

**Economic Cohesion and Economic Development of the European Union's Regions and Member States - A Methodological Proposal to Measure and Identify the Degree of Regional Cohesion.**

**Anna Garashchuk, Fernando Isla Castillo, Pablo Podadera-Rivera**

***Abstract***

*The EU cohesion policy seeks to mitigate imbalances between countries and regions and enhance greater economic development of the whole Union. However, notwithstanding its efforts and certain progress on this issue, territorial disparities still represent an open challenge for the European Union, which requires improving the cohesion policy, particularly regarding its measurement, in order to allocate resources more efficiently.*

*This article aims to propose an innovative methodology to measure and identify the degree of cohesion of both EU NUTS-2 regions and member states in economic terms. To this end we first selected the main indicators which would better explain GDP per capita growth by applying factor analysis; and second, we measured the degree of cohesion of every indicator by calculating inequality indexes between both regions and countries. To ensure the robustness of this research, we compared the results obtained by Gini, Atkinson, and Theil indexes, and three of which gave us similar findings. Finally, the Economic Cohesion Index (ECI) was elaborated, which allowed us to identify regions that, regardless of their economic development, still have a very low level of cohesion.*

*Among the main results of the study, we can highlight that the 27 EU countries are quite cohesive, since a very clear correspondence is shown between the levels of development of each country, and their potential is attributable to the inequalities of the set of indicators. On the contrary, from the regional perspective, the study shows important imbalances between economic development and its potential in 34 regions, with the least developed regions being the most affected and, to a lesser extent, regions in transition.*

**Key Words: Terrestrial Cohesion, European Union, NUTS-2 Regions, Cohesion Policy, Economic Development, Inequality Indexes**

## Introduction

The European Union is a project focused on the balanced distribution of prosperity to all its regions (Batur & Çalışkan, 2019). In regard to the overriding objective of the European Union, Darvas et al. (2019) stress the importance of strengthening regional cohesion by addressing development disparities, particularly by targeting more-unfavoured regions. The authors argue that the EU's southern and eastern enlargements could be considered a political bargain in which the newer, less-developed member states opened up their markets in return for job opportunities provided by more-developed regions and cohesion policy funds to enhance their transformation and convergence.

The construction process of the EU itself, inserted in the current global context, requires precise and appropriate knowledge of the territory to facilitate its assessment, as well as adopting political decisions, monitoring, and periodically evaluating public policies and their territorial impact. This necessity has become an instrumental challenge for the EU's cohesion policy, based on the assumption that a reduction of territorial disparities implies greater cohesion and, therefore, territorial balance, which in turn contributes to greater economic development.

One of the most crucial questions related to the EU Cohesion Policy is the selection of the indicators to be used when allocating funds to regions (Darvas et al., 2019). For the 2021-2027 period, EU funds allocated to the Cohesion Policy amount to EUR 392 billion. Fund allocations are still mostly based on GDP per capita, even though at present the relative role of this main indicator has been slightly reduced to increase the importance of other more social-oriented indicators, such as the labour market, education, demographics, migration, and climate. However, in this research study, we were guided by the GDP per capita, considered by Eurostat as a key indicator to evaluate and classify the economic development of European Union regions.

Based on previous research, referred to the study of the conceptualization of territorial cohesion (Camagni, 2006; Faludi, 2010; Medeiros, 2016; Barca, 2009; Davoudi, 2005; Doucet, 2006; Florio, M. 2006; Evers, 2008; Schön, 2005; Servillo, 2010; Sykes, 2011; Waterhout, 2007; Iammarino et al.; 2017; Bachtler, J. et al., 2016; Podadera & Calderón, 2019, Moreno, S. et al., 2020, among others) and linked to the concepts of territorial inequality, diversity development, convergency and innovation, this paper aims to provide a methodological approach for the measurement of disparities in the economic dimension of the territorial system (trend of economic cohesion) within the framework of the European Union, in order to approach the measurement of territorial cohesion in such

a system, through the analysis of inequalities and identification of the degree of cohesion of its regions.

The concept of "territorial cohesion" is above all political and multidimensional. In this sense, it could be considered "as a component in achieving the EU goals of competitiveness and economic growth thus emphasizing the political-economic dimension of cohesion" (Weckroth & Moisiso, 2020). It is based on a central idea of equity (reduction of imbalances) and, therefore, of cohesion between the territories at a certain scale and admitting the particularities of each territory from the diversity. We can say that it is part of the planning and territorial ordering processes in favor of the balanced integration of the dimensions that make up the territorial system (sociocultural, economic-productive, political-institutional and physical-environmental) and socio-spatial harmony in the long term (Cabeza et al., 2015; Medeiros et al., 2022)

On the other hand, "economic cohesion" supposes the establishment of links between the components that allow the gearing of an economic-productive scheme, framed in the principles of environmental sustainability and good governance. Therefore, economic cohesion becomes an input for territorial cohesion.

Although this research is mainly focused on the NUTS-2 EU regions as classified by Eurostat, it also embraces the analysis of EU member states, spanning the period 2006-2019. This time frame has been selected because of the availability of selected indexes that explain the GDP per capita growth since 2006 for most of the EU NUTS-2 regions and member states.

The paper is organized as follows: after the introduction, we provide a literature review regarding territorial cohesion and methodological aspects related to inequality indexes. We then describe the methodology, followed by presenting of the results. The final section provides the discussion and conclusions.

## **Literature Review**

Territorial cohesion can be perceived as a strategic process that aims to balance territories from an economic, social, infrastructural (in the sense of connectivity), or even institutional (in the sense of governance) perspective, on the basis of solidarity and with claims to improve territorial competitiveness in a broader geographical framework of

influence<sup>1</sup>. However, it is the historical existence of inter-territorial differences in Europe, that has been used to justify the need to measure territorial cohesion in the process of building the EU and, therefore, the demands on the Cohesion Policy to reduce these disparities<sup>2</sup>.

The concept of territorial cohesion covers a set of dimensions, such as the political-institutional, physical-environmental, economic-productive, and even sociocultural (Cabeza and Gutiérrez, 2015), related to the economic and social development of the geographical context under consideration. Podadera and Calderón (2019), in turn, argue that the conceptualization of territorial cohesion is extremely important for the cohesion policy of the European Union, even though the concept can be ambiguous (Davoudi, 2005), vague (Faludi, 2013), elusive (Schön, 2009) and even imprecise (Medeiros, 2016), but not impossible to measure (Zaucha & Böhme, 2020). However, we consider that it should be treated as a concept that is complex, polysemic, multidisciplinary and multidimensional, dynamic, and open to a process of integration.

