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Fiscal policy and growth: The case of Spanish regions

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ABSTRACT

This paper studies the effects of several fiscal variables on the regional growth of labour productivity in Spain over the period 1965-1997. Panel estimates are reported for this sample. The results show that public consumption affects growth negatively whereas public investment exerts a positive (but not always significant) effect on the productivity growth rate. Public investment in education has a positive impact on the dependent variable, while the opposite is true for public investment in health. Our findings also detect that taxes and social benefits are growth-impeding. Estimates dealing with specification problems are considered.

1. INTRODUCTION

THE EFFECT OF FISCAL POLICIES on regional growth remains a relevant issue. Firstly, the persistence of regional disparities in European countries makes us doubt the effectiveness of regional policies implemented through EU Structural Funds (Boldrin and Canova, 2001). Secondly, the recent enlargement of the European Union will generate a new scenario for these policies, which will entail fewer resources for countries of the EU-15; hence, national and regional governments will be forced to make more efficient and effective use of public policies for regional development.

In addition, several issues are now involved in the debate on the relationship between fiscal policy and growth. One comes from the discussion on whether governments are able to modify the steady-state growth path or not; that is, if an endogenous growth model is followed instead of a neoclassical approach. Although most empirical papers on growth use a theoretical framework based on Solow-type models, recent papers suggest that future research should focus on models that exhibit endogenous growth (Bernanke and Gurkaynak, 2001).

Another central point is the generally accepted view that a large public sector is growth-impeding. This claim can be found in papers such as Barro

(1991), Hanson and Henrekson (1994) or De la Fuente (1997). However, empirical evidence against this result is pointed out in works by Easterly and Rebelo (1993) and Mendoza et al. (1997). Hence, the literature does not provide an unambiguous conclusion, and a diversity of results is to be expected according to samples and econometric specifications (Agell *et al.*, 1997).

If the composition of public spending and taxes matters, further research studying the effects of the public sector on growth needs to be carried out (Tanzi and Zee, 1997). Certain governmental activities may affect growth rates positively; public investment in productive infrastructures is the best example of this (Barro, 1990). On the other hand, from a theoretical point of view, the effect of public consumption on growth could present any sign; in particular, it depends on the substitution between private and public consumption, although a negative coefficient for public consumption is usually found in growth regressions (Easterly and Rebelo, 1993; Barro and Sala-i-Martin, 1995). In turn, social benefits may have different effects on growth. If they are viewed as a mechanism to maintain property rights or to retire low-productivity workers from the labour force their effects are, as might be expected, growth-enhancing (Sala-i-Martin, 1996); conversely, when transfer payments from the government to households reduce incentives to save or work, a negative influence is found (Fölster and Herenkson, 1999).

Alternatively, one of the most robust results from the literature shows that taxes exert a negative impact on growth rates. As is well-known, taxes alter private decisions on savings and capital accumulation, and hence the growth rate. Theoretical models such as Jones *et al.* (1993), and empirical papers by Kneller *et al.* (1999) and Bleaney *et al.* (2001) support this conclusion.

Recently, studies on economic growth and fiscal policy have stressed the importance of taking into consideration both sides of public performance, namely taxes and public spending, jointly (Kneller *et al.*, 1999; Bleaney *et al.*, 2001). They claim that the set of fiscal variables must be considered simultaneously in these kinds of studies, otherwise biased estimates of growth regressions are obtained and policy implications may be misleading.

This paper provides evidence of the effects of fiscal policy on productivity growth for the case of Spanish regions over the period 1965-1997. Hence we translate the literature on empirical growth to a regional level, focusing on the composition of the public budget. This paper is the first to provide a discussion on this. Most previous references evaluating the effects of fiscal policy on Spanish regional growth focused on public investment. De la Fuente and Vives (1995) and Mas *et al.* (1996) find that infrastructures have affected regional growth positively. Conversely, the results obtained by Gorostiaga (1999) and González-Páramo and Martínez (2003) are ambiguous about this positive effect. Regarding public transfers, Bajo *et al.* (1999) detect a negative effect on growth in Spanish regions as a whole, while this effect becomes positive in the poorest regions.

