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# Has the Great Recession affected the convergence process? The case of Spanish provinces<sup>☆</sup>

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## ABSTRACT

This paper explores potential convergence across the Spanish provinces, paying special attention to the influence of the recent international crisis on this process. To this end, we have taken the traditional per capita gross domestic product and the multidimensional index of human development as references. Our results show the formation of several clubs whose composition and convergence pattern has been modified by the recent crisis: the previously increasing differences in the average per capita gross domestic product between clubs have been attenuated, whilst the decreasing disparities in the average human development index have been stabilized. However, the behavior of the clubs in the last period of the sample suggests that these differences may increase notably in the post crisis years.

## 1. Introduction

The analysis of the growth path of a group of economies has received much attention since the publication of the seminal papers of Barro et al. (1991) and Barro and Sala-i-Martin (1992). This attraction can be easily understood if we bear in mind that this type of research is crucial for designing adequate policies to decrease disparities. Given this interest, the progress of the convergence theory has been intense. The early research was based on the analysis of the absolute convergence hypothesis, which predicts that there is a global equilibrium to which all countries will tend so the per capita income will grow faster in the poorest states than in the richest ones. As absolute convergence was not supported by the data, the concept of conditional convergence was introduced. Conditional convergence states that only economies with identical structural characteristics also share the steady state, so the income of states close to their long-run equilibrium will grow slower whatever the initial conditions. Empirically, advances in time series analysis offered new possibilities, from papers based on the analysis of relatively simple concepts such as  $\beta$ -convergence and  $\sigma$ -convergence, both related to the absolute convergence hypothesis, to other methodologies that cover conditional convergence and include non-parametric estimations and econometric innovations such as the inclusion

of structural breaks. These advances were reflected in the contributions of Carlino and Mills (1993, 1996), Quah (1993), Bernard and Durlauf (1995), Evans and Karras (1996), Loewy and Papell (1996), Nahar and Inder (2002), Strazicich et al. (2004), Carrion-i-Silvestre and German-Soto (2007) and Ceylan and Abiyev (2016). Apart from absolute and conditional convergence, a new concept was developed, club convergence. This concept states that regions with identical initial and structural conditions converge to the same long-run equilibrium (Barro and Sala-i-Martin, 2004). Club convergence analysis has received a new impulse thanks to the methodology proposed by Phillips and Sul (2007, 2009), who developed some new and very powerful techniques for testing the null hypothesis of convergence while, at the same time, providing useful tools to determine the formation of convergence clubs. This approach examines whether regions in the same area could be creating convergence groups, and has the advantage of not biasing the results in favor of the divergence hypothesis since it contemplates several long-run equilibria (Galor, 1996).<sup>1</sup> Furthermore, it exhibits good performance in commonly employed sample sizes, especially when compared to alternative methodologies such as the standard unit root/cointegration approach.

The literature has generally selected the per capita GDP as the macroeconomic aggregate that best measures economic conditions.

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<sup>1</sup> See the papers of Bartkowska and Riedl (2012), Ghosh et al. (2013), Monfort et al. (2013) and Apergis and Georgellis (2015). See also Tian et al. (2016) or Wang et al. (2014), amongst many others, for other applications of this methodology.

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However, this aggregate cannot represent real human welfare because other related aspects such as health, education level and the degree of satisfaction of the citizens are ignored. Hence, the use of broader measures to assess the evolution of a group of regions seems reasonable, especially if the current economic environment is based on the application of austerity policies that affect education and health care, for example. Although other measures are also possible,<sup>2</sup> an interesting index is the Human Development Index (HDI), which has been published since 1990 by the United Nations Development Programme in its annual Human Development Report. This index provides information about the capacities of an economy and not about economic performance, as in the per capita GDP. Consequently, the HDI can offer alternative results in the analysis of convergence among groups of economies. Examples of the use of this index to test for convergence are Nissan (2002), Marchante and Ortega (2006) and Yang et al. (2016).

A recent analysis carried out by Montañés and Olmos (2014) studies the convergence of the Spanish regions by comparing the results obtained when both GDP and HDI are used. The results obtained from the use of the two measures exhibit some differences at the end of the sample (2010), but they tend to show similar results at the beginning of the sample (1980). This fact invites us to use both variables to analyze convergence, given their marked complementary relationship. Furthermore, these authors conclude that the evolution of the Spanish regions can be better understood as the sum of several divergent patterns of behavior rather than as a real convergence process. The authors could not answer the question of whether there are convergence clubs or not using unit root techniques. Nevertheless, the sample used by these authors considers aggregated geographical areas, the Spanish regions, and covers the period from 1980–2010. With this data, the total effects of the economic crisis that Spain has suffered since 2008 could not be properly assessed. The crisis may have increased the differences between regions or, on the other hand, the distances may have been reduced. In any case, there is no information on the impact of the crisis on the convergence process and, consequently, it seems appropriate to further analyze the behavior of Spain over this period. Against this background, the aim of this paper is to extend previous results by, first, using a higher level of territorial disaggregation (provinces instead of regions), second, extending the sample until 2014, which could help us to analyze the influence of the recent economic crisis on the convergence process across the Spanish provinces and, third, employing a more suitable methodology, the Phillips and Sul (2007, 2009) approach. Furthermore, we estimate a probit model in order to determine the structural factors that form the clubs and, therefore, define the evolution of the Spanish provinces.

