Exports' productivity and growth across Spanish regions

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Abstract

According to recent studies, countries specialised in goods associated with high productivity levels grow faster than countries specialised in goods associated with low productivity levels. In this paper we analyse whether that relationship also takes place at the regional level. We calculate the productivity level associated to Spanish provinces' exports and test whether that level is associated with higher growth. Our results also show a positive link between exports' productivity and growth at a regional level. However, results are sensible to the indicator used to measure exports' productivity and the estimation technique.

Keywords: Spain, exports, productivity, growth

JEL Classification: F14; O40

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1. Introduction

There is long standing argument in the literature that specialising in some goods is more growth promoting than specialising in others. Back in the 1950s, in separated articles, Prebisch (1950) and Singer (1950), argued that there was a secular decline of the net barter terms of trade between primary products and manufactures. Due to this deterioration, countries that specialised in primary products would have a declining capacity to import manufactures, and among them capital goods, which would reduce their growth possibilities. Due to different reasons, other authors have also pointed out that specialising in natural resources may have depressing effects on economic growth (Gylfason, 2001; Sachs and Wagner, 2001). According to this line of research, known as the natural resource curse, countries that specialise in primary products are prone to suffer Dutch disease problems and rent-seeking behaviour; moreover, wealth obtained from natural resources imbue people with a false sense of security that hinders the introduction of growth promoting policies, such as investment in human capital. Other authors have also argued that some sectors, due to learning by doing externalities, have a higher growth potential than others (Young, 1991; Matsuyama, 1992). According to those authors, countries that specialise in sectors where productivity can be enhanced due to learning by doing (equated with manufacturing or high-tech sectors) will grow faster than those countries that specialise in sectors in which productivity is not improved through experience (equated with agriculture or low-tech sectors).

Recently, Hausmann, Hwang and Rodrik (2007) (henceforth HHR) put forward another link between specialisation and economic growth. They argue that some commodities have a higher implied productivity level than others; in particular, HHR assert that commodities exported by rich countries are associated with high productivity levels, whereas commodities exported by poor countries are associated with low productivity levels. According to HHR if countries latch on high-productivity commodities they will grow faster than if they specialise in low-productivity commodities. A key contribution by HHR is the development of a quantitative index to rank commodities in terms of their implied productivity; based on this index, they also calculate the productivity-level associated to a country's exports. Equipped with this latter indicator they empirically test their model and, as expected, they find that countries specialised in high-productivity goods, relative to their income per capita, grow faster than countries specialised in low-productivity goods.

In the HHR model, growth occurs when resources are transferred from lower productivity products to higher productivity products[1]. In that model, specialisation patterns are not entirely predictable, because, along with fundamentals (labour, capital, natural resources and the quality of institutions), idiosyncratic factors also play a role in determining countries' comparative advantage. Hence, each country has a range of products, that differ in their implied productivity, in which it can specialise. However, the country does not know the exact commodity-composition of that range; it has to "discover" it. If entrepreneurs "discover" the high-productivity products within that range, economic growth will (temporarily) occur as resources are transferred to more productive activities.

In line with the HHR model, regional studies also have a large tradition of analysis on how the shift of resources from lower productivity sectors (agriculture) to higher productivity sectors (industry and services) explains income convergence or divergence across regions (Barro and Sala-i-Martin, 1991; Barro and Sala-i-Martin, 1992)[2]. However, there are some differences between the regional studies' literature and HHR. The aim of the former is to account for the differences in the evolution of income across regions by structural transformation. For this exercise regional studies need data on value added and employment that are usually only available at high aggregation levels, such as sectors (agriculture, industry and services). The aim of the latter is to highlight that there is some room in the specialisation pattern that countries may end up with, and to point out that there can be substantial differences in terms of productivity across specialisation patterns that are not observable at the aggregated sectoral level; in addition to that, their goal is to show that specialisation patterns matter because countries that specialise in high-productivity goods grow faster than countries that specialise in low-productivity goods.

