Recent changes in cross-regional convergence patterns

Rationale

Economic convergence measured by income per capita refers to the process whereby lower income regions post higher growth, so that over time cross-regional differences diminish. This process was quite intense in Spain from 1980 to 2008 when, coinciding with the onset of the financial crisis, it came to a halt. Accordingly, it is of interest to document this phenomenon and investigate its possible causes.

Takeaways

- Economic convergence between the Spanish regions was intense from 1980 to 2008, when it came to a halt following the outbreak of the financial crisis.

- Labour productivity, largely driven by capital accumulation, was the main determinant of the convergence process between 1980 and 2008. It is also the main contributor to its subsequent stagnation.

- However, in the most recent period, population ageing, which is especially pronounced in regions with higher income per capita, has helped to narrow the differences, albeit not sufficiently to offset the impact of the other factors.

Keywords

Convergence, demographics, productivity, regions.

JEL classification

J11, J21, R11, R53.

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Introduction

There is ample literature analysing GDP per capita convergence across countries and regions. This analysis is important to determine whether geographical areas with an initially low GDP per capita level record higher growth rates than those with initially higher income levels, enabling them to move closer to those levels and thus reducing the initial differences in terms of income and, ultimately, well-being.[1]

In the specific case of the European Union, Pina and Sicari (2021) show that, in general, the cross-regional differences in GDP per capita in the EU countries remained quite constant between 2000 and 2008, whereas after that year, following the outbreak of the financial crisis, the differences increased.[2]

Against this backdrop, it is important to analyse whether this time pattern of convergence across European regions was also observed across Spanish regions. In particular, Puente (2017) showed that between 1980 and 2015, per capita income levels across Spain's regions became more similar. This article analyses regional convergence in Spain over a longer period (1980-2019), incorporating more years subsequent to the start of the financial crisis (see next section). It also explores the factors that have made the most contribution to this change.

Convergence across Spanish regions

The economic literature has analysed convergence primarily using two metrics: sigma- and beta-convergence.[3] Sigma-convergence considers a reduction in the dispersion of GDP per capita levels across regions as an indicator of convergence.[4] As Chart 1 shows, in the case of the Spanish regions this dispersion clearly diminished up to the onset of the financial crisis in 2008, when a process of divergence began, which has not been offset by the timid decline observed since 2017. This pattern contrasts with that observed following the 1992 recession, when there was hardly any increase in dispersion across regions.

The beta-convergence metric, which measures if, for a specific time interval, the poorer regions recorded lower or higher growth than their wealthier counterparts, depicts the same pattern.[5]

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1 See, for example, Barro (1991), Barro and Sala-i-Martin (1992) or, for Spain, Fuente (2002a, 2002b) and Puente (2017).

2 In these periods, cross-country convergence in Europe was unequal. The eastern European countries posted higher growth rates both before and after 2008, thus contributing to convergence. But between 2000 and 2008 there was scarcely any convergence across the western European countries, and following the financial crisis convergence with the southern European countries (including Spain) declined, as they moved farther away from the economic levels of their northern European counterparts.

3 For a discussion of the relationship between the two concepts, see, for instance, Young, Higgins and Levy (2008).

4 Dispersion is measured using the standard deviation of the natural logarithm of GDP per capita in real terms.

5 In some cases, beta-convergence analysis also considers other variables, such as levels of institutional development (see, for instance, Barro (1991)).

Chart 1
GDP per capita dispersion across Spanish regions
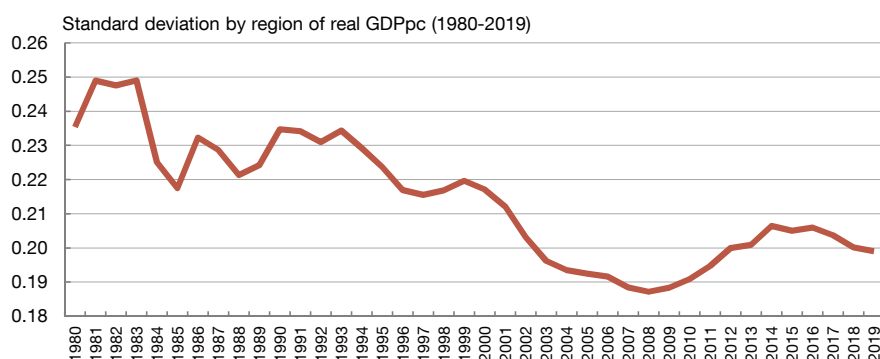
Standard deviation by region of real GDPpc (1980-2019)

SOURCE: Banco de España calculations drawing on INE National Accounts data.