In this sense, Podadera and Calderón (2019) highlight the need for an operational concept of territorial cohesion in the European Union and propose five metacomponents: "Redistributive" with thematic contents related to inter-territorial solidarity and territorial competitiveness; "Polycentric Development", which considers aspects related to balanced development, social elements and standard of living conditions; "Territorial", referring to connectivity, access to Services of General Economic Interest (SGEI), sustainable development, vulnerable areas and remote regions; "Institutional", related to multilevel governance, public policies and intangible aspects (R&D, innovation, European identity, etc...); and "Relational", referring to territorial and institutional cooperation, included in a vision of prosperity or economic development of the whole of the EU, linked to the competitiveness of the community's territories, and based on the endogenous potential for economic growth and relations with other community and non-

---

<sup>1</sup> This is nothing new; the Preamble to the Treaty of Rome already declared that "the EC member states are concerned with ensuring their harmonious development, reducing the differences between the different regions and the backwardness of the less favored"

<sup>2</sup> Some of the main antecedents are the creation of the Marjolin Committee in 1959 to carry out regional studies; the Motte Report to the European Parliament, in 1960, for the elaboration of a master program for land use planning; in 1961, the Conference of Regional Economies in Brussels; in 1965, the Thompson Report on the regional problems of the enlarged Community; or in 1972, the Paris Summit Conference, which was the embryo of the creation of the ERDF, among others. Since 1996, the different Cohesion Reports have followed one another periodically until the eighth report on economic, social and territorial cohesion of February 2022. Likewise, different initiatives have also contributed to the Cohesion Policy, such as the European Spatial Development Prospective (ESDP) of 1999, European Territorial Strategy (ETS) of the same year, and the Territorial Agenda of the European Union 2020 (TA20) of 2011.

community territories. This operational intention has been reflected in various studies carried out within the framework of the ESPON Program (ESPON TeDi, 2010; ESPON INTERCO, 2011; ESPON KITCASP, 2012). Nevertheless, the analysis of territorial cohesion in this article focuses particularly on the economic aspect, with the idea of incorporating other essential components into further research.

From a metric perspective, the analysis of territorial imbalances to measure territorial cohesion can be carried out between countries, between the regions of the same country (Camagni et al., 2020) or between all the regions of the European Union (in our case the measurements were made between countries and between NUTS-2 regions of the EU). From a political standpoint (territorial cohesion policies in this case), the analysis entails the "multifaceted question" (Castells and Espasa, 2002) of the relationships between income and wealth between territories, since policymaking includes different economic, political, fiscal, and ethical aspects in accord with actions of the public sector to ensure inter-territorial solidarity.

In connection with territorial imbalance, it is worth mentioning that all of economics is the result of inequality and that without inequality, there would be neither trade nor specialization (Welch, 1999). However, Roemer (2019) highlights that in any case, most people pursue economic equality because it is the way to achieve justice and share scarce resources. In this regard, researchers have developed various inequality indices to measure inequality by applying a single index.

The Gini index is the most widely used measure of inequality in the literature and is accepted practically by all international and national institutions as a universal methodology. It is closely related to the Lorenz curve (1905), which can be used to graphically represent inequality. Gini's original work on the subject appeared in 1912 in Italian (Gini, 1955) and in addition to the inherent mathematical and statistical interest, became increasingly popular, in fields such as insurance (Frees et al., 2011; Samanthi et al., 2017) and economics (Reardon and Bischoff, 2011). In this regard, Charles et al. (2022) stress that the Gini index has evolved into quantifying inequity in all kinds of distributions, such as wealth, gender parity, access to education and health services, and environmental policies. The authors also discuss the implications of the traditional Gini index for international diplomacy and policymaking.

The Gini index, which is a single number that measures how equitably a resource is distributed in a population, provides a simple tool for summarizing and interpreting economic data (Farris, 2010). The Gini coefficient ranges from zero (perfect equality) to

one (maximum inequality). However, the Gini index has been critiqued by social scientists (Atkinson, 1970). Stefanescu (2010), for instance, argues that the Gini index is not always adequate to measure the poverty level of an analyzed population and recommends only using the Gini index together with other similar or complementary poverty indicators. Thus, despite its scalability and universality, the Gini index is very sensible to sample size and systematic and random data errors. Moreover, it does not reflect the structural changes in a population. Besides the Gini index, two of the most popular ones are the Atkinson and Theil indices (Sen and Foster, 1997).

The Atkinson index, introduced in 1970 by British economist Anthony Atkinson (Atkinson, 1970), connects a social welfare function to a concept of equality. It is one of the few inequality measures that incorporates normative judgments about social welfare (Theodorakis et al., 2006). The Theil index, introduced in 1967 by Dutch econometrician Henri Theil, is based on the concept of information entropy and is meant to measure income inequality, lack of diversity, isolation, segregation, non-randomness, compressibility, irrigation systems, software metrics and other phenomena (Tutberidze et al., 2018). Unlike the Gini index, both the Atkinson and Theil indexes satisfy the decomposability axiom, i.e., we can express the index for the entire population as a weighted sum of the indices for the population subgroups plus the index for the subgroup means.

On the other hand, in their analysis of the literature on inequality convergence, Suarez-Arbesú et al. (2022) highlight that little attention is given to the case of the EU, despite the interest derived from economic integration and the common policies adopted. Thus, the strong evidence after the formation of the Eurozone provides firm support for economic convergence in terms of per capita income (Villaverde & Maza, 2008; Kutan & Yigit, 2009;), which is primarily attributed to the validity of the catch-up hypothesis in the growth of the weaker economies such as Greece, Ireland, Portugal, Spain, and Eastern Europe (Suarez-Arbesú et al., 2022).

However, the majority of inequality research in the EU only focuses on income inequality at national or regional levels. In this regard, Ezcurra and Pascual (2005) stress the presence of weak convergence across EU Members at the regional level, owing to the low levels of intradistributional mobility. Likewise, Ezcurra & Del Villar (2021) do it considering the globalization context. Bárcena and Imedio (2008), for example, apply Bonferroni and De Vergottini inequality measures together with the well-known Gini

index to obtain rankings of the EU countries, using the European Community Household Panel data. The authors stress that only the Bonferroni measure satisfies the Principle of Positional Transfer Sensitivity. Kvedaras and Cseres-Gergely (2020) evaluated both the total and the inequality-affecting convergence of income distribution across EU Members using Monte Carlo experiments. Suarez-Arbesú et al. (2022) identify patterns of convergence in the income inequality of European Union countries by using the Gini Index and an alternative inequality measure, specifically the 80:20 ratio, while employing the club convergence approach and an ordered logit model.