The aim of this paper is to analyse whether the link between trade specialisation and economic growth found by HHR at the country level also takes place at the regional level. In particular, we aim to investigate whether Spanish provinces (NUTS III) that have specialised in high-productivity goods have grown faster than provinces that have specialised in low-productivity goods. As a preliminary to our conclusion, we also find a positive link between

[1] Hausmann and Klinger (2007) show that there are differences across countries in their possibilities to upgrade from lower productivity products to higher productivity products.

[2] Other studies, such as de la Fuente and Freire (2000), along with structural transformation, also analyse the differences in sectoral productivity growth rates and regional specialisation to explain income evolution across regions.

provinces' exports productivity level and subsequent growth; however, the results are very sensible to the exports' productivity index used in the analysis and to the estimation technique.

The remaining of the paper is organised as follows. The next section explains the construction of the quantitative index developed by HHR and the amendments proposed by Minondo (2007a). Section 3 presents data on Spanish provinces' exports productivity level. Section 4 studies the relationship between provinces' exports productivity and subsequent growth. The final section summarizes the paper's main findings.

2. The construction of an exports' productivity index

Following HHR, to construct the productivity-level associated to a province's exports indicator (EXPY), two steps are followed. Firstly, we compute the income level associated to each exported commodity. This indicator, denominated PRODY, is calculated as follows:

$$PRODY_i = \sum_j \frac{x_{ij}/X_j}{\sum_j \left(x_{ij}/X_j \right)} * y_j \qquad (1)$$

where x_{ij} denotes country j exports of product i, X_j country j total exports and y_j country j GDP per capita. The numerator of the weight, x_{ij}/X_j, is the share of product i in j country's total exports; the denominator of the weight, $\sum_j \frac{x_{ij}}{X_j}$, aggregates the shares of product i in total exports across countries. Hence, the weight reflects j country's revealed comparative advantage in product i. $PRODY_i$ is, therefore, the average of exporting countries GDP per capita, weighted by each country's revealed comparative advantage in product i.

Other studies, such as Lall et al. (2005), use the share of country j's exports of product i in total world exports of product i as weight in the PRODY calculation. However, as noted by HHR, if this weight is used the PRODY indicator will be biased towards rich countries GDP per capita, because large countries export more than small countries. In order to overcome this limitation, the authors suggest the use of revealed comparative advantage as weight.

Secondly, the exports' productivity index, EXPY, is calculated as a weighted average of each exported commodity's PRODY, where the weights are the shares of each product in the country's total exports. Algebraically,

$$EXPY_j = \sum_i PRODY_i * \left(x_{ij} \big/ X_j \right) \qquad (2)$$

As HHR recognise, a shortcoming of PRODY, and hence of EXPY, is that it does not correct for differences in quality within a product category. For example, as Rodrik (2006) shows, even at the Harmonised System (HS) 6-digit disaggregation level, which distinguishes more than 5000 product categories, there are large differences in terms of quality. Moreover, Schott (2004) points out that those differences are related with countries GDP per capita level. He shows that, within narrowly defined manufactures, there is a clear vertical differentiation across countries, with low GDP per capita countries specialised at the lower end of the quality spectrum and large GDP per capita countries specialised at the higher end of the quality spectrum. In order to control for quality differences in the PRODY and EXPY indicators, we follow the methodology developed by Minondo (2007a). For each product, we calculate each country's exports unit value. Then, we sort unit values from the lowest to the highest value. In order to minimise the impact of measurement errors, we remove unit values which are below or equal to the first percentile as well as unit values that are equal or above to the 99th percentile. From the remaining unit values, we select the 33rd percentile unit value and the 66th percentile unit value. Exports whose unit value falls between the minimum unit value and the 33rd percentile are considered as low quality varieties; those exports whose unit value falls between the 33rd percentile and 66th percentile are considered as medium quality varieties, and finally, those exports whose unit value falls between the 66th percentile and the maximum unit value are considered as high quality varieties. We only calculate varieties PRODY if we have, at least, five unit value observations per each product.