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Chart 2 presents evidence in this respect,[6] correlating the real GDP per capita growth of the different regions to their starting level, for different periods. Taking into account the whole period from 1980 to 2019, the poorer regions generally post higher accumulated growth (see Chart 2.a). That is, a negative correlation is observed between initial GDP per capita levels and growth rates as evidence of (beta-)convergence across the Spanish regions. However, analysing the different sub-periods, beta-convergence is observed up to 2008, and especially from 1992 (see Charts 2.b and 2.c). But as from 2008, no negative correlation is observed between growth and initial GDP per capita levels, but rather, as from that year, a slightly positive correlation (see Chart 2.d).

In consequence, irrespective of the metric used,[7] the conclusions are the same: up to 2008, cross-regional economic differences declined in Spain, with the poorest regions experiencing stronger growth. But following the financial crisis this pattern came to a halt.

Main determinants of convergence

To identify the main determinants of the convergence process, the following decomposition of GDP per capita was made:

$$\frac{\text{Real GDP}}{\text{Pop}+16} = \frac{\text{Real GDP}}{\text{Employment}} \frac{\text{Employment}}{\text{Active}} \frac{\text{Active}}{\text{Pop 16-64}} \frac{\text{Pop 16-64}}{\text{Pop}+16} \qquad [1]$$
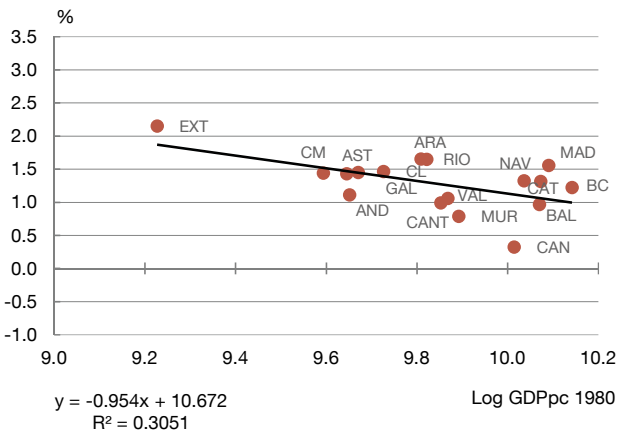
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6 All the charts in this article are based on a correlation of two variables estimated with just 17 data points. It is therefore risky to speak of significance in the usual statistical terms. Nevertheless, the estimated slopes are significantly different from zero at 5% for all the charts in the periods 1980-1992 and 1992-2008, and are indistinguishable from zero for the most recent period, with the exception of Charts 2.b, 5.a and 5.e, whose slopes are not significantly different from zero at 5%.

7 A third metric, gamma-convergence, measures whether the relative position across regions changes over time. In this respect, the main changes in the ranking are concentrated among a small number of regions, with Murcia, the Canary Islands and the Balearic Islands all dropping back several places, and Aragon, Castile-Leon and La Rioja rising up the ranking. Gamma-convergence is complementary to the two metrics considered here, as the differences between regions could have narrowed with or without changes in the rankings. And vice versa, as gamma-convergence does not assure a lower level of dispersion, if for instance the regions that move up the rankings distance themselves from the others.
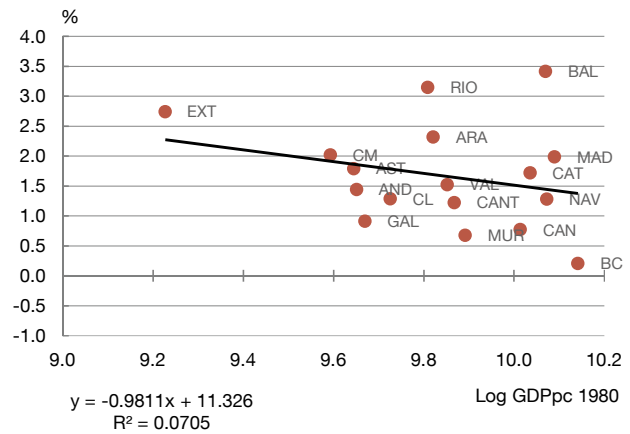
2.a Average GDPpc growth (1980-2019)

y = -0.954x + 10.672
R² = 0.3051

Log GDPpc 1980

2.b Average GDPpc growth (1980-1992)