Regarding our research, we calculated inequality indexes using factor analysis of economic indicators to explain GDP per capita growth at both the regional and national levels, which allowed us to identify the less and more economically cohesive EU NUTS-2 regions and countries. Even though the measurement of income inequality, in and of itself, is not the subject of this research paper, we applied a similar methodology opting for the three most well-known inequality indexes, namely Gini, Atkinson, and Theil, to ensure the robustness of our results (see Table 1).

**Table 1. Inequality Indexes Applied in the Research**

Index	Formula	Year	Reference	Decomposability
<i>Gini</i>	$\frac{\sum_{i=1}^N \sum_{j=1}^N  X_i - X_j }{2N^2 \mu_X}$	1912	Corrado, 1912; Corrado, 1914	No
<i>Theil</i>	$\frac{1}{N} \sum_{i=1}^N \left[ \left( \frac{X_i}{\mu_X} \right) \ln \left( \frac{X_i}{\mu_X} \right) \right]$	1967	Foster, 1985; Sen, 1997	Yes
<i>Atkinson</i>	$1 - \left[ \sum_{i=1}^N \frac{1}{N} \left( \frac{X_i}{\mu_X} \right)^{1-\alpha} \right]^{\frac{1}{1-\alpha}}$ for $\alpha = 0.5$	1970	Atkinson, 1970; Atkinson, 1975	Yes

Source: Based on the Literature Review

Finally, the *Economic Cohesion Index (ECI)* was elaborated based on the fixed effects model applied to a data panel. Thus, this article proposes an innovative methodology to measure and identify the degree of economic cohesion of both EU NUTS-2 regions and member states that were previously not displayed in other research studies of the European Union. The detailed methodological proposal of our research is described in the next section.

## Methodological proposal

The economic growth of the EU regions should be accompanied by a more cohesive economic development. One of the pillars of cohesion between territories is the economic aspect; but what do we mean by economic cohesion? Reviewing the literature, we can affirm that there is no consensus when it comes to defining economic cohesion. This paper proposes to develop an *Economic Cohesion Index (ECI)* defined for a group of regions, which takes into account, on one hand, the inequalities present in a set of indicators, and which at the same time is related to the economic development of a particular region. This way, we define potential economic development in accordance with inequality levels attributed to a set of indicators that also explain economic growth.

The *ECI* defined for a group of  $n$  regions/countries is based on a set of  $k$  indicators observed in  $T$  time periods, which meet two requirements:

- 1) They are closely related to economic growth<sup>3</sup>.
- 2) They are common to the group of regions analyzed and have maximum representativeness in the sample<sup>4</sup>.

It is assumed that the stationary growth signals<sup>5</sup> (interannual rates) of the economic indicators are generated by the factor model:

$$z_{jit} = \lambda_j f_{it} + u_{jit} \quad (1)$$

in which:

- $z_{jit}$ : standardized growth signal (interannual variation) of indicator  $j$ , in region  $i$ , at time  $t$ .
- $\lambda_j$ : factor weight of indicator  $j$ .
- $f_{it}$ : common factor for region  $i$  at time  $t$ .
- $u_{jit}$ : specific or idiosyncratic component of indicator  $j$ , in region  $i$ , at time  $t$ .

---

<sup>3</sup> In the literature, the factor analysis methodology is the most widespread for the selection of a set of indicators that explain economic growth. Dynamic factor analysis combines, in turn, the use of the Kalman filter. See the case of Spain in Cuevas et al (2015).

<sup>4</sup> It would be feasible to consider the use of a set  $k$  of different indicators for a group of regions. Likewise, in cases of lack of information for any region or period, the corresponding values have been interpolated.

<sup>5</sup> We assume that GDP per capita, which measures economic development, and the set  $k$  of indicators that explain economic growth, present a unit root for all regions, i.e. they are integrated variables of order 1. This implies working with interannual growth.

The common factor  $f_{it}$  and the weights  $\alpha_j$  will be updated once new information regarding an indicator becomes available. Likewise, it is also possible to express the factor as a combination of the standardized growth of the indicators:

$$z_{jit} = \sum_{j=1}^k \alpha_j x_{jit} \quad (2)$$

An inequality index<sup>6</sup>,  $I_t$ , is elaborated for a set of  $k$  indicators, for each year  $t$ , and valid for all regions. This index will be based on an appropriate combination of the inequalities that these indicators present in the set of  $n$  regions, associated with economic growth, and will be defined as:

$$I_t = \sum_{j=1}^k \alpha_j I_{jt} \quad (3)$$

$I_{jt}$  being a measure of inequality of the  $j$ -th indicator calculated in year  $t$  and the attributed weight  $\alpha_j$  to the  $j$ -th indicator in the factor analysis. It is possible to make an econometric estimation with  $t$  temporary data, between the average GDP per capita of the set of  $n$  regions and the inequality  $I$ :

$$GDP pc_t = \alpha + \beta I_t + \varepsilon_t \quad (4)$$

The *economic cohesion index* of the set of  $n$  regions ( $ECI^n$ ) would be the model's determination coefficient. The higher the coefficient, the better the inequalities of the indicators explain the economic development of the set of  $n$  regions.

The *economic cohesion index* for region  $i$  ( $ECI_i^n$ ) is defined from the following fixed effects model applied to a data panel consisting of the  $n$  regions and  $T$  temporal data, to which the robust estimator for cross-sectional and temporal units is applied<sup>7</sup>:

$$GDP pc_{it} = (\alpha + u_i) + \beta I_t + \varepsilon_{it} \quad (5)$$

---

<sup>6</sup> In order to ensure the robustness of the results, three inequality indexes were calculated. The description of indexes is provided in the Literature Review (see Table 1).

<sup>7</sup> The White cross-section (period cluster) method assumes that the errors are contemporaneously (cross-sectionally) correlated. Alternatively, the White period (cross-section cluster) method assumes that the errors for a cross-section are heteroskedastic and serially correlated. The White two-way cluster method allows for both cross-section and period clustering. This last robustness option is the one that is finally applied.

$u_i$  being the unobservable heterogeneity attributed to each region<sup>8</sup>. We define the economic cohesion index of region  $i$  in the set of  $n$  regions as:

$$ECI_i^n = \left( r_{GDP_{pc}, \widehat{GDP}_{pc}} \right)^2 \times 100 \quad (6)$$

where  $r_{GDP_{pc}, \widehat{GDP}_{pc}}$  is the correlation between the region's economic development and the estimated value  $\hat{\theta}$  (its economic development potencial) from equation 5.

