WILL EMU INCREASE REGIONAL DISPARITIES WITHIN SPANISH REGIONS? A NEW EMPIRICAL APPROACH

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ABSTRACT

This paper intends to analyse the current and expected evolution of regional disparities in Spain, paying special attention to the feasible impact of the integration in the single currency. Accordingly, it pursues some estimations of the steady state levels of labour productivity under different scenarios. Basic results confirm the idea that Spanish regions seem to be already close to their long run equilibrium. Furthermore, our empirical analysis suggests that the main reason explaining the lack of convergence in productivity levels is technology differences across regions. The single currency will probably bring Spanish regions still closer to the average European welfare level, but further homogenisation within autonomous communities is not warranted unless structural reforms are carried out.

1. INTRODUCTION

The economic and institutional features of Spain have experienced deep changes in the last decades, which in turn have favoured a catching up process with other western countries. The Spanish real per capita GDP has increased from 57.2 per cent of the European Union in 1960 to 76.2 per cent in 1996 (Fundación Banco Bilbao-Vizcaya, 1997). Predictions for the near future may be regarded as optimistic: although the

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connection between nominal convergence and real convergence is not straightforward, depending on the type of shock impinging on the economy (Viñals, 1994), it is expected that the fulfilment of the Maastricht criteria and the subsequent future integration of Spain in the EMU will draw Spanish per capita output still closer to average European levels.

From a more disaggregated approximation, however, monetary integration is looked upon with a certain amount of concern by both national policymakers and population, since the impact of the single currency on regional disparities in Spain is not clear at all. As it is well known, from a theoretical approach it is not possible to quantify accurately the net benefits and costs that the integration process entails for a particular country or region.

This paper intends to contribute to shed some light on this issue by means of exploring the recent performance of the Spanish regions, in order to characterise its convergence pattern and get some insights about the steady state to which they are headed. The analysis is pursued in the framework provided by a stylised dynamic growth model, whereby some preliminary conclusions about the main determinants of their current relative positions, together with predictions for the near future may be inferred.

The structure of the paper is as follows: section 2 gives a brief overview of the Spanish evolution in the last four decades. In section 3, some theoretical considerations about the concept of long run (steady state) equilibrium, that will be the basis of the empirical part of the paper, are provided. Section 4 comments on the data employed and describes the empirical estimates of the steady state that have been pursued. Section 5 summarises some implications of the results, and finally section 6 offers some concluding remarks.

2. THE RECENT SPANISH PERFORMANCE: SOME FACTS.

It may prove useful to place the regional analysis that will be implemented later on in a broader framework of the Spanish global performance.

As it was said above, the last 40 years have seen a progressive narrowing of the distance between Spain and the most advanced European countries; this process, however, has neither been uniformly distributed over time nor through the space encompassed by the Spanish territory.

As regards the time evolution of this convergence with the leader countries, it could be stated that the bulk of the catching up process of the Spanish economy took place until the mid-seventies, while the relative distance between Spanish per capita GDP and the European average increased during the recession that followed both oil shocks. This divergent trend reverted in the mid-eighties, in which the gap started to decline again, although at a lower rate that in the sixties and early seventies. A thorough analysis of the evolution over time of the Spanish economy is beyond the scope of this paper, but some ideas may nevertheless be provided succinctly in order to help understand this growth process both at the aggregate and regional levels

According to some recent contributions, the main factors that explain the Spanish growth process in the second half of the 20th century are an intense pattern of investment, a technological catching up process with the leaders countries and a progressive tendency towards the internationalisation and liberalisation of the economic and institutional set-up.

Furthermore, the gradual process towards the economic integration of Spain in Europe may be confirmed by some basic indicators: the evolution of the ratio “exports + imports/2GDP” has increased from 17.9 in 1988 to 26 in 1996 (Villaverde, 1997). Intraindustrial trade, as captured by an aggregate index, has also expanded from 0.5 to 0.59 for the same period (Carrera and Villaverde, 1998). These patterns may be regarded as having exerted a positive effect in Spanish development.

From the theoretical point of view, the impact of economic integration on economic growth is still a controversial issue, and therefore predictions about its benefits or its drawbacks will generally differ on the basis of the underlying theoretical models that are considered. Generally speaking, neo-classical models predict that the integration will modify only the steady state per capita income (*level effect)* and therefore the impact of the integration will be modest. In contrast, endogenous growth models - by means of relaxing one or more neo-classical features of the economy - may imply larger effects of the integration, which could conceivably alter the rate of growth of output in the steady state (*rate effect*).