y = -0.9811x + 11.326
R² = 0.0705

Log GDPpc 1980

2.c Average GDPpc growth (1992-2008)

y = -1.8097x + 19.809
R² = 0.3577

Log GDPpc 1992
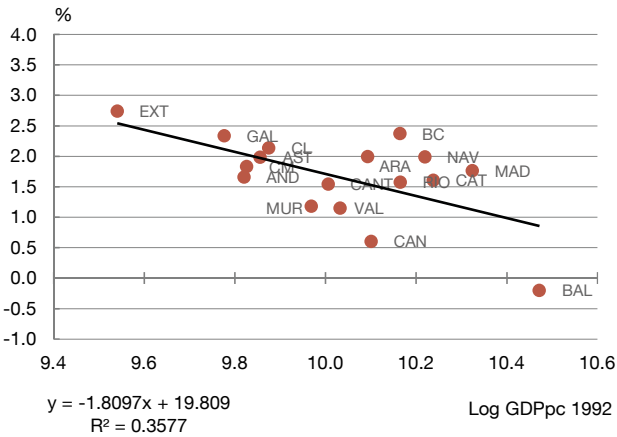
2.d Average GDPpc growth (2008-2019)

y = 0.3788x - 3.57
R² = 0.0418

Log GDPpc 2008
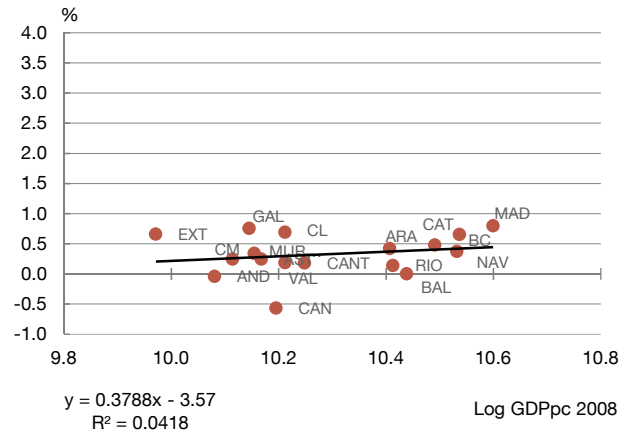
SOURCE: Banco de España calculations drawing on INE National Accounts data.

In equation [1], the first term on the right-hand side is equivalent to labour productivity. The second term measures the share of the labour force that is actually working,[8] while the third measures the participation rate. The product of these last two terms is the employment rate (the ratio of persons in employment to the working age population) and allows us to proxy the labour market's contribution to the convergence process. Lastly, the fourth term is a demographic factor relating to population ageing. Intuitively, the income generated by each working age person (given by the ratio of real GDP to the population between 16 and 64), should be distributed over a larger part of the population in a region that has a higher proportion of over 64-year-olds, meaning that both the last ratio in equation [1] and GDP per capita are lower. This decomposition allows us to analyse which factors have contributed to cross-regional convergence and, by contrast, which

8 Equal to (1 – Unemployment rate).

have had the opposite effect. Specifically, for each of these four ratios, if accumulated growth is greater for the regions with initially lower GDP per capita levels, then this factor contributes to convergence in terms of income per capita, and vice versa.[9]

The main outcome of this decomposition is that, since 1980, labour productivity has been the main determinant of cross-regional convergence in Spain, as it is the only factor whose dynamic is similar to that observed for income per capita analysed in the previous section. It is the main determinant, not only of the convergence observed up to 2008, but also of the subsequent halt in the convergence process. Indeed, both in 1980-1992 (see Chart 3.b) and in 1992-2008 (see Chart 3.c), labour productivity growth was higher in the regions where GDP per capita was lower at the start of each sub-period, and thus made a substantial contribution to the decrease in cross-regional inequalities. After 2008 this pattern inverted (see Chart 3.d), as productivity growth in the wealthier regions was somewhat higher. That is, the labour productivity dynamics essentially replicate the GDP per capita patterns seen in the previous section across the Spanish regions.

The demographic factor, when considered for the entire period analysed, makes an approximately zero contribution to convergence, as it varies irrespective of the initial level of GDP per capita (see Chart 4.a). However, this zero contribution masks important differences by sub-periods. Thus, up to 1992 (see Chart 4.b), demographics contributed to cross-regional divergence, as the wealthier regions recorded lower population ageing. This may have been due to the large-scale migration from (poorer) rural areas to urban areas (with higher GDP per capita levels) seen in Spain in the second half of the 20th century, which led to a shift in working age population from the poorer regions to the wealthier ones, exacerbating these differences.[10] However, this process subsequently decelerated and, in recent years, both this, and the fact that some of the first of these rural migrants have begun to reach retirement age, has meant that the wealthier regions have aged more rapidly, making for greater convergence (see Charts 4.c and 4.d).