In this regard, we guarantee that the *economic cohesion index* varies between 0 and 1. A value close to zero indicates little economic cohesion, or the absence of cohesion, from the set of  $k$  indicators, i.e. the inequality of the economic indicators does not contribute to explaining economic development. A value close to one indicates maximum cohesion between the inequality indicators and economic development<sup>9</sup>. Three levels of cohesion have been defined: high ( $0.75 \leq ECI < 1$ ), medium ( $0.5 \leq ECI < 0.75$ ), and low ( $0 \leq ECI < 0.50$ ). We say that a region belongs to one of the levels when it presents a similar level of cohesion with Gini, Atkinson, and Theil inequality indexes.

### Panel data and selection of indicators

In order to select the indicators, we have worked with a panel that includes 242 NUTS-2 regions of the EU during the period 2006-2019. The regions have been differentiated by levels of economic development according to the official EU Eurostat classification<sup>10</sup>. Thus, according to this classification, between 2006 and 2020 the most developed regions were gradually reduced from 137 to 117, while the regions in transition and the less developed ones increased (from 32 to 42 and from 73 to 81 respectively). The classification of the regions is shown in Table 2.

Table 2. Classifications of the EU NUTS-2 Regions

<sup>8</sup> The estimates of  $\alpha$  and  $\beta$  are identical in equations 4 (temporary data) and 5 (panel data). The difference is reflected in the fixed effects model, where the independent term is different for each region and is associated with heterogeneity. In other words,  $\alpha_i = (\alpha + u_i)$  is obeyed.

<sup>9</sup> If  $r_{GDP_{pc}, \widehat{GDP}_{pc}} < 0$  then  $ECI = 0$ .

<sup>10</sup> The information regarding the indicators at the NUTS2 level (242 regions) used in this research is available at <https://ec.europa.eu/eurostat/web/regions/data/database>. Most of the information about these indicators covers the period from 2006 to 2019. Although the GDP per capita is available also for 2020, there is no information for all the indicators.

	More developed regions	Transition regions	Less developed regions
2000	137	32	73
2001	137	34	71
2002	138	35	69
2003	141	33	68
2004	137	36	69
2005	138	37	67
2006	138	38	66
2007	132	41	69
2008	128	45	69
2009	127	48	67
2010	123	47	72
2011	124	41	77
2012	124	41	77
2013	123	43	76
2014	124	40	78
2015	119	48	75
2016	116	49	77
2017	116	47	79
2018	116	47	79
2019	116	45	81
2020	117	44	81

Source: Own elaboration based on Eurostat data

To construct the factor, nine economic indicators related to activity, income, the labor market, and the tourism sector were finally selected (see Table 3)<sup>11</sup>.

Table 3. Description of the Selected Indicators

Name	Description
1 unemployment_rate	Unemployment rates by sex, age, educational attainment level and NUTS 2 regions (%). From 15 to 74 years. Percentage.
2 nlpr_hw_pceu27	Nominal labour productivity per hour worked. Percentage of EU27 (from 2020) total (based on million euro). Current prices.
3 tourist_arrivals	Arrivals at tourist accommodation establishments by NUTS 2 regions.
4 employ_rate	Employment rates by sex, age and NUTS 2 regions (%). Percentage.
5 hours_worked	Employment (thousand hours worked) by NUTS 2 regions. Thousands.
6 employment	Employment (thousand persons) by NUTS 2 regions. Thousands.
7 vehicles_car	Stock of vehicles by category and NUTS 2 regions.
8 employees_comp	Compensation of employees by NUTS 2 regions. Million euro.
9 income_house	Income of households by NUTS 2 regions. Euros per inhabitant.

Source: Eurostat

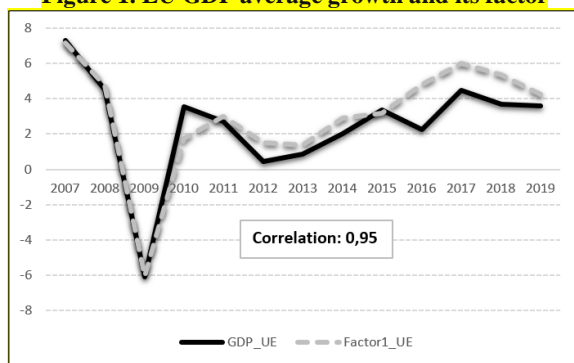
The selection was carried out to verify that the signs of growth (interannual variations) have a medium/high linear correlation with GDP per capita<sup>12</sup>. Finally, it is verified that there is a significant correlation (0.945) between the interannual growth of the factor obtained and the average growth of the EU (see figure 1). Likewise, for the final choice of indicators the available information, which also differs between regions and countries, was taken into account,

<sup>11</sup> Some are a bit redundant (e.g. hours work and employment) but inequality its very diferent. Arencibia et al (2017) includes a broad reference of indicators that can use on the demand side applied to GDP growth.

<sup>12</sup> This procedure begins with a basic nucleus that incorporates those indicators with a correlation greater than 0.5 with the GDP per capita, obtaining from them the corresponding common factor. Next, the indicators most correlated with GDP are added sequentially, determining their permanence in the model if they improve the correlation of the estimated factor with GDP (Cuevas *et al*, 2017).

Table 4 shows the available information for each of the indicators and the different NUTS-2 regions, aggregating regions mentioned by countries. Both GDP per capita and indicator eight (employees\_comp) are completely available. Only two indicators (tourist\_arrivals and employment) show availability below 90%<sup>13</sup>.