Different explanations may account for this greater impact in the context of endogenous models. The most obvious one is that integration will promote international trade among the members of the agreement. Thus, larger markets will allow the exploitation of scale economies while more dynamic competition will foster gains in

efficiency and in competitiveness[1]. Another rationale is provided by Rivera-Batiz and Romer (1991), that show how trade between countries or regions of similar features - this is, in fact, the case of an economic integration *stricto sensu* - will allow to exploit increasing returns associated with the R&D sector.

Indeed, one feasible mechanism by which integration may foster growth is through the appearance of externalities. Now, if externalities appear at the national or local level, then they may induce faster growth only in some countries or regions, since firms will tend to concentrate in those areas in which the spillovers effects of knowledge (Romer, 1986), infrastructure (Barro, 1990) or a large demand due to agglomeration (Krugman, 1991) are more noticeable. Other areas, instead, may suffer from stagnation or divergence from the leaders.

However, if externalities operate at the international level (Coe and Helpman, 1995) then integration may foster growth even in relatively laggard countries or areas. This last assertion may be combined with the technological diffusion mechanism (as designed, for example, by Barro and Sala i Martin, 1997). Imports of intermediate capital goods that incorporate new technology may, in turn, be a specific way by which this links operates (Lee, 1995) [2].

From a theoretical approach, therefore, the impact of the integration on a particular country or region is not unambiguously determined. Empirical evidence about the links between economic integration and growth is not conclusive at this stage, either, but there are already some studies that suggest a positive and significant effect of European integration on growth at the national level; (see, for example, for the Spanish and the French cases Cuñado, 1997, and Coe and Moghadam, 1993, respectively). In particular, the beneficial effect of the integration for the Spanish economy can be attributed to the catching up process that has been facilitated by technological diffusion. This insight will be further considered below.

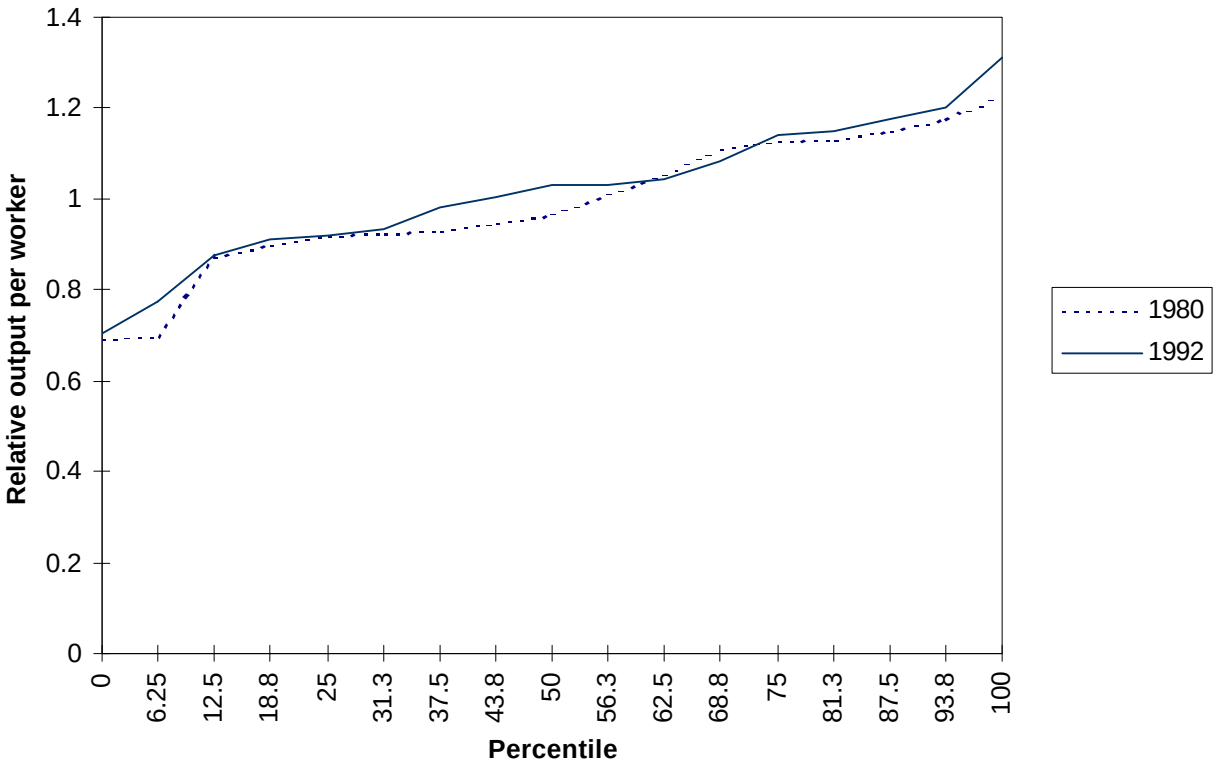
As regards the behaviour of the economy at the regional level, most recent contributions state that the convergence of Spain to other advanced countries has been

[1] The links between international trade and growth has spurred a vast amount of contributions in recent years. For a survey, see Edwards (1993). Although the general consensus today seems to be that international trade enhances economic growth (in contrast with estructuralists contributions of the fifties), this assertion is not easily proved by empirical research due, among other factors, to reverse causation between exports and growth.