Lastly, the employment market overall has contributed very little to convergence, as variations in the employment rate are broadly independent of initial GDP per capita levels.[11] In general, positive changes in the participation rate tend to be offset by equivalent increases in the unemployment rate.

In short, labour productivity is the main determinant of the halt in the convergence process since 2008, as the labour market makes a very low contribution, and in the recent period demographics have contributed in the opposite direction.

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9   Another equally interesting question to examine is whether or not the differences in each variable considered decrease over time. This could be done by changing the horizontal axis in each chart, so that it depicts the initial levels of each variable. However, a lower level of dispersion in these terms is not necessarily accompanied by lower per capita income inequalities, since the initial level of a specific variable may be higher for the poorer regions. In consequence, in this article we have opted to keep the differences in initial per capita income levels on the horizontal axis, irrespective of the variable on the vertical axis.
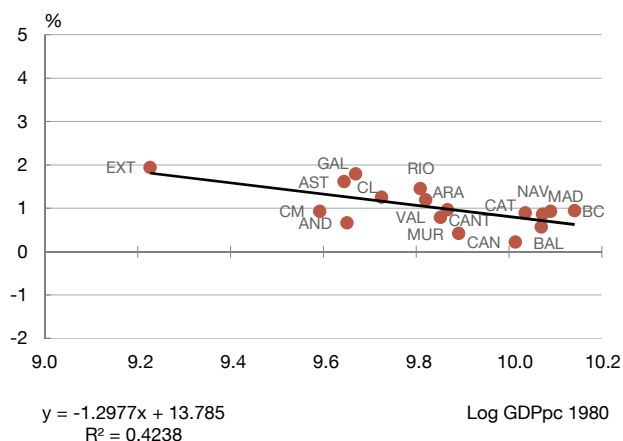
10 For the purposes of cross-regional differences, the important rural exodus is migration across regions as opposed to within regions. In this respect, Gutiérrez, Moral-Benito and Ramos (2020) show that although there was considerable migration within the same province, migration across provinces was also significant.

11 The exception being the period 1992-2008, where the correlation between growth in the employment rate and initial GDP per capita levels is both positive and significant. This means that during this period the labour market increased cross-regional divergence. For all other periods, the correlation is statistically indistinguishable from zero.
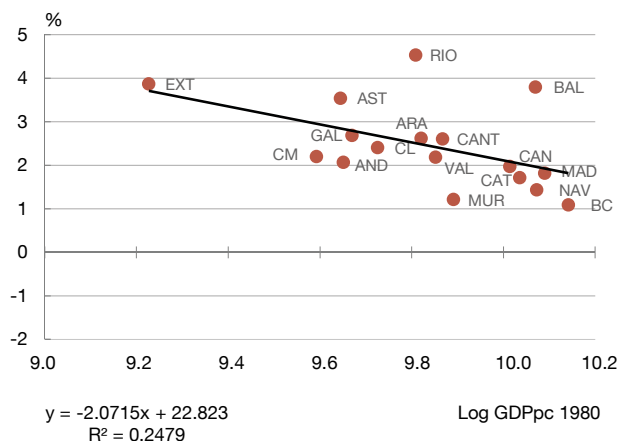
3.a Average productivity growth (1980-2019)

y = -1.2977x + 13.785
R² = 0.4238

Log GDPpc 1980

3.b Average productivity growth (1980-1992)

y = -2.0715x + 22.823
R² = 0.2479

Log GDPpc 1980

3.c Average productivity growth (1992-2008)