**Figure 1. EU GDP average growth and its factor**



Source: Own elaboration based on Eurostat data

**Table 4. Data Availability in the Panel (2006-2019)**

Country	NUTS2	Obs.	GDP pc	Indicators								
				1	2	3	4	5	6	7	8	9
Austria	9	126	1.00	1.00	1.00	1.00	1.00	1.00	0.93	1.00	1.00	1.00
Belgium	11	154	1.00	1.00	1.00	1.00	1.00	1.00	0.93	1.00	1.00	1.00
Bulgaria	6	84	1.00	1.00	1.00	1.00	1.00	1.00	0.93	1.00	1.00	1.00
Cyprus	1	14	1.00	1.00	1.00	1.00	1.00	1.00	0.93	1.00	1.00	1.00
Czech Republ	8	112	1.00	1.00	1.00	1.00	1.00	1.00	0.93	1.00	1.00	1.00
Germany	38	532	1.00	1.00	1.00	0.98	1.00	1.00	0.93	0.99	1.00	1.00
Denmark	5	70	1.00	0.86	1.00	1.00	0.86	1.00	0.93	0.93	1.00	1.00
Estonia	1	14	1.00	1.00	1.00	1.00	1.00	1.00	0.93	1.00	1.00	1.00
Greece	13	182	1.00	1.00	1.00	0.67	1.00	1.00	0.93	1.00	1.00	1.00
Spain	19	266	1.00	1.00	1.00	0.95	1.00	1.00	0.93	1.00	1.00	1.00
Finland	5	70	1.00	0.80	1.00	0.94	1.00	1.00	0.93	1.00	1.00	1.00
France	27	378	1.00	0.97	0.98	0.17	0.98	0.98	0.91	0.88	1.00	1.00
Croatia	4	56	1.00	0.21	1.00	0.25	0.21	1.00	0.93	0.25	1.00	1.00
Hungary	8	112	1.00	0.86	1.00	0.82	0.86	1.00	0.93	0.80	1.00	1.00
Ireland	3	42	1.00	0.50	1.00	0.07	0.50	1.00	0.93	0.36	1.00	1.00
Italy	21	294	1.00	1.00	1.00	1.00	1.00	1.00	0.93	1.00	1.00	1.00
Lithuania	2	28	1.00	0.43	1.00	0.29	0.43	1.00	0.93	0.35	1.00	1.00
Luxembourg	1	14	1.00	1.00	1.00	1.00	1.00	1.00	0.93	1.00	1.00	1.00
Latvia	1	14	1.00	1.00	1.00	1.00	1.00	1.00	0.93	1.00	1.00	1.00
Malta	1	14	1.00	1.00	1.00	1.00	1.00	1.00	0.93	1.00	1.00	0.00
Netherlands	12	168	1.00	1.00	1.00	0.96	1.00	1.00	0.93	1.00	1.00	1.00
Poland	17	238	1.00	0.93	0.21	0.65	0.93	0.21	0.21	0.90	1.00	1.00
Portugal	7	98	1.00	0.98	1.00	0.94	1.00	1.00	0.93	0.00	1.00	1.00
Romania	8	112	1.00	1.00	1.00	0.98	1.00	1.00	0.93	1.00	1.00	1.00
Sweden	8	112	1.00	1.00	1.00	1.00	1.00	1.00	0.93	0.86	1.00	1.00
Slovenia	2	28	1.00	0.64	1.00	0.86	0.64	1.00	0.93	1.00	1.00	1.00
Slovakia	4	56	1.00	1.00	1.00	1.00	1.00	1.00	0.93	1.00	1.00	1.00
all	242	3388	3388	3227	3193	2767	3247	3193	2969	3083	3388	3374

Source: Own elaboration based on Eurostat data

<sup>13</sup> The panel is made up of 242 regions for the period 2009-2019, and represents 3388 observations in total.

Table 5 shows the correlations by countries, regions, and levels of development of the regions. The highest correlations occur when we work with indicators at the country level. Working with regions, no very significant differences are observed. However, in less developed regions indicator 7 (vehicles\_car) presents a higher correlation, compared to regions in transition or that are more developed. In any case, the indicators with the highest correlation levels correspond to indicators 8 and 9 (employees\_comp and income\_house, respectively).

**Table 5. Analysis of Correlations**

Indicators	Countries (313 obs.)			Regions (2333 obs.)		
	Correlation	t-student	probability	Correlation	t-student	probability
1 unemploy_rate	-0.6456	-14.9101	0.0000	-0.4983	-27.7485	0.0000
2 nlpr_hw_pceu27	0.7723	21.4394	0.0000	0.6720	43.8111	0.0000
3 tourist_arrivals	0.4593	9.1191	0.0000	0.2811	14.1392	0.0000
4 employ_rate	0.5709	12.2612	0.0000	0.3621	18.7562	0.0000
5 hours_worked	0.5732	12.3370	0.0000	0.4092	21.6531	0.0000
6 employment	0.5303	11.0298	0.0000	0.3532	18.2279	0.0000
7 vehicles_car	0.2722	4.9886	0.0000	0.3179	16.1885	0.0000
8 employees_comp	0.8680	30.8220	0.0000	0.8143	67.7232	0.0000
9 income_house	0.8844	33.4129	0.0000	0.8157	68.0842	0.0000

Indicators	Less developed (680 obs.)			Transition (356 obs.)			More developed (1297 obs.)		
	Correlation	t-student	probability	Correlation	t-student	probability	Correlation	t-student	probability
1 unemploy_rate	-0.4722	-13.9489	0.0000	-0.6687	-16.9225	0.0000	-0.4804	-19.7133	0.0000
2 nlpr_hw_pceu27	0.6695	23.4696	0.0000	0.6561	16.3556	0.0000	0.6943	34.7185	0.0000
3 tourist_arrivals	0.2828	7.6761	0.0000	0.2966	5.8435	0.0000	0.2448	9.0842	0.0000
4 employ_rate	0.2941	8.0117	0.0000	0.4896	10.5651	0.0000	0.4037	15.8811	0.0000
5 hours_worked	0.2881	7.8345	0.0000	0.6207	14.8958	0.0000	0.5862	26.0371	0.0000
6 employment	0.2715	7.3467	0.0000	0.5795	13.3777	0.0000	0.4689	19.1017	0.0000
7 vehicles_car	0.4245	12.2083	0.0000	0.3441	6.8948	0.0000	0.1604	5.8490	0.0000
8 employees_comp	0.8299	38.7316	0.0000	0.8843	35.6313	0.0000	0.7664	42.9345	0.0000
9 income_house	0.8083	35.7416	0.0000	0.8782	34.5379	0.0000	0.8039	48.6409	0.0000

Source: Own elaboration based on Eurostat data

Finally, Table 6 shows the unit root tests in the data panel, both by country and region<sup>14</sup>.

**Table 6. Unit Root Test<sup>15</sup>**

<sup>14</sup> The annex contains the results of the contracts (see Table 1 by countries and Table 2 by regions). Notably all of these tests require cross-sectional independence.

<sup>15</sup> Independent cross-section panel unit root tests: Levin, Lin and Chu (2002) assume common unit root process; Im, Pesaran and Shin (2003), Fisher-type tests using ADF and PP tests assume individual unit root process; Maddala and Wu (1999) and Choi (2001). We select Individual intercept to include individual fixed effects.