[2] The assesment of the benefits and costs of the integration may also be implemented from an alternative approach, that focuses in the theory of optimal currency areas. For an update, see Villaverde, (1997).

accompanied by a reduction of the regional disparities within Spanish regions, as measured by the evolution of the σ-convergence indicator (Villaverde, 1997). However, the dispersion among Spanish regions has not decreased steadily, but only until the early 1980s, to stagnate thereafter. Figure 1 shows a plot of the distribution of output per worker in two selected years, 1980 and 1992. Productivity levels are considered relative to the Spanish average. The distribution is slightly smoother in 1992 for the poorer regions but steeper for the last deciles (richer regions), pointing out to a reduction of the disparities at the bottom of the income distribution and to an increase of the inequality in the upper third. In this regard, some authors (De la Fuente, 1996; García, Raymond and Villaverde, 1995) have suggested that the forces of convergence among Spanish regions are exhausted, since the various regions may be already close to their steady state. This issue has important practical consequences since it could be interpreted as suggesting the future persistence of regional inequalities unless important structural reforms are carried out.

Figure 1. Relative output per worker distribution, 1980 and 1992



In terms of β-convergence, most contributions agree that conditional convergence be a more accurate description of the long run evolution of these units than absolute convergence. This result implies, in turn, that Spanish regions are headed towards different steady states, and therefore that they are not expected to reach a common level of per capita income automatically, by the sole action of traditional convergence mechanisms such as the diminishing marginal productivity of capital.

Some studies have pointed to a bunch of variables that seem to have had relevance in conditioning the convergence process and therefore in determining the steady states levels of output and productivity of the various regions. Some of these variables are public capital, (Mas et al., 1995a), technological catching up and reallocation among sectors (De la Fuente, 1996), and human capital (De la Fuente and Vives, 1995; Dolado et al., 1994).

In addition, part of the regional inequality in Spain may also be attributed to the behaviour of unemployment rates (De la Fuente and Vives, 1995), whose dispersion has increased during the eighties (Villaverde, 1997). This fact, in turn, may be related to severe rigidities in the labour market and in the bargaining process, that end up in uniform rates of growth of wages across the nation despite regional differentials in productivity.

Two relevant questions arise at this point: first, taking into account its recent evolution, how will the pattern of Spanish regional convergence or divergence look like in the following years? Second, which are the main factors - including international considerations and, in particular, European monetary integration - determining the steady state to which a specific region converges? The rest of the paper will deal with these issues.

3. THE STEADY STATE: A THEORETICAL FRAMEWORK

It is not easy to estimate the steady state to which a particular economy is converging, especially because of the difficulty of figuring out the correct model underlying its dynamic behaviour. Nonetheless, Jones (1997) has devised a useful procedure in order to overcome this problem and get an approximation to the steady state. He has applied this method to a set of developed and developing countries. The implicit assumption in his analytical and empirical apparatus is that long run values of per capita income may be inferred from recent past data, since a country's fundamentals

regarding preferences and technology show strong persistence over time. We shall apply this insight to the Spanish regions.

As far as the theoretical framework of this technique is concerned, the starting point is the Cobb Douglas production function (equation 1).

$$Y(t) = K(t)^{a}\left[A(t)H(t)\right]^{1-a} \quad (2)$$
$$0 < a < 1$$

This equation is slightly reformulated along the lines of the neo-classical growth model, as presented by Mankiw, Romer and Weil (1992), in order to include human capital. This modified version is displayed in equation (2)

$$Y(t) = K(t)^{a}\left[A(t)H(t)\right]^{1-a} \quad (2)$$
$$0 < a < 1$$

Where Y is output, A is technological progress (total factor productivity) - growing at a constant rate g - and α is the share of capital in production.

H is human capital or skilled labour. The production function in this model, while keeping the main neo-classical features (non-increasing returns of reproducible inputs) captures also an important feature of the New Growth Models, by means of the introduction of human capital H. We can assume (as in Lucas, 1988), that human capital is a rival and excludable good that accumulates by means of education. A straightforward way to capture this idea is to model it as follows:

$$H(t) = e^{f\,m(t)}\,L(t) \quad (3)$$

In which m stands for the number of years devoted to education, ϕ is the rate of return to education investment and L is the total of employed population (raw labour input).

In order to alleviate notation, we can suppress the argument t and divide over by L so that lowercase letters represent per worker variables, i.e.:

$$y \equiv \frac{Y}{L}$$

This last procedure has the useful advantage of providing a direct interpretation of the results in terms of productivity.