y = -1.9586x + 19.734
R² = 0.3825

Log GDPpc 1992
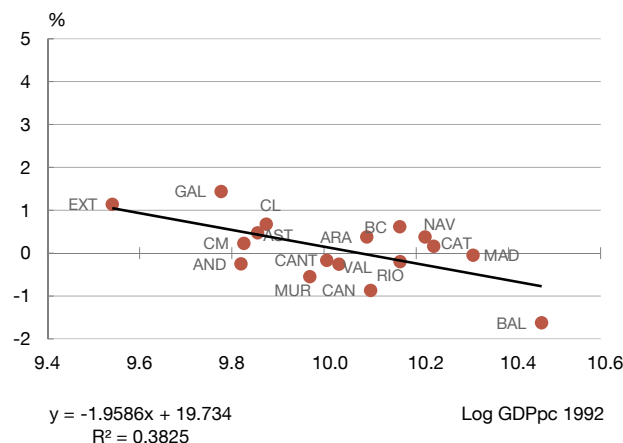
3.d Average productivity growth (2008-2019)
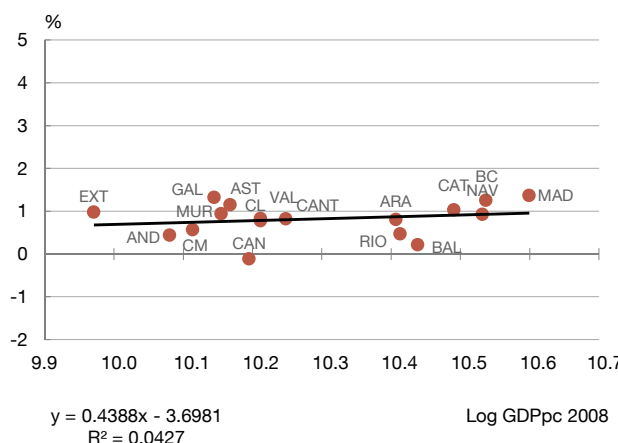
y = 0.4388x - 3.6981
R² = 0.0427

Log GDPpc 2008

SOURCE: Banco de España calculations drawing on INE National Accounts data and the Spanish Labour Force Survey (EPA).

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# The role of capital and total factor productivity

As we have seen, labour productivity (the first term in equation [1]) has been one of the main determinants of the convergence process. This section analyses this factor in greater depth, breaking it down into the role played by capital accumulation and by all the other factors that may affect productivity growth aside from capital (referred to as "total factor productivity" (TFP) in the literature), which include technological progress, improvements in business organisation and human capital gains, in the following terms:[12]

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12 To obtain equation [2] a Cobb-Douglas production function with constant returns to scale is assumed. Parameter α measures the importance of capital in the production function, and is proxied by the ratio of gross operating surplus to GDP expressed in current
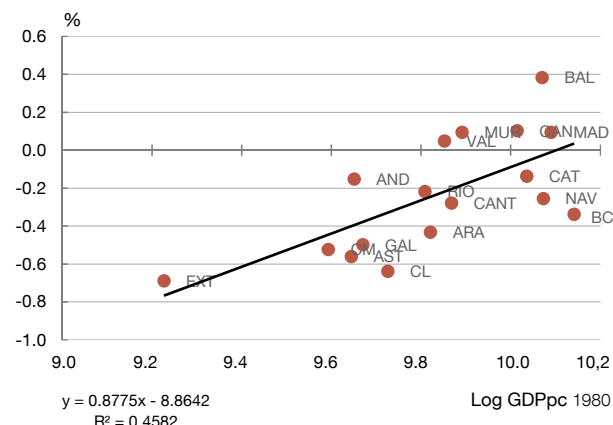
4.a Average growth in pop. 16-64 / pop. +16 (1980-2019)

%

y = -0.0151x - 0.051
R² = 0.0021

Log GDPpc 1980
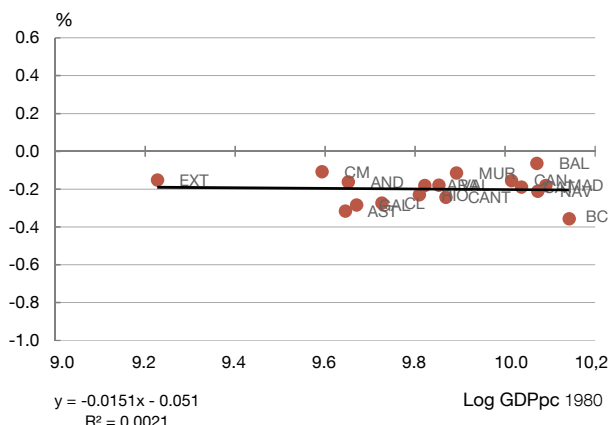
4.b Average growth in pop. 16-64 / pop. +16 (1980-1992)

%

y = 0.8775x - 8.8642
R² = 0.4582

Log GDPpc 1980

4.c Average growth in pop. 16-64 / pop. +16 (1992-2008)