Once we establish, for each product, the unit value ranges for each quality level, we calculate the PRODY value associated to each variety:

$$PRODY_{qi} = \sum_j \frac{\left(x_{qi,j} / X_j \right)}{\sum_j \left(x_{qi,j} / X_j \right)} * y_j \qquad (3)$$

where $x_{qi,j}$ denotes country *j* exports of product *i*'s *q* variety, where *q* can be low, medium or high. As before, X_j denotes *j* country's total exports and y_j is *j* country's GDP per capita. Now, the numerator of the weight, $x_{qi,j} / X_j$, is the share of product *i*'s *q* variety in total exports; the denominator of the weight, $\sum_j \frac{x_{qi,j}}{X_j}$, aggregates the shares of product *i*'s *q* variety in total exports across countries. Hence, the weight reflects *j* country's revealed comparative advantage in product *i*'s *q* variety. $PRODY_{qi}$ is, therefore, the average of exporting countries GDP per capita, weighted by each country's revealed comparative advantage in product *i*'s *q* variety.

The EXPY indicator will now be calculated as follows:

$$EXPY_j = \sum_i \sum_{q=low,medium,high} \left(\frac{x_{qi,j}}{X_j} \right) PRODY_{qi} \qquad (4)$$

which is a weighted average of each variety's *PRODY*, where the weights are the shares of each variety in total exports.

3. The productivity-level of Spanish provinces' exports

Minondo (2007b) already calculates the Spanish provinces' EXPY figures for the 1996-2005 period. For this research we extend that time series to the 1994-2005 period, following the data and methodology used in that paper. The Data Appendix describes the data-sources and the methodology followed to calculate the varieties' PRODY and provinces' EXPY figures.

Table 1 presents Spanish provinces' quality-adjusted EXPY in 1994, in 2005 and the average annual growth rate between those years. In 2005 the average of Spanish provinces' quality-adjusted EXPY was 15612$; the standard deviation of the quality-adjusted EXPY was 2276$. The Spanish province with the highest quality-adjusted EXPY was Huelva: 18870 $. That province was followed by Ávila (18752$), Girona (18671$), Soria (18606$) and Huesca (18369$). In the bottom of the ranking we find Las Palmas (9431$), Almería (10209$), Tenerife (10259$), Cáceres (12211$) and Lugo (12669$). We can observe that the ratio between the province with the highest quality-adjusted EXPY (Huelva) and the province with the lowest quality-adjusted EXPY (Las Palmas) is around 2. If we look to the 1994 year's column, we can see that the average quality-adjusted EXPY was lower than in 2005; however, the standard deviation is higher to that found in 2005. We can observe that in 1994 Tenerife was the province in the top of the ranking, followed by Salamanca, Ourense, León and Palencia; at the bottom of the ranking we find Ávila, Zamora, Almería, Granada and Badajoz.

The last column of the table presents the average annual growth rate between 1994 and 2005. It is important to note that during all the period varieties' PRODY values are fixed. Hence, changes in provinces quality-adjusted EXPY can only occur through changes in the relative share of each variety in provinces' exports. As can be seen in the bottom of the table, the average annual growth rate in the 1994-2005 period was 0.46%. There are 33 provinces that improve their quality-adjusted EXPY and 17 provinces that deteriorate their quality-adjusted EXPY. Ávila is the province that presents the highest annual average growth (6.67%), followed by Granada (3.31%), Zamora (2.80%), Málaga (2.44%) and Cuenca (1.98%). On its hand, Tenerife is the province with the largest drop in quality-adjusted EXPY (-6.51), followed by Las Palmas (-5.24), Salamanca (-2.45), León (-1.79%) and Ourense (-0.77%).

Table 2 presents Spanish provinces' non quality-adjusted EXPY figures (equation (2)) for 1994 and 2005, and the average annual growth rate between those years. The average Spanish provinces' non quality-adjusted EXPY for 2005 was 14580$ and the standard deviation 2182$. In 2005 Palencia was the Spanish province with the highest non quality-adjusted EXPY (18598$); it was followed by Girona (17649$), Valladolid (17230$), Madrid (17226$) and Soria (17008$). The bottom positions were occupied by Las Palmas (8588$), Almería (9394$), Tenerife (9948$), Cáceres (10817$) and Granada (11845$). We should point out that the correlation between non quality-adjusted EXPY and quality-adjusted EXPY is very high for 2005: 0.78; however, the correlation is lower for 1994 (0.48). Now, the ratio between the province with the highest non quality-adjusted EXPY and the province with the lowest non quality-adjusted EXPY is higher than for the quality-adjusted EXPY indicator. It is interesting to note that in 2005, for most provinces, the quality-adjusted EXPY is higher than the non-quality adjusted EXPY; this means that most Spanish provinces export products with a quality level which is above the world average.

