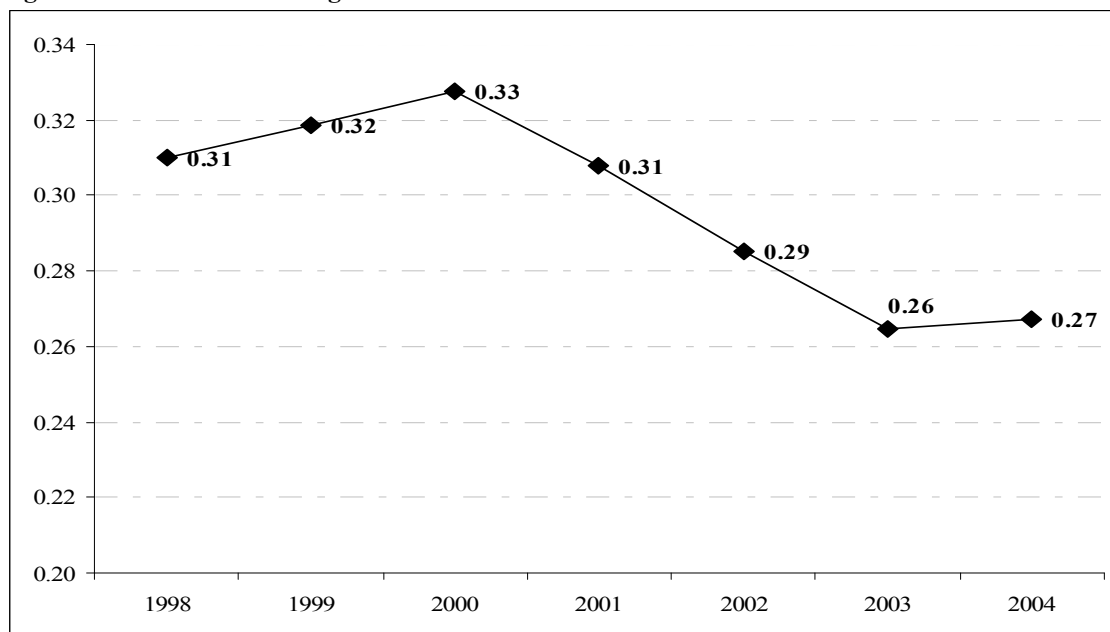
Notes: t-Statistic in parenthesis. The coefficients are statistically significant with a confidence of 90%(), 95%(**) or 99%(***)*

Figure 5. The process of convergence 1998 – 2001: the effects of GDP per capita 1998



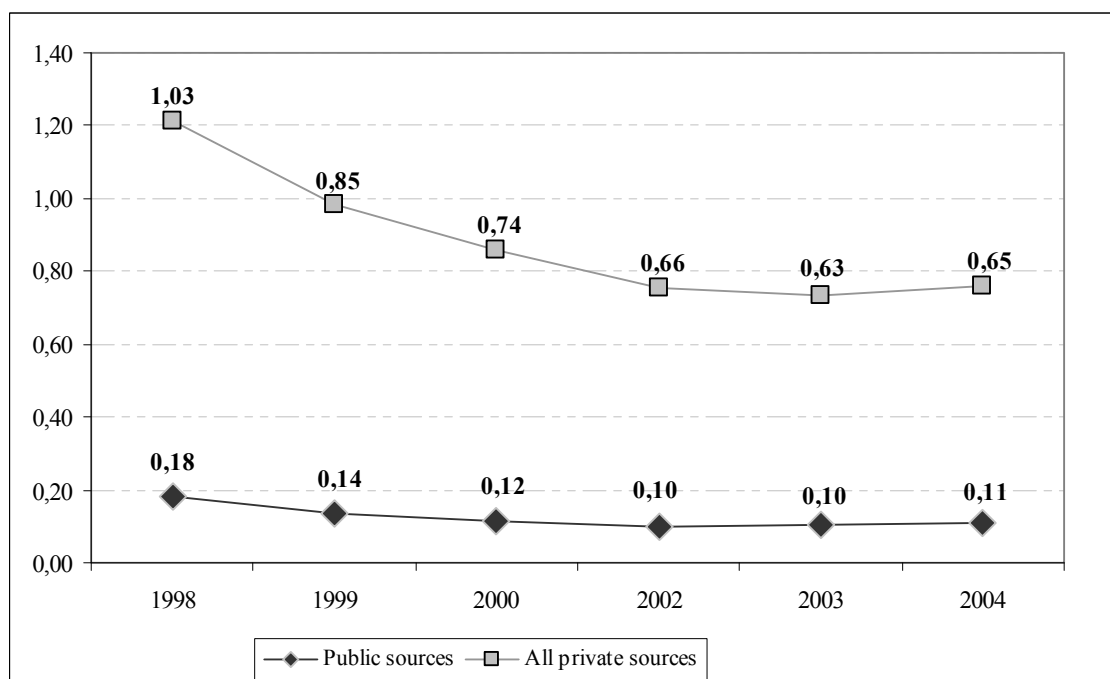
Source: Authors' elaboration with data from OECD (2007).