%

y = -0.4676x + 4.5851
R² = 0.5541

Log GDPpc 1992
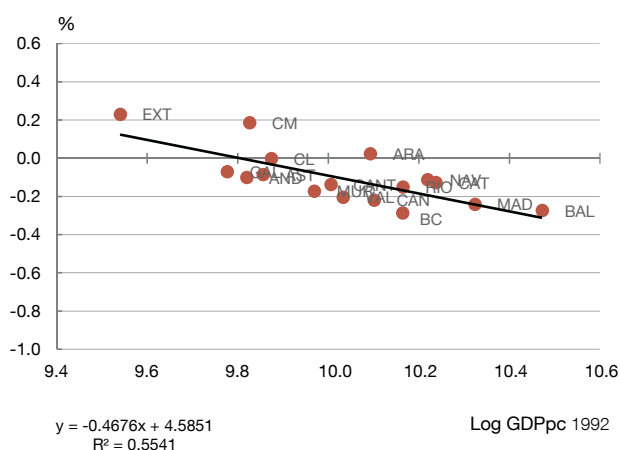
4.d Average growth in pop. 16-64 / pop. +16 (2008-2019)
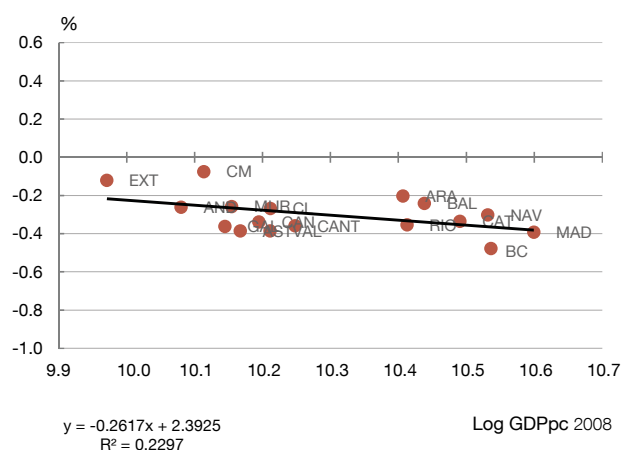
%

y = -0.2617x + 2.3925
R² = 0.2297

Log GDPpc 2008

SOURCE: Banco de España calculations drawing on INE National Accounts data and the Spanish Labour Force Survey (EPA).

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$$\frac{\text{Real GDP}}{\text{Employment}} = \text{TFP} \cdot \left(\frac{\text{Capital}}{\text{Employment}} \right)^{\alpha} \qquad [2]$$

We can thus estimate whether the changes observed in labour productivity are due to differences in capital accumulation per worker[13] or to factors other than capital.[14]

The outcome of this exercise shows that, up to 2008, capital accumulation (see Charts 5.d and 5.e) and TFP growth (see Charts 5.a and 5.b) were both greater in the poorer regions, thus

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prices for each Spanish region. This parameter is allowed to change over time. For every two-year period in which growth is analysed, the value of the aforementioned ratio is used in the first year considered.

13   Drawing on the productive capital stock published by the Valencian Institute of Economic Research (IVIE), at constant prices and factoring in efficiency losses due to workforce ageing.

14   These other factors are included in TFP, which is calculated as the residual value of equation [2].
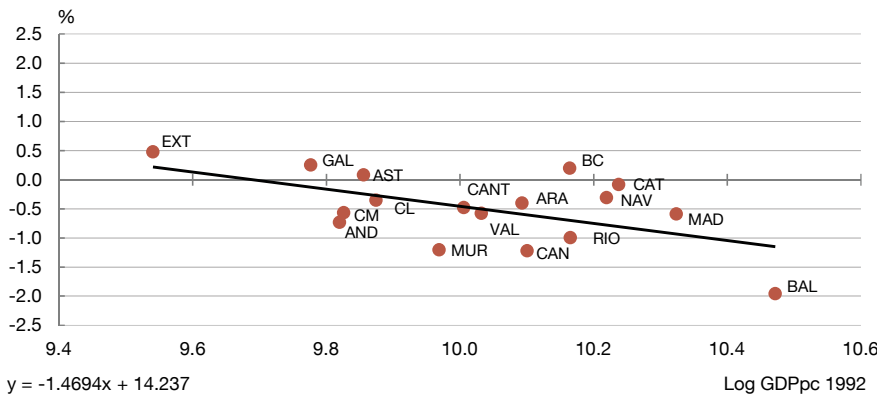
Chart 5
Ratio of TFP growth and capital accumulation per worker to initial natural logarithm GDP per capita level
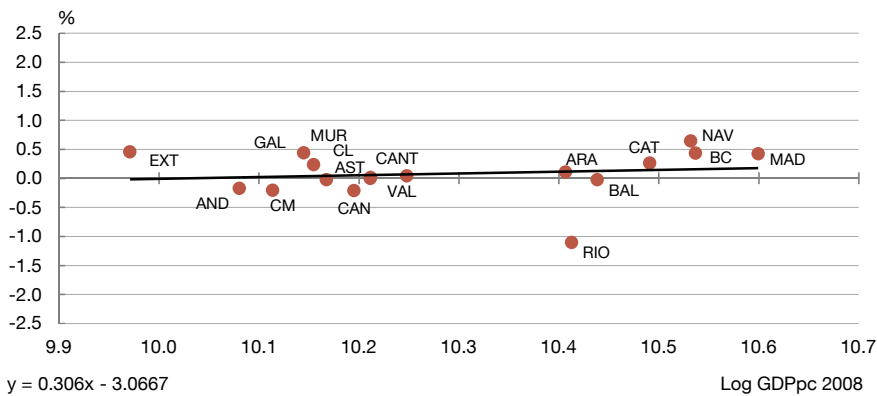
5.a Average TFP growth, 1980-1992