If the economy is assumed (for now) to be closed and without public sector, then the evolution of physical capital is as follows:

$$\dot{k} = s\,y - (d+n)k \qquad (4)$$

Where δ is the depreciation rate, n stands for population growth and s is the (constant) share of output devoted to gross investment.

As it is common in this kind of models, in the steady state the growth rate of capital over employed population is equal to the growth rate of technological progress (g). Very simple algebraic manipulation in equation (4) allows to compute the steady state level of output over employed population, y*, as equation (5):

$$y^* = \left(\frac{s}{n+g+d}\right)^{\frac{a}{1-a}} A\,h \qquad (5)$$

Where the expression for the level of human capital per worker is obtained from (3) and yields

$$h = e^{f\,m} \qquad (6)$$

As equation (5) shows, the steady state level of output per worker depends on the level of saving, technology and human capital, and on the rate of technological progress, population growth and depreciation, together with the elasticity of output with respect to capital, α. This equation will be the benchmark of our empirical analysis.

4. DATA AND EMPIRICAL RESULTS

4.1. Data

The empirical part of this paper carries out basically the estimation of equation (5), first in a baseline case and afterwards specifying several alternative assumptions.

We have used data for the 17 Spanish regions, in the years 1980-1992. Output series have been obtained from the GAV (Gross Added Value) data at constant prices published by the Ministry of Economy (Ministerio de Hacienda, 1997). Total and

employed population series have been taken from the TEMPUS database (INE), and physical and human capital from Fundación Banco Bilbao-Vizcaya (1996) and Mas *et al*. (1995b).

In order to construct the series of human capital, and according to some recent studies (Psacharopoulos, 1994), we have taken 0,1 as the rate of return to a year of schooling (ϕ in equation 3). The number of years devoted to education has been approximated by the fraction of employed population that has completed studies at a Bachelor's level. According to Jones (1997), the proportion of the population with a certain level of studies may be an acceptable forecast of the future level of human capital.

The levels of A have been computed as labour augmenting total factor productivity (the Solow's Residual), from a traditional growth accounting exercise applied to the production function (2) written in per worker magnitudes. Values for 1992 are reproduced in Appendix.

Finally, other parameters have been given standard and constant values across regions, such as α=1/3 (in accord with De la Fuente, 1996) and $(g+\delta)$= 0.075 (following Jones, 1997).