We have run a number of standard growth regressions with fiscal variables among the regressors. The results show that taxes and social benefits (considered jointly in a single variable) and public consumption negatively affect the growth rate of labour productivity, whereas public investment seems to exert a positive but not significant effect. In the case of social public investment, government investment in education appears to be growth-enhancing; the opposite is true for public investment in health. Different estimates dealing with problems of endogeneity support these conclusions. The findings we have obtained have clear policy implications on the relevance of different public instruments to promote economic growth at a regional level, and highlight that redistribution policies have a cost in terms of the growth rate.

The structure of this paper is the following. Section 2 provides some insights on the growth process experienced in Spanish regions and its connection with fiscal variables. Section 3 describes the data sources we have used and characteristics of the variables involved in our regressions. Section 4 gives the estimates of a growth equation with the growth rate of labour productivity as a dependent variable. Finally, section 5 concludes.

2. Some insights into the process of Spanish regional growth

Spain is one of the most decentralized countries in the world. Three different levels of government can be distinguished in its political structure: central, regional and local. In the last two decades, Spain has experienced an intense process of decentralization, which has led to an increase in the share of the subnational governments in total public spending from ten percent in 1980 to more than 37 per cent in 2001.[2] This increase is mainly due to the return of power to regions, derived from the democratic Constitution of 1978, because the relative weight of local governments has remained fairly unchanged. At the present, regional governments in Spain have a high degree of autonomy in the definition and implementation of fiscal policies, with important competences in education, health care, social expenditures and public investment. Also a part of the central government tax power recently has been assigned to regions, including income and excise taxes. But this institutional framework has been developed over more than two decades and it is not even completely homogenous among all regions nowadays.[3] Since the aim is to study the effects of fiscal policy on regional growth over the period 1965-1997, all levels of government have to be considered jointly.

Regarding regional economics, Spain has followed a similar pattern to other European countries. There was a clear convergence in income per capita up until the late 1970s, after when convergence came to a sudden stop (Lopez-Bazo *et al.*, 1999). As is well known, a key factor in the evolution of income per capita is labour productivity. In fact, this variable was the main one responsible for the convergence of income per capita during the 1960s and 1970s; when regional labour productivity showed weak dynamics towards convergence in the 1980s and 1990s, Spanish regions convergence in income

per capita became disrupted (Goerlich *et al.*, 2002). Over this last period, Spanish regions also became less equal in terms of unemployment rates, which encouraged the absence of convergence (Puga, 2002).

Anyway, regional differences in labour productivity have decreased in Spain over the period 1965-1997. The standard deviation of the log of labour productivity decreased from 0.24 in 1965 to 0.11 in 1997. However, this aggregate analysis hides significant features in the behaviour of labour productivity when individual regions are considered. Table 1 shows to what extent the labour productivity of each region has come close to the national average.

Table 1: Regional labour productivities respect to national average

	1965	*1997*
Andalucia	83.1	92.3
Aragon	89.6	99.8
Asturias	94.9	92.9
Baleares	116.0	108.4
Canarias	91.0	92.0
Cantabria	96.0	99.4
Castilla-La Mancha	70.3	87.9
Castilla-Leon	78.1	91.4
Catalonia	125.8	115.4
Comunidad Valenciana	99.1	100.3
Extremadura	62.4	84.9
Galicia	63.6	78.9
Madrid	155.8	105.4
Murcia	88.9	89.5
Navarra	102.4	106.0
Pais Vasco	132.2	119.2
La Rioja	93.0	103.4
Total	100	100

Source: FBBVA

There are three groups of regions defined according to whether they have improved their labour productivity or not, with respect to the national average. The first one consists of those regions with higher relative productivity in 1997 than in 1965, namely: Andalucia, Aragon, Castilla-La Mancha, Castilla-Leon, Extremadura, Galicia, and La Rioja. A second group is composed of regions which experienced a decrease in their initial advantage in terms of relative labour productivity: Baleares, Catalonia, Madrid, Navarra, and Pais Vasco, which were the richest at the beginning of the period. Finally,

a third group of regions only modified their initial relative position slightly: Asturias, Cantabria, Canarias, Valencia and Murcia. As is well known, the literature on growth describes this stylized fact (poor regions grow faster than rich ones) as a result of decreasing returns to scale in the production function.