At the beginning of the period, the average non quality-adjusted EXPY is lower and the standard deviation is higher. Hence, between 1994 and 2005 there has been an increase in the average Spanish provinces' non quality-adjusted EXPY and a reduction in the differences in non quality-adjusted EXPY across provinces. In 1994, the province with the highest non quality-adjusted EXPY was also Palencia, followed by Valladolid, León, Madrid and Zaragoza; at the bottom of the ranking we find Las Palmas, Zamora, Almería, Tenerife and Cáceres. With respect to the evolution of provinces' non quality-adjusted EXPY, we can see that the rate of growth is higher to that obtained for quality-adjusted EXPY. During the 1994-2005 period 37 provinces improve their exports' productivity level, whereas 13 provinces reduce their exports' productivity level. The provinces with the highest increase in non quality-adjusted EXPY are: Zamora (2.49%), Cuenca (1.92%), Girona (1.03%), Las Palmas (0.97%) and Jaén (0.87%). On the contrary, the provinces with the largest drops are: Lugo (-0.62%), León (-0.52%) Segovia (-0.49%), Asturias and Valladolid (-0.08%).

4. Exports' productivity and economic growth

In this section we analyse econometrically whether regions specialised in high-productivity exports have grown faster than regions specialised in low-productivity exports. In order to control for differences in employment rate across provinces, we use value added per worker growth, instead of GDP per capita growth, as our dependent variable. We estimate the following regression equation:

$$y_i\_growth = \beta_0 + \beta_1 \log(EXPY_i) + \beta_2 \log(y_i) + \beta_3 \log(h_i) \qquad (5)$$

where y_i_growth is the average annual growth rate of value added per worker in province i, $EXPY_i$ the initial exports' productivity, y_i the initial value added per worker and h_i the initial human capital level. Value added per worker is included in the equation because, according to the HHR model, it is the productivity level of exports relative to value added per worker which determines provinces' growth opportunities. In particular, provinces with an EXPY which is higher than the one predicted by their value added per worker will have opportunities to transfer resources from less productive activities to more productive activities. In addition to that, value added per worker is also included in the equation in order to control for convergence processes. Finally, human capital is also introduced in the equation, as it may contribute, as well, to explain differences in EXPY and growth rates across provinces.

Value added per province data are obtained from Spanish Statistical Institute's (INE) Regional Economic Accounts database (www.ine.es)[3]. Data on occupied population is obtained from the Instituto Valeciano de Investigaciones Económicas (Ivie) database (www.ivie.es). Human capital is proxied by the percentage of occupied population that have upper-secondary or tertiary studies. Those data are also obtained from the Ivie database. The period of analysis is 1994-2004.

Table 3 presents the results of the regression analyses. Firstly, in column (1) and column (2) we estimate the regression equation for the average annual growth rate during the whole 1994-2004 period. As can be seen in Column (1), the coefficient for non quality-adjusted EXPY is positive and statistically significant. As shown in Column (2) the coefficient for quality-adjusted EXPY is also positive; however, it is not statistically significant. These results point out that there is a positive association between provinces' exports productivity level and subsequent growth; however, that relationship is statistically significant if we do not control for differences in quality within product categories. In both cases the coefficient for initial value added per worker is negative and statistically significant, showing that less productive Spanish provinces have converged toward more productive Spanish provinces in the 1994-2004 period. On its hand, the human capital coefficient, although positive, is not statistically significant. In order to increase the number of observations, in Column (3) and Column (4) we estimate regressions with a pool of 5 year intervals. Although the fit of the

[3] As there are no GDP deflators for provinces, we use autonomous communities' (NUTS 2) GDP deflators to transform current values into constant values. It is important to note that during the period of analysis there have been changes in the methodology used to calculate provinces GDP (1986's methodology, 1995's methodology and 2000's methodology). In order to control for those changes, and taking into account that in some years provinces' GDP figure is available in more than one methodology, we calculate the real growth rates during the years that compose the 1995's methodology period and the 2000's methodology period. Afterwards, we use those growth rates to extend the 1986's methodology period's GDP figures.

model is reduced, we obtain very similar results. The only significant change is the increase in the value of the quality-adjusted EXPY coefficient.