4.2. Empirical estimates of the steady state

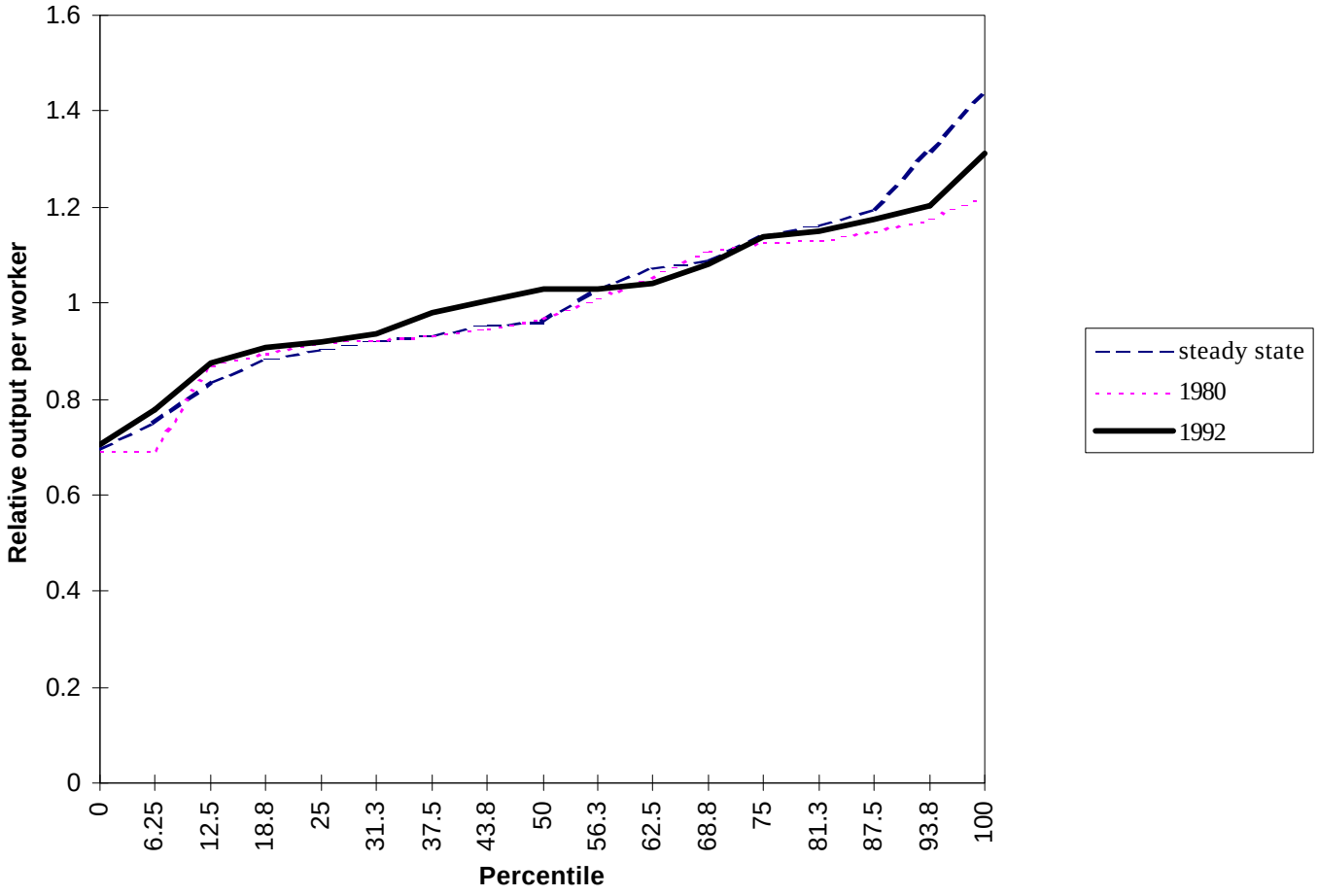
4.2.a. Baseline case

As it was stated above, some authors have argued that Spanish regions seem to be already rather close to their steady state values of per capita income and productivity. De la Fuente (1996) goes one step ahead and provides some estimates of the steady state levels of productivity that - interestingly- display values that are not far from the levels that were reached in 1991. According to these pieces of research, we have assumed that the values of some relevant variables in 1992 may be used in order to calculate the steady state of the Spanish regions. Therefore, we have estimated the steady state level of productivity by means of computing equation (5), with the values of A, s and h that correspond to 1992 levels. As the rate of population growth, though, the average for the 1980-92 period has been used. All computations have been made in relative terms with respect to the national average.

Figure 2 shows the predicted steady state distribution, which is not very different from the one implied by figure 1: disparities tend to decrease in the lower part of the distribution (poorer regions) but increase for the richer regions. The value of the

dispersion of productivity that corresponds to this distribution is 0.19 (Table 1), which is indeed very close to the figure of 0.20, around which σ-convergence has tended to

Figure 2. Steady-State distribution, baseline



stagnate from the mid-eighties onwards. The relative position of the various regions is rather similar for 1992 and the predicted steady state values.

Table 1 displays also the values corresponding to the R^2 obtained from a linear regression of the 1992 level of productivity on its steady state level. The interpretation of this figure should be made with caution, however, since it may be argued that the

correlation between both productivity levels may be an artifact of the procedure followed in order to estimate the steady state level. In any case, the high value (0.87) of the coefficient of determination confirms the message conveyed by the σ–convergence indicator, in the sense that regions in 1992 were already nearby their long run equilibria.

TABLE 1: REGIONAL PRODUCTIVITY AND CONSUMPTION DISTRIBUTIONS: ALTERNATIVE SCENARIOS

	GDP		Consumption	
Scenario	Sigma	R2	Sigma	R2
Data for 1980	0.1554		0.1575	
Data for 1992	0.1559		0.1352	
Steady-State distributions:				
(1)Base model	0.1943	0.8715	0.1636	0.8770
(2)--A >= 1	0.1321	0.4605	0.1117	0.5208
(3)--Same A	0.0565	0.1354	0.0286	0.2263
(4)--A>=1, same h	0.1282	0.4237	0.1082	0.4874
(5)--Same n	0.1927	0.8998	0.1617	0.8996
(6)--Open Economy	0.2183	0.9181	0.1888	0.9360

Finally, the table also reports the consumption per worker distribution, where consumption has been computed as (1-saving rate) times output per worker. Its dispersion is slightly smaller than the one corresponding to productivity for each scenario, as reported in the last column of table 1, which may be related to the fact that consumption is more related to disposable income than to productivity. According to some estimates (Villaverde, 1997), regional disposable income disparities in Spain are lower than those of productivity, due to the redistribution policies implemented by the State.