What role has government played in this process? As mentioned in the introduction, theoretical papers do not provide unambiguous conclusions on the effects of some fiscal variables on growth rate, and empirical studies are not able to achieve clear results in many cases. Several doubts arise by simply looking at Spanish data on the consequences of governmental performance on regional growth. For instance, Galicia is one of the regions with the biggest gains in labour productivity between 1965 and 1997; however, it has been the territory that has received less public investment (in relation to its private investment) in the same period (Gonzalez-Paramo and Martinez, 2003). Public investment is to be expected to have positive effects on growth but it does not appear as relevant in this case. Another example could address the effects of government redistribution programmes on national growth rate. Households in the poorest regions of Spain have received more resources through social benefits, and have paid less tax than families in the richest regions. At first sight, redistribution should exert a positive impact on poorer regions and a negative impact on richer regions (via resources available for investment), but what would be the net effect for national growth as a whole?

We are aware that many factors are involved in the dynamics of income per capita, and consequently in convergence processes. The role of government is one of them, and policy implications that can be derived from this role should be taken into account. Moreover, a regional perspective adds new issues to be considered. This paper addresses these points in the Spanish case.

3. The data

Our sample consists of 17 Spanish regions over the period 1965-1997. Data can be found in *Foundation BBVA* (several years); some of this is available at http://w3.grupobbva.com/TLFB/TLFBindex.htm). All monetary variables are measured at 1986 prices. Our dependent variable is the regional growth rate of labour productivity measured as GDP per job.[4]

On the RHS of the growth equation, two types of variable can be found. The first set consists of conditioning variables suggested by empirical papers on growth. We refer to private investment as the ratio of regional private investment in physical capital over regional GDP. Labour growth is shown through the growth rate of jobs in each region. The unemployment rate has also been included to control for the regional business cycle; moreover, previous contributions have shown that regional differentials in unemployment rates are relevant to regional convergence in Spain (Bentolila and Jimeno, 1995; Puga, 2002). A measure of human capital was considered among the regressors (share of the working-age population with secondary and university studies) but significant multicollinearity problems arose so it was decided

to not include it.[5] As a way to control for the catching-up effect, the log of initial labour productivity has also been taken into consideration in the RHS of growth equation.

The second group of variables used as regressors aims to control for the effect of fiscal variables on growth. In such a way, we define public investment as a percentage of productive public investment (roads, hydraulic infrastructures, urban structures, ports) in a territory over regional GDP; at this point, we consider productive capital spending by all levels of government (central, regional and local).[6] Social public investment is considered as well, with an identical definition of productive public investment, but in terms of government investment in education and health.

Since there are no existing data for public consumption, this variable has been approximated through two variables. These are regional labour costs in the public sector over regional GDP, and the share of public services production in a region over the value of total regional production. Estimates reported have been obtained using labour costs in the public sector as a proxy. Anyway, the results hold whichever proxy is considered. Before estimating the growth regression, we checked that data for public consumption and taxes did not display biased geographical distribution in favour of the Madrid region.

Taxes are measured as a share of tax resources collected by all governments (social security contributions, direct and indirect taxes) in a region over regional GDP. This variable was included as a regressor at the beginning but our estimates of the coefficient for taxes were problematic: they appeared with an implausible positive sign. Easterly and Rebelo (1993) emphasize the close relationship of the tax variable with other regressors in growth equations and it is difficult to isolate the effects of taxation in the presence of high collinearity. In fact, we detected correlations in a range of 0.8-0.9 between taxes and other variables (such as initial labour productivity, public investment and public consumption), so we decided to remove taxes from among the regressors. Something similar happened when social benefits (retirement pensions, unemployment benefits, etc) were included among the regressors.

Hence, in order to control for the government redistribution function, we used a single variable and defined it as the following ratio. The numerator consists of the effects of public performance on household income, i.e., households' gross disposable income minus direct income generated by households and other transfers received by households from the rest of the world; the denominator is regional GDP. This ratio aims to measure to what extent regional GDP is jointly affected by taxes and social spending programmes. Lago (2001) argues that this variable is a good approximation for the government redistribution function at a regional level.

4. Estimation results

Here an econometric analysis is implemented in order to obtain more detailed results on the relationship between fiscal policies and growth rates for the

Spanish regions. We have followed a panel data approach. As pointed out by Islam (1995), this methodology allows us to yield unbiased estimates when unobserved heterogeneity may exist. Moreover, employing panel regressions avoids several problems produced by a cross-section analysis, such as an endogenous selection of tax policy (Fölster and Henrekson, 2001). In addition, cross-section analyses may have a potentially severe simultaneity problem between fiscal and non-fiscal variables owing to the long period considered.