y = -0.7004x + 7.586

Log GDPpc 1980
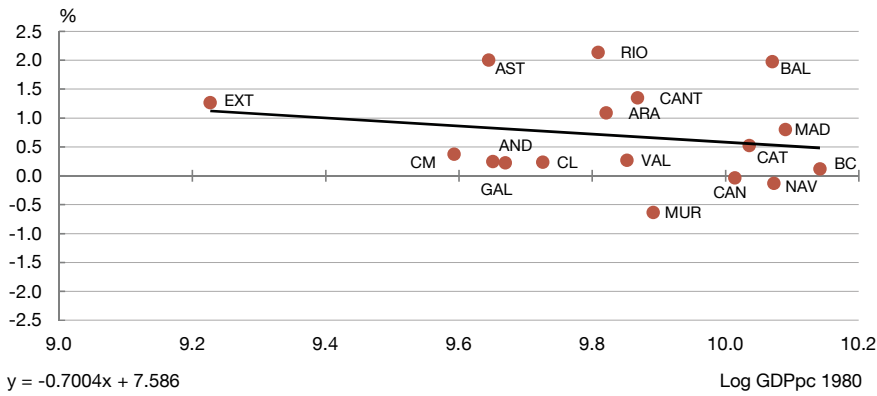
5.b Average TFP growth, 1992-2008