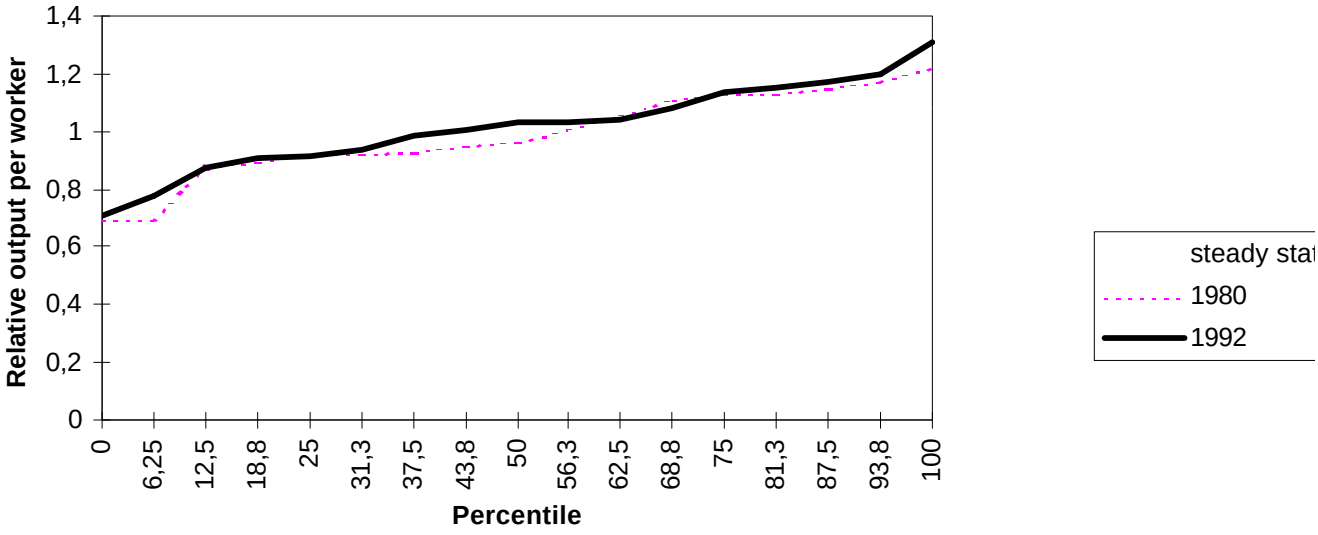
4.2.b. Steady state alternative scenarios

The steady state distribution may be estimated under different assumptions concerning the values of the relevant parameters. Case number 2 assumes a more rapid process of technological diffusion among regions. This feature is captured by means of letting those regions below the national average catch up with that value. The more

productive regions, however, keep their positive differences with regard to the average. In this particular instance the estimated dispersion diminishes to 0.13 (table 1, row 4).

Case 3, in turn, allows for perfect technological diffusion and considers the same A for all regions. The predicted distribution is reflected in Figure 3: homogenisation among regions is almost perfect, and the dispersion of productivity decreases to 0.056. Not surprisingly, in this case the coefficient of determination displays its lower value (0.135).

Figure 3. Steady-State distribution (scenario 3)



It is interesting to compare the predicted outcomes of these two last virtual economies. The main message that this comparison conveys is that the relative reduction of the divergence - as measured by the standard deviation of productivity - is smaller if it is the group of relative laggard regions the one which converge. The estimated σ is not very distant from the baseline case in scenario number 2, implying that the bulk of the

divergence is made up by the distance of the richer regions from the average. The dispersion decreases dramatically, though, if all regions converge in productivity (scenario 3) while maintaining their differences regarding saving habits, population growth and human capital.

Case 4 considers a slight variation of case 2: the assumption regarding technology flows replicates case 2, but human capital is considered to be the same across regions. In this scenario the dispersion does not decrease significantly (the estimated value is 0.12). We have tried to disentangle the impact of human capital from technology, by means of estimating also a small modification of case 4. Accordingly, we have assumed that all regions maintain their technological advantages (differences in A) while imposing the restriction of having the same human capital; the outcome, however, is similar to the one obtained in case 4. These exercises point out to the fact that human capital differences, then, do not seem to be crucial to regional disparities, at least at this stage. Indeed, our data show that autonomous communities in Spain have already reached rather similar levels of human capital (the dispersion of human capital endowments in 1992 is only 0.007) [3]. Notwithstanding this fact, we should not forget that the bulk of our analysis in this paper conveys information basically about the *level effect* of the various factors that are relevant for the dynamics of the economy. As Serrano (1998) points out, human capital may also induce a *rate effect* by enhancing activities of innovation or imitation that, in turn, raise technical progress. In addition, high endowments of human capital in a particular area may induce further accumulation of physical capital or even attract investment from other regions, offsetting therefore the neo-classical prediction by which investment should flow to those regions characterised by sparser capital endowments and larger rate of returns.

In case 5 all regions are supposed to exhibit the same population growth rate. The standard deviation for this case is 0.19, very close to the baseline model.