Figure 6. Results of σ -convergence 1998 - 2004



Source: authors' elaboration.

Figure 7. Coefficient of variation for the percentage of public and private financing of HEIs 1998 - 2004



**Figure 8. Coefficient of variation for the public and private expenditure per student
1998 - 2004**

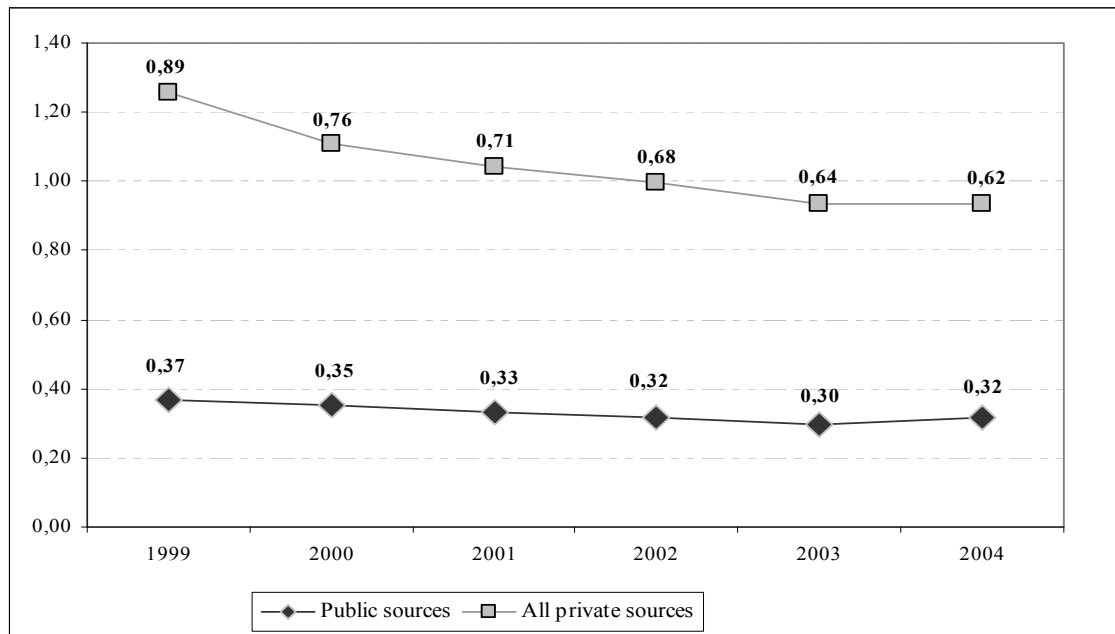


Table 8. Results of β -convergence of private expenditure per student in HEIs. 2001-2004

β	0,146623*** (4,824366)
α	0,921969*** (6,864533)
R^2	75.37 %
Adjusted R^2	73.32 %
$\bar{\rho}$	14,7%

Notes: *t*-Statistic in parenthesis. The coefficients are statistically significant with a confidence of 99% (***)

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