The estimations in Table 2 have been carried out weighing observations in the cross-section so as to avoid heteroscedasticity caused by the different size of the units. We have also used the White covariance matrix. In addition, a time trend is included to control for (exogenous) technical progress.[7]

Table 2: Growth regressions with fiscal variables. Spanish regions (1965 - 1997)
Dependent variable: Growth rate of labour productivity

	(1) FE	*(2) DIF*	*(3) DEV IV*	*(4) DEV GMM*	*(5) DIF IV*	*(6) DIF IV*
Initial labour productivity	-0.09[a] (0.01)	-0.36[a] (0.02)	-0.14[a] (0.03)	-0.11[a] 0.02)	-0.22[a] (0.03)	-0.25[a] (0.03)
Private investment	0.08[a] (0.03)	0.16[a] (0.02)	0.24[a] (0.04)	0.28[a] (0.04)	0.28[a] (0.05)	0.24[a] (0.06)
Labour growth	0.13[b] (0.07)	-0.24[a](0.06)	0.22[b] (0.10)	0.24[a] (0.08)	-0.31[b] (0.13)	-0.32[b] (0.14)
Unemployment rate	0.07[a] (0.02)	-0.06[b] (0.03)	0.36[a] (0.03)	0.22[a] (0.02)	0.46[a] (0.07)	0.44[a] (0.09)
Public investment	0.45[a] (0.11)	-0.01 (0.10)	0.54[a] (0.19)	0.44[a] (0.17)	0.20 (0.24)	0.34 (0.28)
Public consumption	-0.45[a] (0.14)	-0.75[a](0.15)	-0.87[a] (0.15)	-0.64[b](0.27)	-1.31[a] (0.23)	-1.30[a] (0.27)
Redistribution	0.05 (0.05)	-0.24[b] (0.10)	0.09 (0.17)	-0.17 (0.11)	-0.52 (0.35)	-0.60[c] (0.35)
RSS	0.05	0.06	0.06	0.06	0.11	0.11
m1	0.474	-1.605	2.280	2.190	-2.897	-2.798
m2	0.758	2.460	1.495	1.884	-1.020	-1.014
Sargan			11.99 [3]	88.87 [48]	1.04 [1]	1.08 [1]

Notes: Standard errors in parentheses; a,b,c denote significance at 1%, 5% and 10% level, respectively.
Degrees of freedom are in brackets for Sargan statistics. Number of observations: 238.

Column (1) shows estimates when a within-groups estimator is used. The Hausman test provides for this regression evidence in favour of the existence of correlations between individual effects and regressors (χ^2=27.18, with eight degrees of freedom) so that a fixed effects model is adequate. The coefficients obtained for the conditioning variables illustrate the catching-up effect through a negative value of initial labour productivity, a positive but very small impact of private investment on growth productivity, an implausible

positive sign for labour growth rate, while unemployment rate behaviour is as expected. In the case of fiscal variables, public investment exerts a very high influence on growth while public consumption presents the opposite effect; redistribution through taxes and social benefits does not seem to be a determinant in the evolution of labour productivity. Besides the non-realistic estimates achieved for some variables, one of the main shortcomings of the results comes from the indications of serial correlation found in the residuals (see the statistics m_1 and m_2), i.e., from a misspecification of the model.[8]

Column (2) reports the results when a first differences estimator is used. Initial labour productivity, private investment and public consumption have the same sign but higher coefficients (in absolute value), while the remaining variables change their impact on the dependent variable.[9] Public investment becomes a growth-impeding (but not statistically significant) factor in determining the growth of labour productivity, and government redistribution seems to affect the dependent variable negatively. A likely risk of misspecification is again detected in the results.