Finally, case 6 explicitly shows the pattern of behaviour following a complete monetary integration (Figure 4). A single currency should bring about, at least from the theoretical point of view, perfect capital mobility and therefore a tendency towards the

[3] Nonetheless, we can not discard the possibility of measurement error in the series of human capital that we used ; unfortunately more accurate descriptions of the human capital endowment of the different regions are not available yet.

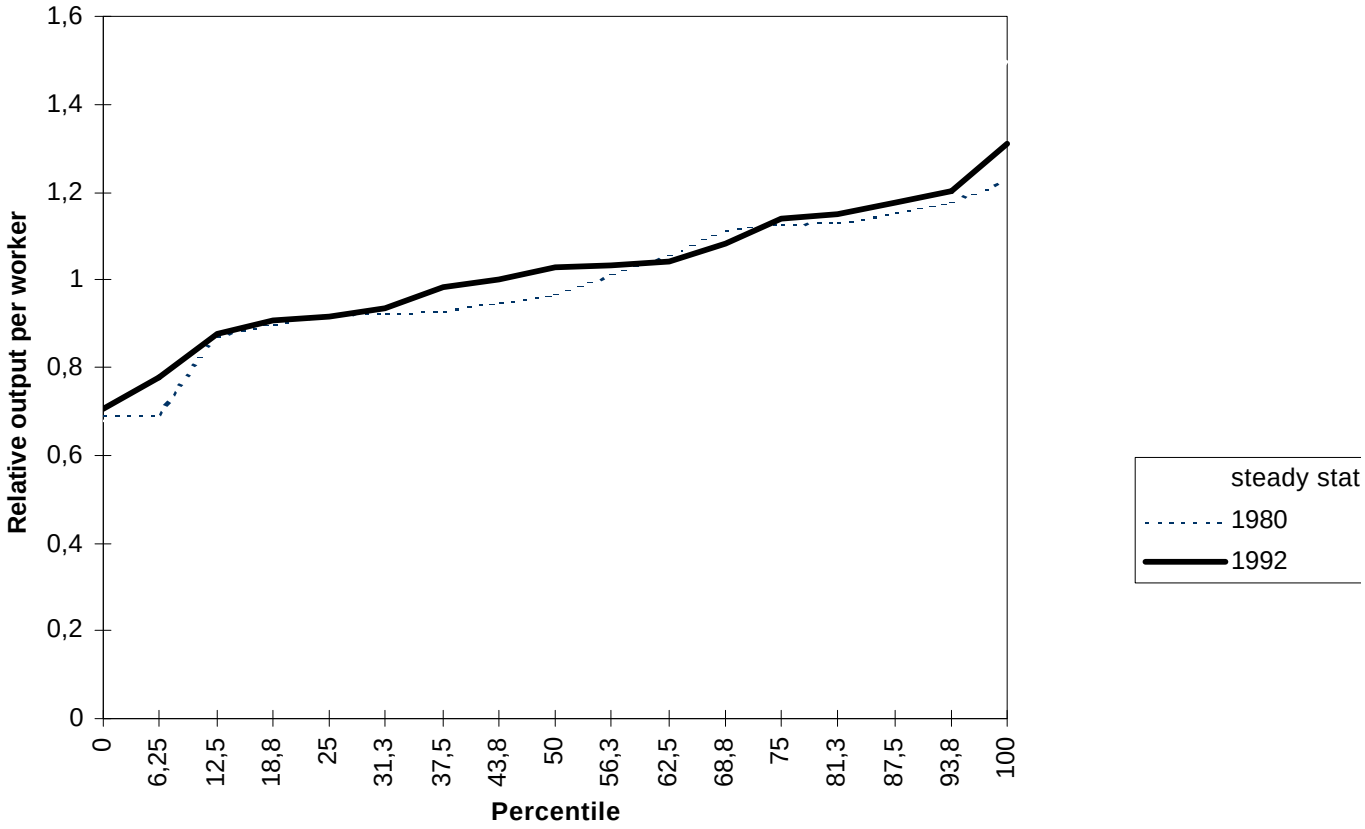
equalisation of interest rates across the countries that encompass the monetary union[4]. It could be argued, however, that such an equalisation should be already apparent in the Spanish economy, since - at least presumably - factors are already mobile. Surprisingly, this is not the case: according to our data (results not shown for lack of space) the marginal productivity of capital is not the same across regions, neither for some selected years, as 1980 and 1992, nor for the predicted value in the steady state baseline case. In this last scenario, the standard deviation of the return to capital is 0.017. In particular, it is higher in the more developed autonomous communities[5]. Moreover, the difference between the return to capital in the region exhibiting its maximum (Canarias) and its minimum (Castilla La Mancha) is 0.056. Hence these data provide evidence in favour of the assertion that further mobility of factors, and in particular capital, is still feasible within the Spanish regions[6], therefore supporting the case for further liberalisation in specific markets.