y = -1.4694x + 14.237

Log GDPpc 1992

5.c Average TFP growth, 2008-2018

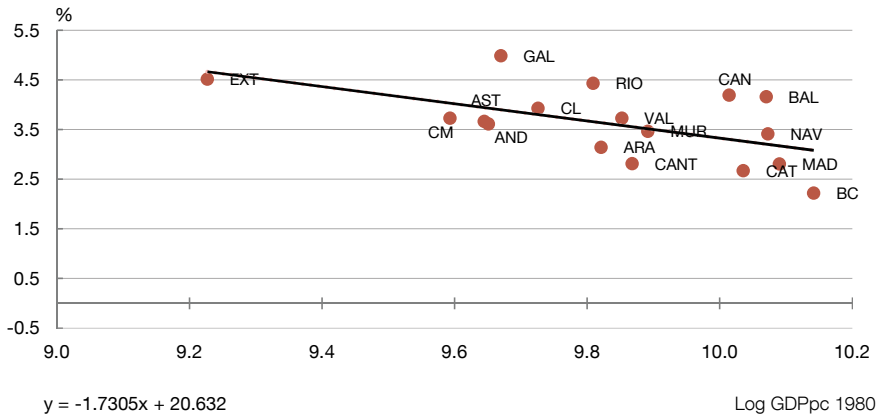

y = 0.306x - 3.0667

Log GDPpc 2008

SOURCE: Banco de España calculations drawing on INE National Accounts and IVIE data.
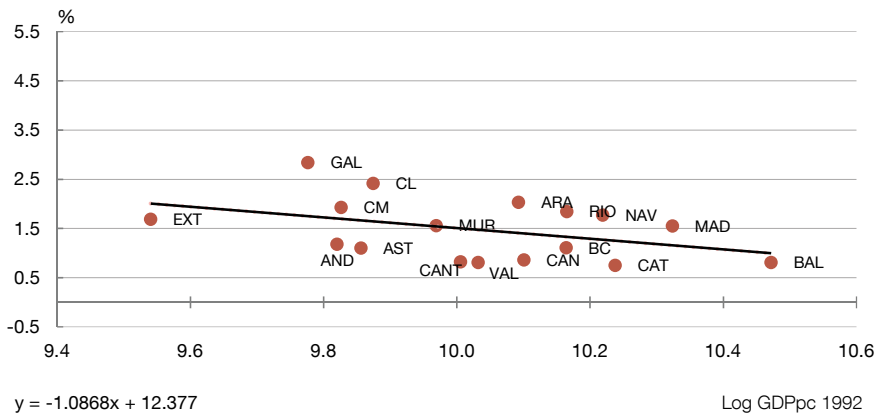
Chart 5

Ratio of TFP growth and capital accumulation per worker to initial natural logarithm GDP per capital level (cont'd)
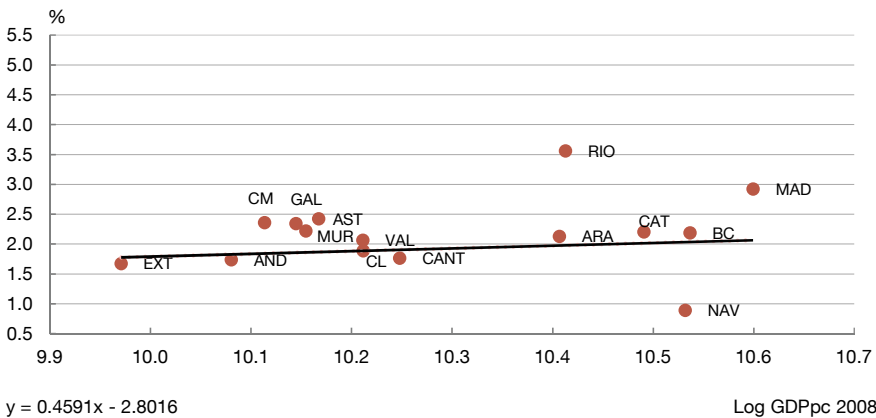
5.d Average capital accumulation per worker, 1980-1992

y = -1.7305x + 20.632   Log GDPpc 1980

5.e Average capital accumulation per worker, 1992-2008

y = -1.0868x + 12.377   Log GDPpc 1992

5.f Average capital accumulation per worker, 2008-2018

y = 0.4591x - 2.8016   Log GDPpc 2008

SOURCE: Banco de España calculations drawing on INE National Accounts and IVIE data.

contributing to the convergence process. Some differences were observed within that period, with capital accumulation playing a more prominent role up to 1992, and a similar relationship between the two factors in 1992-2008. However, since the financial crisis, these two factors have made no contribution to convergence, and have even contributed somewhat to divergence (see Charts 5.c and 5.f). Thus, the stagnation in the contribution of labour productivity to cross-regional convergence appears to be due to a combination of both factors (capital accumulation and TFP).

Lastly, we can analyse the contribution of different types of productive capital (public or private), based on a series of assumptions.[15] It should be noted that, in all regions, most capital is privately-owned. The movements in total capital are therefore very similar to those observed in private capital. Nevertheless, it is interesting to examine whether the small role played by public capital has contributed to reducing or increasing cross-regional inequalities. The outcome of this exercise shows that private capital dynamics are very similar to those observed for total capital, with a positive contribution to convergence up to 2008, when it came to a standstill. The growth in public capital up to 1992 was entirely separate from the regions' economic levels in 1980 and, as a result, its contribution to convergence was practically zero. However, between 1992 and 2008, this contribution changed significantly. With the stock of public capital growing the most precisely in the poorest regions, it became a driver of convergence. Since 2008, this contribution to convergence has remained, but it is far weaker than before.

In short, this article documents the halt in the convergence process following the financial crisis of 2008. The reason for this standstill is that, unlike prior to 2008, labour productivity no longer posts stronger growth in the poorer regions. This, in turn, is due to the accumulation of physical capital and TFP growth, which are no longer higher in the regions with lower GDP per capita levels. Meanwhile, in recent years, demographics have had the opposite effect, driving convergence, since population ageing has been more pronounced in the wealthier regions.

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15 The level of public capital is calculated as the capital ratio at constant prices (100 in 2015), multiplied by the stock of public capital as a percentage of total capital at current prices in 2015, in both cases using the data published by the IVIE. Private capital is calculated as the difference between total capital and public capital as defined above.

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