In order to control for time-invariant province characteristics, in Column (5) and Column (6) we estimate a fixed effects model. A shown in the table, there are important changes in the results of the estimations. Firstly, the non quality-adjusted EXPY becomes negative, although statistically not significant. Secondly, the quality-adjusted EXPY remains positive and, now, it becomes statistically significant by a large margin. Moreover, in this last estimation, as well, the coefficient for human capital is positive and statistically significant. To sum up, most of the estimations find a positive link between the initial productivity level associated to a province's export and subsequent labour productivity growth. However, there are variations in the statistical significance of the coefficients depending on whether we control for quality differences within a product category and the estimation technique.

5. Conclusions

Recent studies have pointed out that countries specialised in high-productivity products, relative to their GDP per capita, grow faster than countries specialise in low-productivity products. The aim of this paper has been to test the relationship between exports' productivity and growth at a regional level. In particular, we analyse whether Spanish provinces specialised in high-productivity exports have grown faster than provinces specialised in low-productivity exports. In order to do that, firstly, we calculate the productivity level associated to each province exports, taking into account that there might be quality-differences within a product category. Secondly, we regress the average growth rate in labour productivity on the initial exports' productivity level and other control variables. Our results shows that, in most of the estimations, there is a positive link between the initial exports' productivity level and subsequent labour productivity growth. Hence, our results show that the relationship between exports' productivity and growth also holds at a regional level. However, our results are very sensible on whether quality differences are taken into account when calculating provinces' exports productivity and the estimation technique.

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Data Appendix

In order to calculate varieties' PRODY we use a sample of countries that reported export and GDP per capita data (in PPP constant dollars) in 2002, 2003 and 2004. Following HHR we use three years in order to attenuate the biases generated by observations driven by year specific circumstances. Exports' data are total country's exports at the HS (1992 version) 6-digit disaggregation; these data are obtained from the UN Comtrade database; GDP per capita in PPP constant dollars are obtained from the World Bank's World Development Indicators database. The sample is composed by 115 countries. We decide to drop Luxembourg from the sample due to its artificially high GDP per capita. In order to reduce measurement errors we drop from the analysis those observations where the value of exports is below 10000$. The sample accounts for 89 per cent of total world merchandise exports in the 2002-2004 period. In order to obtain average values for the 2002-2004 period, we have to transform current exports' values into constant exports' values. To perform this operation, ideally, we would like to have exports' price indexes for each country and each HS product included in the sample. Since we do not have those data, we decide to use the US Harmonised System import price index in order to proxy the evolution of export prices in the world; these data were obtained from the Bureau of Labour Statistics. For each country and HS product, we add up the 2002, 2003 and 2004 (constant) exports and quantity data. With this procedure we only allow each country to have one variety per each product. Not all exports' observations provide a quantity measure that allows the calculation of the unit value; for example, in our sample such observations account for 7.5 per cent of total sample's exports. The Comtrade database offers export observations that, in most cases, report a net weight figure, which allows a $ per kilogram unit value calculation. In other cases, a supplementary quantity figure is reported as well. In order to compare a commodity's unit value across years and countries, all unit values should be calculated with the same quantity unit. For each commodity we analyse which is the quantity unit (kilograms, items, litres,...) that maximises the number of observations. In the majority of cases the weight in kilograms is the quantity unit chosen. This procedure obliges us to remove from the sample some observations that allow the calculation of a unit value but do not use the quantity measure that has been chosen for the product. The removal of those observations raises the percentage of exports for which a valid unit value cannot be computed to 18.4 per cent of total sample's exports. Finally, in order to minimise measurement errors, we remove observations where the unit value is below or equal to the 1st percentile and equal or above the 99th percentile. The removal of those observations further raises the number of excluded exports to 19.8 per cent of total exports. This figure also includes those exports that are dropped from the sample because there were not enough unit value observations per product to calculate varieties' PRODY.