[4] The technology assumed in the paper is homogeneous of degree one in reproducible factors, and therefore the price of factors should equalise their marginal productivity.

[5] This effect is similar to the main prediction of the Balassa-Samuelson model, whereby more developed countries exhibit higher price levels than developing ones. The feasibility of explaining differentials in the marginal productivity of capital across Spanish regions by such a mechanism will be explored in further research.

[6] A similar reasoning may be applied to the case of labour. See Villaverde (1997).

Figure 4. Steady-State distribution (scenario 6)



The calculations for steady state distribution corresponding to this last case are shown in the last row of Table 1. The dispersion of estimated productivity is the highest of all the scenarios analysed, amounting to 0.21.

The comparison among all cases, though, suggests that allowing for technological catching up, totally or partially, induces the largest changes with respect to the relative productivity distribution prevailing in 1992, whereas to permit equalisation of the rate of growth of population, human capital or the marginal productivity of capital does not change the existing *statu quo* very much.

5. A PRELIMINARY INTERPRETATION OF THE RESULTS

The main ideas that the preceding analysis suggest may be summarised as follows:

1. The use of Jones's (1997) methodology has allowed us to confirm a prediction already pointed out by previous pieces of research, i.e.: Spanish regions seem indeed to be very close to their steady state. The relative position of the 17 autonomous communities in the steady state - as captured by labour productivity- is similar to the one prevailing in recent years, with dynamic areas, such as La Rioja or Navarra at the top of the distribution and traditionally backward areas - Galicia or Extremadura - at the bottom. This ranking is also in accord with the division of Spanish areas in convergence clubs that was obtained in Villaverde and Sanchez-Robles (1988).

2. Technological catching up seems to be the most important factor influencing regional disparities, since allowing for complete convergence in technology levels (case 3) yields the smallest dispersion in productivity. At the same time, this scenario seems relatively far off the present situation, according to our 1992 productivity levels and its low correlation with the predicted steady state levels in case 3 (R^2 is 0.13). This means that there are significant differences among technology levels of the Spanish regions.

The importance of technology in determining the long run equilibria of Spanish regions agrees with other contributions (De la Fuente, 1996, Cuñado, 1997), and in our view points out to the existence of some kind of externalities in the R&D sector. The results in this paper, however, are premature in order to ascertain the exact geographical nature of these spillovers effects (international or domestic) and its origin (agglomeration effects, infrastructure, localisation or technological diffusion). A presumption can be made, however, in the sense that further integration, by fostering these kind of externalities, will not necessarily reduce regional disparities.

Instead, the differences in human capital or in population growth do not seem to be that important for the relative position of Spanish regions.

3. The Open Economy scenario (Spanish integration in the EMU) has yielded the largest value of dispersion in productivity. This is, at first sight, a perplexing result. There is a possible explanation, though, which is consistent with the assumption of decreasing marginal productivity of physical capital: poorer regions are still able to exploit decreasing returns of capital and have therefore potential to converge to the leaders through this mechanism. Therefore, if this is suppressed by the assumption of

perfect capital mobility, the only convergence mechanism is the contagion one by technology diffusion, which benefits precisely the most advanced regions if - as it seems to be the case - technology displays noticeable spillover effects.

4. Nonetheless, the message conveyed by this paper is not as dismal as one could think at first sight, as regards Spanish integration in the EMU. It is true that our results do not point out to a reduction of regional disparities within Spain as a consequence of the integration. However, we do think that the integration will enhance Spanish growth globally considered and hence will draw Spanish regions nearer to average European living standards. In sum, we - tentatively- forecast a twofold process of convergence whereby the gap of Spanish autonomous communities with Europe will decrease, one the one hand, while we are sceptic about further homogenisation of living standards within Spanish geographical units.

6. CONCLUSION

This paper has carried out some research in order to get some insights about the present and future situation of regional inequalities in Spain. Our basic findings suggest that there is a remarkable degree of persistence in geographical disparities, as implied by the fact that Spanish regions seem to be approaching already their long run equilibrium. Although the estimated dispersion in productivity in the steady state does not yield an outrageous value, it nevertheless generates a certain amount of concern in the researcher. This discomfort is especially acute due to the fact that future monetary integration will not presumably smooth these differences if the process of technological diffusion and other spillover effects associated with knowledge are, as we think, a crucial factor influencing regional dynamism.

Regional policy implications are not easy to formulate. On the one hand, we support the frequent request in favour of further liberalisation and removal of distortions from those markets in which they hinder efficiency. These kinds of measures will entail gains in productivity. On the other, we advocate more serious efforts to R&D activities on the part of economic agents: the allocation of resources to this strategic sector is more compelling, moreover, for the laggard regions if they want to catch up with the leaders in the near future.

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