Previous contributions have addressed the problems derived from the endogeneity of regressors in growth equations (King and Levine, 1994). This probability is especially high when fiscal variables such as public investment are considered (see, for example, Sturm, 1998). To deal with this issue, we employ two different instrumental variable estimators. The first one is used on the basis of the model transformed in orthogonal deviations.[10] Column (3) in Table 2 selects lagged regressors as instruments whereas column (4) uses a GMM procedure (see appendix A for the instrument sets chosen).[11] Both estimates are quite similar. With the exception of labour growth, the coefficients of non-fiscal variables are reasonable; by contrast, the positive sign found for labour growth implies marginal productivity of labour increasing on the level of employment, which admits a difficult explanation. Regarding fiscal variables, public consumption continues to affect labour productivity negatively, public investment becomes the most important regressor in explaining the evolution of the dependent variable, and the effect of redistribution is not clear. Misspecification caused by serial correlations in residuals does not seem to be a problem, but Sargan statistics are high enough to place doubt on the validity of the instruments sets used.

The second IV method used — columns (5) and (6) — is based on a first differences model with several lags of the regressors as instruments (see appendix A). Two-step estimates are reported here in order to deal with potential heteroscedasticity in the disturbances. Serial correlation in residuals is not a problem and overidentifying restrictions are accepted according to the value of Sargan statistics. The estimated coefficients now permit a better interpretation. The negative effects of initial labour productivity and public consumption are stronger under these specifications. Labour growth presents the negative sign as expected and public investment decreases its contribution to growth, both in terms of the coefficient and statistical significance.

Redistribution seems to confirm its negative impact on productivity growth with estimated coefficients almost inside the usual thresholds of statistical significance.

It may be interesting to provide an additional explanation for the estimates obtained for public investment. Our findings with orthogonal deviations show a very high value for the coefficient of public investment; one of the reasons for that is given by the high collinearity existing between public investment and other regressors in the RHS of the growth equation (see appendix B). In the case of the model in first differences, correlations do not appear as severe as in columns (3) and (4). Under this specification, we obtain a positive but *insignificant* impact of this type of public spending on growth, in contrast with most theoretical predictions and many empirical papers, which support the design of regional policies based on public investment in order to achieve convergence.

From a theoretical point of view, it can be proven that a determined dynamic for public investment may drive the growth rate below its maximum value. Using a two sector model with public capital similar to that of Mulligan and Sala-i-Martin (1993), an inverse relationship between the public capital/private capital ratio and the growth rate can be found using transitional dynamics. In such a way, Gonzalez-Paramo and Martinez (2003) verify that regional policy in Spain has followed a redistribution pattern which devotes more public investment to regions where the public capital/private capital ratio is high, and vice versa. Therefore, these facts qualify the extended statement that public investment necessarily increases the growth rate, and consequently other factors (for instance, private capital) should be considered in exploring this issue. Moreno *et al.* (1999) reach a similar result using a dual approach to public capital effects.

Finally, other forms of public investment can be studied to see how they influence labour productivity growth. We refer to social public investment, especially that devoted to education and health. Table 3 reports the estimates obtained when first differences and IV are used. Because of the correlations between productive public investment and the new variables relating to social investment, we have been forced to remove the former. Also two-step estimates are provided.

By comparing these new estimates with those of column (6) in Table 2, not very significant changes are detected in the coefficients of regressors, except in the case of private investment, where substantially minor coefficients are reported in columns (1) and (3).[12] Redistribution also increases its negative impact in these specifications. Social public investment appears as insignificant in column (1) but when it is divided into investment in education and in health the results are different. Government investment in education affects the labour growth rate positively and greatly, whereas the opposite occurs for public investment in health. High coefficients (in absolute value) obtained for both types of social public investment are mostly due to scale

issues: observations corresponding to investment in education and in health are much less than those of other variables.[13]

Table 3: Growth regressions with fiscal variables. Spanish regions (1965-1997)
Dependent variable: growth rate of labour productivity

	(1) DIF IV	*(2) DIF IV*	*(3) DIF IV*
Initial labour productivity	-0.25[a] (0.03)	-0.26[a] (0.03)	-0.21[a] (0.03)
Private investment	0.15[a] (0.05)	0.21[a] (0.06)	0.16[a] (0.05)
Labour growth	-0.37[a] (0.14)	-0.28[c] (0.16)	-0.36[a] (0.12)
Unemployment rate	0.36[a] (0.09)	0.36[a] (0.08)	0.36[a] (0.06)
Social public investment	0.67 (0.90)		
Public investment in education		2.37[b] (1.06)	
Public investment in health			-5.14[c] (2.76)
Public consumption	-1.28[a] (0.27)	-1.18[a] (0.28)	-1.23[a] (0.25)
Redistribution	-1.04[a] (0.29)	-0.74[b] (0.34)	-1.00[a] (0.22)
RSS	0.11	0.12	0.11
m1	-2.509	-2.952	-2.501
m2	-0.666	-0.460	-1.145
Sargan	6.70 [2]	6.08 [2]	4.68 [2]

Notes: Standard errors in parentheses. a,b,c denote significance at 1%, 5% and 10% level, respectively.
Degrees of freedom are in brackets in Sargan statistics.
Number of observations: 238.