The rest of the paper is organized as follows. Section 2 describes the database. Section 3 presents the methodology employed in the paper, the results obtained from the convergence analysis and the exploration of the sources that generate the different clubs of behavior. The paper ends with a review of the most important insights.

## 2. The effect of the crisis on the Spanish provinces: data and descriptive analysis

As we have previously stated, the objective of this paper is to analyze whether the recent international crisis has affected the convergence process in the Spanish provinces. Now, it is necessary to decide on which variable to focus in order to analyze the convergence process. Most of the previous convergence papers are based on the use of the per capita GDP. Nevertheless, this measure can hide the effect of the crisis on other essential aspects of a society, especially if we take into account that the provincial, regional and central governments have implemented austerity measures. These policies are aimed at reducing

the deficit of the public administrations and, consequently, have had restrictive effects on public health and education. It is foreseeable that the crisis has altered not only the levels of economic wellbeing, but also those of health and education attained since the 1980s. Thus, it seems advisable to use an indicator, such as the well-known Human Development Index (HDI), that takes into account these three aspects: material wellbeing, health and education. This index is based on the idea of Amartya Sen of reflecting capabilities and opportunities more than realizations (see Sen, 1985). Its definition has recently changed and its current version can be stated as follows:

$$HDI_{it} = \sqrt[3]{HI_{it} * EI_{it} * MWI_{it}} \quad t = 1, 2, \dots, N \quad (1)$$

where  $HI$ ,  $EI$  and  $MWI$  mean a Health Index, an Education Index and a Material Wellbeing Index, respectively. The  $HI$  depends on the life expectancy at birth ( $LE$ ) and is defined as follows:

$$HI_{it} = \frac{LE_{it} - \min LE}{\max LE - \min LE} \quad (2)$$

with  $\min LE$  and  $\max LE$  being 20 and 85 years, respectively. The education index is obtained as follows:

$$EI_{it} = \frac{MYSI_{it} + EYS_{it}}{2} \quad (3)$$

where  $MYSI$  represents average years of schooling index and  $EYS$  is the expected years of schooling index. These indexes are obtained as follows:

$$MYSI_{it} = \frac{MYS_{it}}{15} \quad (4)$$

$$EYS_{it} = \frac{EYS_{it}}{18} \quad (5)$$

Finally,  $MWI$  is an income index that can be defined as follows:

$$MWI_{it} = \frac{\ln(GNI_{it}) - \ln(100)}{\ln(75,000_{it}) - \ln(100)} \quad (6)$$

where  $GNI_{it}$  is the Gross National Income of each  $i$ -th province at period  $t$ .

Throughout this paper, we will combine the use of the more standard per capita GDP with the use of the HDI that, in our view, can help us to better understand the type of effects that the crisis has had on the Spanish convergence process.

Having defined the variables that we will focus on, the next problem we face is the level of territorial disaggregation to be used. In our view, it seems advisable to use the most disaggregated information possible, in our case, provincial data, which is equivalent to the TL3 used by the OECD and to the NUTS-3 defined by Eurostat. It is true that most papers use less disaggregated data, as is the case of the previously mentioned regional analysis developed in Montañés and Olmos (2014) and other analysis of European regions such as Azomahou et al. (2011). However, we should bear in mind that the use of regional data may not always provide very useful insights. Here we are considering cases where the regions are divided into infra-regional territories, namely, provinces that behave heterogeneously. Given that the regional data is a weighted average of all of them, the conclusions based on aggregated data cannot be very informative. Spanish regions are often composed of very heterogeneous provinces. For instance, we can consider the case of Aragon. The activity in this region is mainly concentrated in the cities of Huesca, Teruel and Zaragoza, which give their names to the three homonymous provinces. 50% of the population of Aragon lives in the city of Zaragoza and 72% in its province. The productive structure is also diverse if we analyze it from a provincial perspective. For instance, the weight of the manufacturing industry in Zaragoza almost doubles that of Huesca and Teruel. Similarly, the contribution of agriculture to GDP is clearly higher in Huesca than in Teruel and Zaragoza. This example is not only related to a particular region, but can be extended

<sup>2</sup> See Apergis and Georgellis (2015).

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