Spanish regions' exports data are obtained from the *Agencia Tributaria*'s database. The database offers annual data on international trade, disaggregated by Spanish provinces and in the Common Nomenclature (CN) classification. The CN is an 8 digit extension of the HS classification used by European Union countries. Hence, there are no difficulties, at first hand, to transform NC products into HS products. However, the *Agencia Tributaria* reports trade data in the NC classification's revision, and hence in the HS classification's revision, that is in use in each year. This fact introduces some limitations in the calculation of provinces' EXPY. As explained above, we use the 1992 version of the HS classification to calculate the varieties' PRODY. In order to avoid biases, we only calculate provinces' EXPY figures with those products whose classification does not change between 1994 and 2005. Those products represent 90% of total provinces' exports.

In order to calculate provinces' EXPY we assign each HS 6 digit export observation to the low, medium or high variety, depending on which quality range the unit value falls. In order to overcome the effect of the evolution of prices and exchange rates on the calculation of unit values, as explained before, we use the US import price index to transform current values into 2000 constant values. Secondly, each provinces' exports are valued at the 2002-2004 average euro/dollar exchange rates. Observations that lack a valid unit value enter the EXPY calculation multiplying their value by the non quality-adjusted PRODY. Finally, in the calculation of Spanish regions' EXPY we do not include some products with a high PRODY, such as sailboats and motorboats, that have a second-hand export market. In most of the cases those products are not produced in Spain; however, as some of them are sold as second-hand products in foreign countries, their inclusion in the EXPY calculation could bias some provinces' sophistication index[4]. We also exclude Badajoz's exports of natural gas; those exports are assigned to Badajoz because the gas pipeline crosses this province in its way to Portugal.

[4] Following the same reasoning, in the case of Balearic Islands, we also exclude aircraft exports.

Table 1. Spanish provinces quality-adjusted EXPY (2000 constant PPP $)

Province	1994	2005	Average annual growth (%)
A Coruña	12389	15053	1.79
Álava	16695	17855	0.61
Albacete	14896	17089	1.26
Alicante	11827	14450	1.84
Almería	10752	10209	-0.47
Asturias	15800	15590	-0.12
Ávila	9214	18752	6.67
Badajoz	11442	13541	1.54
Baleares	17047	16244	-0.44
Barcelona	15846	17777	1.05
Burgos	15325	15435	0.07
Cáceres	12904	12211	-0.50
Cádiz	14468	13424	-0.68
Cantabria	14325	16204	1.13
Castellón	15786	17820	1.11
Ciudad Real	12144	14313	1.51
Córdoba	11629	13101	1.09
Cuenca	14305	17748	1.98
Girona	15809	18671	1.52
Granada	10769	15409	3.31
Guadalajara	17005	16344	-0.36
Guipúzcoa	14895	17150	1.29
Huelva	17502	18870	0.69
Huesca	15689	18369	1.44
Jaén	14515	16243	1.03
Las Palmas	17051	9431	-5.24
León	18111	14854	-1.79
Lleida	13618	14722	0.71
Lugo	13347	12669	-0.47
Madrid	16811	18263	0.76
Málaga	13382	17452	2.44
Murcia	13184	15524	1.50
Navarra	16990	17686	0.37
Ourense	18595	17078	-0.77
Palencia	17873	17474	-0.20
Pontevedra	16263	15285	-0.56
Rioja	12418	13514	0.77
Salamanca	20261	15427	-2.45
Segovia	17000	16154	-0.46
Sevilla	13500	13791	0.19
Soria	15375	18606	1.75

Table 1. (cont.)