5. Concluding remarks

The debate on the effects of fiscal policy on the growth rate has a long tradition in growth economics. Many papers provide results on the influence of the government's size and the composition of public spending and taxes on countries' growth rates. Moreover, recent empirical studies have stressed the relevance of taking into consideration both sides of public performance; otherwise, the risk of achieving biased estimates for a growth equation is present, and conclusions might be misleading.

This paper shows evidence of the impact of different fiscal variables on regional labour productivity growth. We have obtained estimates from growth regressions run for Spanish regions over the period 1965-1997. In spite of several difficulties related to the variables used and the availability of regional data, our results are consistent with the standard theoretical frameworks.
The principal results are the following. A catching-up effect is found, and the

coefficients of private investment and population growth are to be expected. Public consumption and redistribution variables negatively affect the growth rate of labour productivity, whereas the impact of public investment appears as a positive but is not statistically significant. At this point, further analysis should be carried out. When social public investment is considered, public investment in education is found to be growth-enhancing while estimates show that the impact of government investment in health on productivity is negative. In order to avoid a misspecification problem, we have paid attention to issues related to the endogeneity of the regressors.

Our findings suggest several policy implications. According to the estimates, the composition of public expenditure is relevant for regional growth processes. Whereas public consumption exerts an unambiguously negative effect on productivity, public investment seems to foster economic growth weakly. In such a way, some doubts on the effects of public capital on productivity arise as long as a dilemma between efficiency and equity appears in the regional distribution of public investment. In fact, the paper suggests that current regional policies based on public investment have to be reconsidered, especially now when the consequences of EU enlargement are on the table.

On the other hand, policy-makers must be aware that personal redistribution policies have an efficiency cost. Taxes, social benefits programmes and the part of public consumption linked to them satisfy equity principles but they may also introduce disincentives in work and savings decisions. In particular, from a regional point of view, social benefits play an important role in workforce mobility, so they can have remarkable consequences on regional convergence. Because of this, adequate design of these policies is important.

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APPENDIX A:
Instruments used

This appendix collects the definition of instruments sets used in section 4. Table 2 includes estimates under several specifications and the instruments used are (by columns):

- Column (3): levels of private investment, labour growth, public investment and redistribution with one and two lags, first differences of public consumption, and levels of initial labour productivity and unemployment lagged two periods.
- Column (4): levels of private investment, labour growth, public investment and redistribution with one lag.
- Column (5): levels of private investment, public investment and redistribution with one and two lags, first differences of public consumption, level of growth of labour with one lag, and levels of initial labour productivity and unemployment lagged two periods.
- Column (6): levels of private investment and redistribution with one and two lags,

first differences of public consumption, levels of growth of labour, public investment and unemployment rate with one lag, and level of initial labour productivity lagged two periods.

For the Table 3, the instruments sets used are the following:

•Column (1) : levels of private investment, social public investment and redistribution with one and two lags, first differences of public consumption, levels of growth of labour and unemployment rate with one lag, and level of initial labour productivity lagged two periods.

•Column (2): levels of private investment, public investment in education and redistribution with one and two lags, first differences of public consumption, levels of growth of labour and unemployment rate with one lag, and level of initial labour productivity lagged two periods.

•Column (3): levels of private investment, public investment in health and redistribution with one and two lags, first differences of public consumption, levels of growth of labour and unemployment rate with one lag, and level of initial labour productivity lagged two periods.

In both cases estimates with other instruments sets are available upon request.