Countries (27)			Countries (27)		
Indicators	Panel unit root test		Indicators	Panel unit root test	
	Level	First difference		Level	First difference
1 unemployment_rate	No	No	1 unemployment_rate	No	No
2 nldr_hw_pceu27	Yes	Yes	2 nldr_hw_pceu27	Yes	No
3 tourist_arrivals	Yes	No	3 tourist_arrivals	Yes	No
4 employ_rate	Yes	No	4 employ_rate	Yes	No
5 hours_worked	Yes	No	5 hours_worked	Yes	No
6 employment	Yes	Yes	6 employment	Yes	No
7 vehicles_car	Yes	No	7 vehicles_car	Yes	No
8 employees_comp	Yes	No	8 employees_comp	Yes	No
9 income_house	Yes	No	9 income_house	Yes	No
gdp_pc	Yes	No	gdp_pc	Yes	No

Regions (242)			Regions (242)		
Indicators	Panel unit root test		Indicators	Panel unit root test	
	Level	First difference		Level	First difference
1 unemployment_rate	No	No	1 unemployment_rate	No	No
2 nldr_hw_pceu27	Yes	No	2 nldr_hw_pceu27	Yes	No
3 tourist_arrivals	Yes	No	3 tourist_arrivals	Yes	No
4 employ_rate	Yes	No	4 employ_rate	Yes	No
5 hours_worked	Yes	No	5 hours_worked	Yes	No
6 employment	Yes	No	6 employment	Yes	No
7 vehicles_car	Yes	No	7 vehicles_car	Yes	No
8 employees_comp	Yes	No	8 employees_comp	Yes	No
9 income_house	Yes	No	9 income_house	Yes	No
gdp_pc	Yes	No	gdp_pc	Yes	No

Null: Unit root (assumes common unit root process)      Null: Unit root (assumes individual unit root process)

Source: Own elaboration based on Eurostat data

Observing Table 6 we can say that on the left side is the null hypothesis of the unit root common to all the cross-sectional units and on the right side is the null hypothesis of the unit root for each cross-sectional unit. In all cases, the indicators and the gdp\_pc present a unit root in the level, and no unit root in the first differences in the natural logarithm, except for indicator 1 (unemployment\_rate), which does not present unit roots in any case. The results of the research are shown in the next section.

### Results (and discussion or discussion of results)

Table 7 shows the result of the factorial analysis for the period 2006-2019, first working with the 27 countries and then with 242 regions and, secondly, differentiating between the most developed regions (116), the regions in transition (45) and less developed regions (81)<sup>16</sup>. Table 6 lists the weights ( $\lambda_j$ ) according to equation 1 and factorial weights ( $\alpha_j$ ) according to equation 2. The factorial loads should be as high as possible, whereas the factorial weights measure the relative importance of each indicator within the estimated factor. Table 6 also shows the values of the Indeterminacy Indices (R-squared and Minimum Corr.), which should be as high as possible. Factor weights are higher when working with countries than with regions. By type of region, the highest factor weights in the least developed and in the ones in transition, correspond to indicators 8 and 9 (employees\_comp and income\_house respectively). In the more developed

<sup>16</sup> The classification of the regions in 2019 (last year available in the panel) has been used.

regions, the highest factor weight is attributed to indicator 5 (hours\_worked). The results show that the selected indicators are equally valid for the countries, regions, and groups of regions considered, due to which a specific selection of indicators for the different groups considered was not proposed.

**Table 7. Factor Analysis**

	Countries (313 obs.)		Regions (2333 obs.)	
	$\lambda_i$	$\alpha_i$	$\lambda_i$	$\alpha_i$
1 unemployment_rate	-0.8567	-0.1455	-0.7259	-0.1513
2 nlpr_hw_pceu27	0.4250	0.0445	0.2348	0.0584
3 tourist_arrivals	0.4994	0.0247	0.3672	0.0369
4 employ_rate	0.8598	0.1629	0.6912	0.1491
5 hours_worked	0.8474	0.1647	0.7309	0.2055
6 employment	0.8537	0.2084	0.7403	0.2168
7 vehicles_car	0.3112	-0.0039	0.2687	0.0238
8 employees_comp	0.8441	0.2103	0.7816	0.2365
9 income_house	0.8411	0.2155	0.7721	0.2274
Indeterminacy Indices:	R-squared	Minimum Corr.	R-squared	Minimum Corr.
Factor1	0.9710	0.9420	0.9177	0.8354

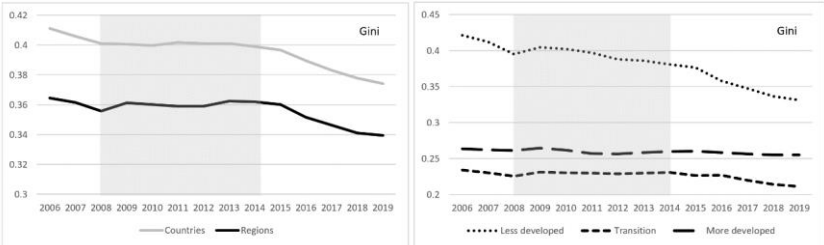
  

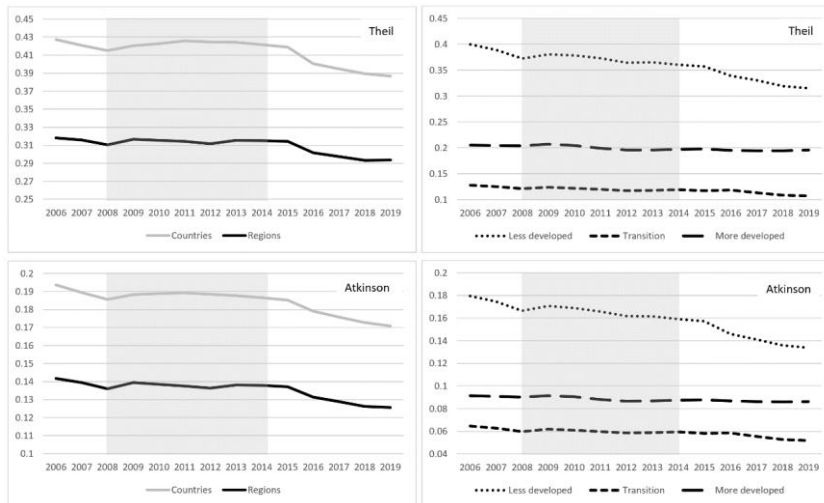
	Less developed (680 obs.)		Transitions (356 obs.)		More developed (1297 obs.)	
	$\lambda_i$	$\alpha_i$	$\lambda_i$	$\alpha_i$	$\lambda_i$	$\alpha_i$
1 unemployment_rate	-0.7331	-0.1697	-0.7841	-0.1146	-0.7335	-0.1491
2 nlpr_hw_pceu27	0.2018	0.0812	0.3715	0.0324	0.2525	0.0323
3 tourist_arrivals	0.3963	0.0356	0.4014	0.0431	0.3028	0.0284
4 employ_rate	0.6903	0.1653	0.7213	0.1014	0.6937	0.1304
5 hours_worked	0.6684	0.2112	0.8200	0.1763	0.8485	0.2478
6 employment	0.7095	0.2115	0.8300	0.2238	0.8138	0.2058
7 vehicles_car	0.3571	0.0292	0.3375	0.0125	0.1415	0.0144
8 employees_comp	0.7684	0.2591	0.8592	0.2315	0.7891	0.1834
9 income_house	0.7323	0.1939	0.8770	0.2604	0.7987	0.2369
Indeterminacy Indices:	R-squared	Minimum Corr.	R-squared	Minimum Corr.	R-squared	Minimum Corr.
Factor1	0.9117	0.8234	0.9541	0.9082	0.9303	0.8606

Source: Own elaboration based on Eurostat data

In respect to the factorial weights, the inequality indices have been calculated according to equation 3. Figure 2 shows the estimates of the above-mentioned indices by countries and regions (graph on the left), as well as types of regions (graph on the right) for the three measures of inequality (Gini, Theil, and Atkinson).