Province	1994	2005	Average annual growth (%)
Tarragona	14297	16296	1.20
Tenerife	21512	10259	-6.51
Teruel	15724	15462	-0.15
Toledo	13619	13708	0.06
Valencia	14412	16691	1.34
Valladolid	14899	16213	0.77
Vizcaya	14454	16721	1.33
Zamora	9325	12640	2.80
Zaragoza	17555	16829	-0.38
Average	14851	15612	0.46
Standard deviation	2570	2276	

Source: authors' calculation based on Comtrade and Agencia Tributaria databases.

Table 2. Spanish provinces non quality-adjusted EXPY (2000 constant PPP $)

Province	1994	2005	Average annual growth (%)
A Coruña	11248	12674	0.70
Álava	15963	16518	0.20
Albacete	12181	13511	0.61
Alicante	11790	12461	0.33
Almería	9469	9394	-0.05
Asturias	14040	13794	-0.10
Ávila	15445	15320	-0.05
Badajoz	11439	12234	0.40
Baleares	14447	15482	0.41
Barcelona	16347	16776	0.15
Burgos	14708	16301	0.61
Cáceres	10175	10817	0.36
Cádiz	14675	15248	0.23
Cantabria	14979	15448	0.18
Castellón	13223	13749	0.23
Ciudad Real	13309	13230	-0.03
Córdoba	10423	12024	0.84
Cuenca	10488	14480	1.92
Girona	14836	17649	1.03
Granada	10357	11945	0.84
Guadalajara	14629	15326	0.27
Guipúzcoa	15822	16691	0.31
Huelva	12974	14161	0.52
Huesca	14513	14397	-0.05
Jaén	13866	16056	0.87
Las Palmas	7290	8588	0.97
León	17303	15823	-0.52
Lleida	12852	14657	0.78
Lugo	14282	12847	-0.62
Madrid	17056	17226	0.06
Málaga	12887	14746	0.80
Murcia	11939	13696	0.81
Navarra	16319	16482	0.06
Ourense	16513	16415	-0.03
Palencia	18632	18598	-0.01
Pontevedra	15914	16730	0.29
Rioja	12269	12486	0.10
Salamanca	16545	16819	0.10
Segovia	15879	14613	-0.49
Sevilla	11985	13219	0.58
Soria	16398	17008	0.22

Table 2 (cont.)

Province	1994	2005	Average annual growth (%)
Tarragona	13971	14423	0.19
Tenerife	10033	9948	-0.05
Teruel	13869	14257	0.16
Toledo	13925	13738	-0.08
Valencia	14980	15481	0.19
Valladolid	17481	17230	-0.08
Vizcaya	15068	15936	0.33
Zamora	8237	12506	2.49
Zaragoza	16828	16999	0.06
Average	13746	14580	0.54
Standard deviation	2538	2182	

Source: authors' calculation based on Comtrade and Agencia Tributaria databases.

Table 3. Cross-provinces growth regressions

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	OLS	FE	FE
Log initial value added per worker	-0.041	-0.040	-0.048	-0.047	-0.185	-0.185
	(-5.01)***	(-4.43)***	(-4.58)***	(-4.58)**	(-12.78)***	(-13.61)***
Log initial non quality-adjusted EXPY	0.018		0.020		-0.008	
	(2.04)**		(2.31)**		(-0.32)	
Log initial quality-adjusted EXPY		0.004		0.017		0.018
		(0.48)		(1.63)		(3.42)***
Log human capital	0.004	0.006	0.005	0.007	0.015	0.015
	(0.72)	(0.91)	(0.80)	(1.03)	(1.50)	(1.88)*
Constant	0.245	0.368	0.289	0.312	1.938	1.680
	(2.08)**	(3.31)***	(2.45)**	(2.64)***	(7.03)***	(11.79)***
Period	1994-2004	1994-2004	1994-2004	1994-2004	1994-2004	1994-2004
Interval	10 years	10 years	5 years	5 years	5 years	5 years
Number of observations	50	50	100	100	100	100
R-squared	0.43	0.32	0.27	0.24	0.72	0.75

Column (3) - Column (6) regressions include period dummies. Robust t-statistics in parentheses. *** statistically significant at 1%; ** statistically significant at 5%; * statistically significant at 10%.