APPENDIX B
Correlation matrix

For variables transformed in orthogonal deviations:

G. rate	Initial prod.	Priv. inv.	Labour g.	Pub. inv.	Social pub. inv.	Pub. cons.	Redist.	Unem.
1.00								
-0.31	1.00							
0.16	-0.19	1.00						
0.29	-0.20	0.12	1.00					
-0.02	0.60	-0.14	0.03	1.00				
-0.08	0.01	-0.02	0.05	0.34	1.00			
-0.31	0.55	-0.29	-0.42	0.30	-0.17	1.00		
0.02	-0.18	0.13	-0.20	-0.14	-0.16	0.23	1.00	
-0.18	0.72	-0.44	-0.25	0.41	-0.19	0.66	-0.03	1.00

For variables transformed in first differences:

G. rate	Initial prod.	Priv. inv.	Labour g.	P. inv.	P. inv. educ	P. inv. health	P. cons.	Redist.	Unem.
1.00									
-0.60	1.00								
0.26	-0.01	1.00							
0.07	-0.12	0.16	1.00						
-0.13	0.23	0.02	0.00	1.00					
-0.31	0.25	-0.19	0.06	0.26	1.00				
-0.19	0.26	-0.05	0.03	0.30	0.15	1.00			
-0.24	0.06	-0.11	-0.34	0.06	-0.08	-0.05	1.00		
-0.15	0.01	-0.16	-0.23	-0.19	0.04	-0.04	0.02	1.00	
-0.05	-0.19	-0.33	-0.38	-0.05	-0.18	-0.04	0.26	0.20	1.00

ENDNOTES

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2. Since 2001, this figure has reached a stable value.

3. Not only has the access of regional governments to autonomous powers shown a particular timing for each region (according to bilateral political agreements), but also the Constitution establishes a dual map of regions in terms of fiscal autonomy: on the one hand Pais Vasco and Navarra, and on the other hand the remaining regions.

4. There are no series for employed workers over the period 1965-1997 at a regional level. Anyway, differences between GDP per employee and GDP per job are insignificant in the years when both series can be compared. This series is biannual.

5. Several papers have concluded that the effects of human capital on growth are very difficult to grasp (see, for instance, De la Fuente and Doménech, 2002; Wolf, 2000; Kneller *et al.*, 1999). The results of estimates with human capital are available upon request.

6. EU Structural Funds and the Cohesion Fund are included here.

7. Coefficients on this variable are not reported in this paper; the values are always positive and usually statistically significant. They are available upon request.

8. The *m* statistics tests report for the absence of first-order and second-order serial correlation in the first differenced residuals. If the disturbances of the model are not serially correlated, there should be evidence of significant first-order serial correlation in the differenced residuals, and no evidence of second-order serial correlation in the differenced residuals. These tests are based on the standardised average residual autocovariances, which are asymptotically $N(0, 1)$ variables under the null of no autocorrelation. See Arellano and Bond (1991) for a further discussion.

9. Since these coefficients have been estimated in first differences, they must be interpreted accordingly.

10. Orthogonal deviations express each observation as the deviation from the average of future observations for the same individual, and weight each deviation to standardise the variance. Formally, each observation transformed is computed as:

$$x_{it}^{*}=\left(x_{it}-\frac{x_{i(t+1)}+\ldots+x_{iT}}{T-t}\right)\left(\frac{T-t}{T-t+1}\right)^{1/2}$$

for $t = 1, 2,....T-1$. Orthogonal deviations preserve the

lack of correlation among the transformed errors if the original ones are not correlated and have constant variance. This is an advantage over a first-differences transformation, which introduces a moving average structure in the error term. See Arellano (1988) and Arellano and Bover (1995) for further discussions.

11. Since this method minimizes the correlations between regressors and remainders, its utilization will allow us to generate an efficient instruments set. The potential heteroscedasticity in the disturbances suggests a two-step GMM procedure. Nevertheless, different Monte Carlo simulations show that the standard errors estimated in a two-step procedure may be biased, so it is advisable to take one-step GMM estimators in the case of the inference based on asymptotic standard errors (for a further discussion see Arellano and Bond (1991) and Judson and Owen (1999)).

12. Low values obtained for the coefficient of private investment are similar to those found by Dolado *et al.* (1994), Islam (1995), Gorostiaga (1999) and Alvarez *et al.* (2003), among others.

13. The mean values in first differences of the variables of public investment in education and in health are 0.00006 and 0.00004, respectively. They contrast with the following smallest mean that corresponds to variable redistribution: 0.0012 (in absolute value).

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