**Figure 2. Inequality Indices of Indicators**





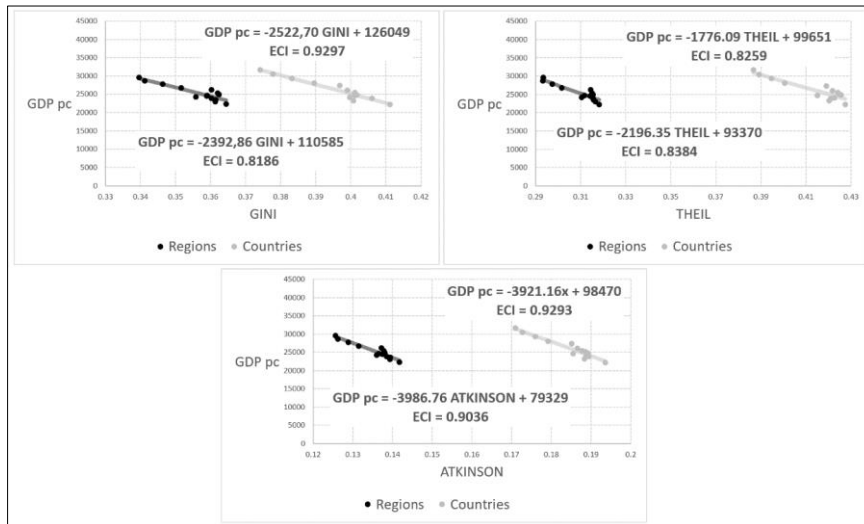
Source: Own elaboration based on Eurostat data

Comparing countries and regions, the inequality index of the indicators is higher for countries than regions. The evolution of inequalities is closely linked to the effects of the financial crisis that began in 2008 and lasted until 2014 (marked in gray, see [Figure 2](#)). The reduction in inequalities slowed down in 2008, after which there was a worsening or stagnation until 2014, with a clear recovery since 2015. The graph on the right reveals lower inequality in regions in transition and in more developed regions. There is also a clear stagnation of the inequality index in the more developed regions and a continuous decrease in the less developed regions, which demonstrates a greater convergence during the research period.

The levels of inequality and the mean values of the GDP per capita were used to prepare the point clouds for the 14 years considered ([figures 3 and 4](#)) together with the regression lines (equation 4). [Figure 3](#) refers to the 27 countries (grey color) and 242 regions (black color). In both cases, the point clouds confirm a negative relationship between inequality indices and economic development. Moreover, economic cohesion is higher between countries than between regions in the case of Gini and Atkinson<sup>17</sup>. However, the apparent higher cohesion between countries contrasts with a higher inequality of the indicators compared to the regions.

<sup>17</sup> These results concur with the theory proposed in the article by Castells and Espasa, 2002.

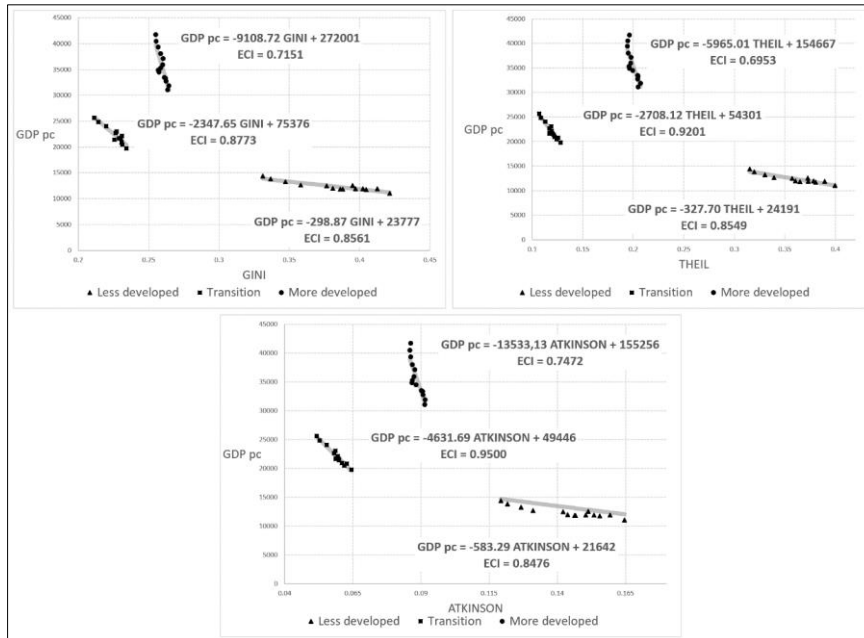
**Figure 3. Straights of Economic Development and Inequality by Regions and Countries**



Source: Own elaboration based on Eurostat data

**Figure 4** refers to the clouds of points of less developed regions, regions in transition and more developed regions. As in the analysis by countries and regions, a negative relationship between the inequality of indicators and economic development is confirmed, **showing higher economic cohesion in the regions in transition and in less developed regions**. In the case of regions in transition, economic cohesion fluctuates between 0.88 and 0.95 (depending on the inequality index); in the least developed regions it remains practically at 0.85 (for all inequality indexes); and in the most developed regions, economic cohesion varies between 0.69 and 0.75. However, as in the analysis between countries and regions, it is confirmed that the less developed regions have higher levels of economic cohesion compared to the most developed, although with higher levels of inequality in their indicators. Conversely, in the case of the regions in transition the highest cohesion is accompanied by less inequality of indicators. Finally, **Figure 4** highlights the significant differences in the marginal effects of inequalities on economic development. As we can observe, the negative slope is more pronounced in the most developed regions, and it is flatter in the less developed regions.

**Figure 4. Straights of Economic Development and Inequality by Groups of Regions**



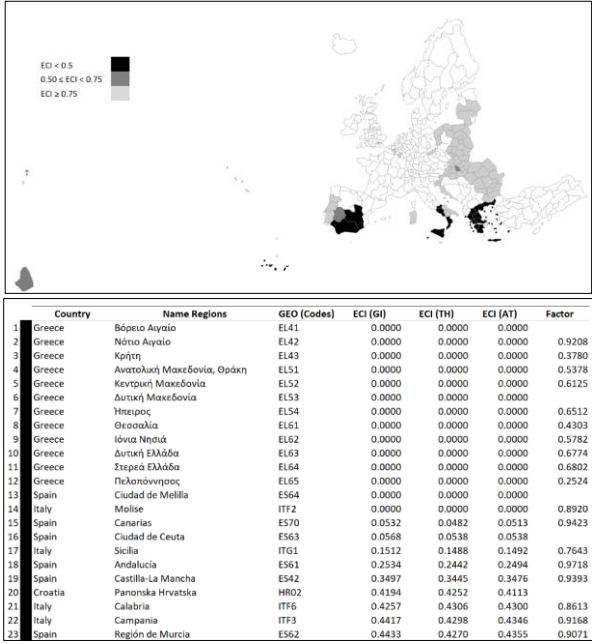
Source: Own elaboration based on Eurostat data

The annex (see Table 3 by countries and regions and Tables 4, 5, and 6 by group of regions) includes estimations of the fixed effects models (equation 5), from which the economic cohesion indexes (ECIs) are calculated and ordered from lowest to highest by for all regions and countries (Tables 7, 8, 9 by group regions, Table 10 by all regions and Table 11 by countries). Figures 5, 6, and 7 show the maps for the less developed regions, the regions in transition and the more developed regions, respectively, where the levels reached by the dark black cohesion indexes with an ECI below 0.5 are collected with different shades of gray and black and in a lighter gray the regions with an ECI above 0.75. Together with the figures, those regions that have a level of cohesion below 0.5 are grouped together with the values of the inequality indices of the indicators and the correlation between the factor and economic growth<sup>18</sup>. As shown, even though these regions have a low level of cohesion, they are compatible with a high correlation between

<sup>18</sup> The correlation is not available for all regions. In some cases, it was impossible to obtain the factor due to the lack of information. In cases where the factor was available, it was not considered if the number of observations was less than 50% of the temporal sample.

the indicators used and economic growth. However, this growth is not accompanied by greater cohesion, as previously indicated. In the annex (see Tables 7, 8, and 9 by group of regions, Table 10 by all regions, and Table 11 by countries). you can find the complete list of regions with ECI, the levels of inequality of the indicators, and the correlations of the indicators with economic growth. **Figure 5** shows that there are 23 regions with an economic cohesion level below 0.5. Most of these regions belong to Greece where, in addition, cohesion is zero<sup>19</sup>. However, the indicators are closely related to their economic growth. As for the rest, there are regions of Italy, Spain, and Croatia. In the case of Spain, the regions are Murcia (0.44), Castilla La Mancha (0.35), Andalusia (0.25), Ciudad de Ceuta (0.06), and the Canary Islands (0.05).

**Figure 5. Economic Cohesion Index: Less Developed Regions**



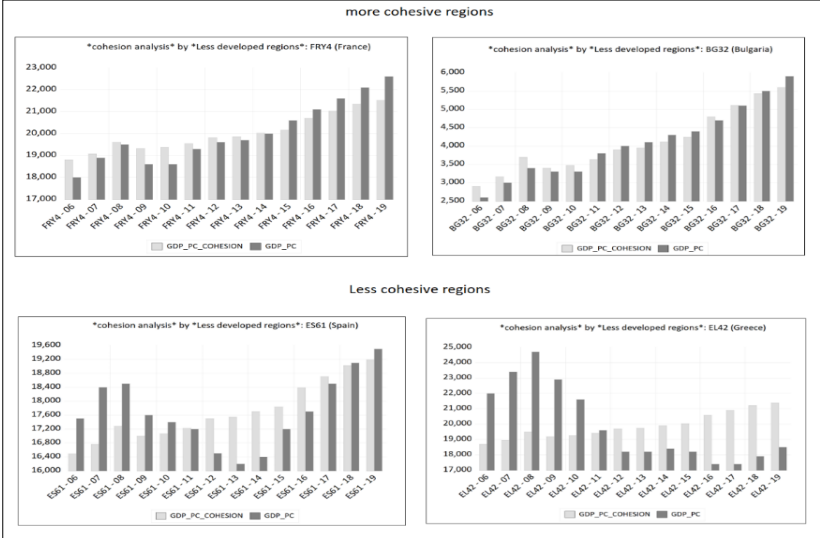
Source: Own elaboration based on Eurostat data

Observing **Figure 6**, we can see why some regions such as Andalusia (ES42) in Spain or Νότιο Αιγαίο (EL 42) in Greece present a low economic cohesion, in comparison, for example, with the French region of La Réunion that occupies the first position in

<sup>19</sup> As previously mentioned, this zero cohesion is due to a negative linear correlation between the cohesion of the indicators and the economic development of the region.

cohesion (0.98) or Северен централен in Bulgaria (0.97). In these last two cases, the levels of development in the period 2006-2019 correspond to the levels indicated according to the inequality of indicators. However, in Andalusia and Νότιο Αιγαίο there are clear discrepancies, although the Spanish region has managed to improve its economic development in line with the one indicated by the cohesion indicators in the last three years. On the other hand, although for five years (2006-2010) the Greek region had a higher per capita GDP than expected, in the last 8 years economic development levels are well below their potential.

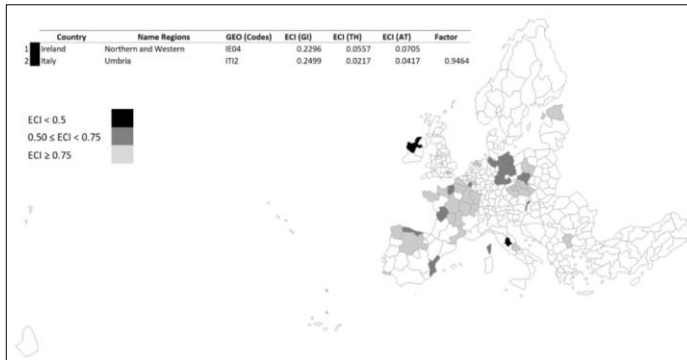
**Figure 6. Evolution of Economic Development and Its Potential**



Source: Own elaboration based on Eurostat data

**Figure 7** shows the map of cohesion levels in the regions in transition. As shown, only two of the 45 regions have levels of economic cohesion below 0.5: Umbría (which belongs to Italy) and Northern and Western (23.0) to Ireland.

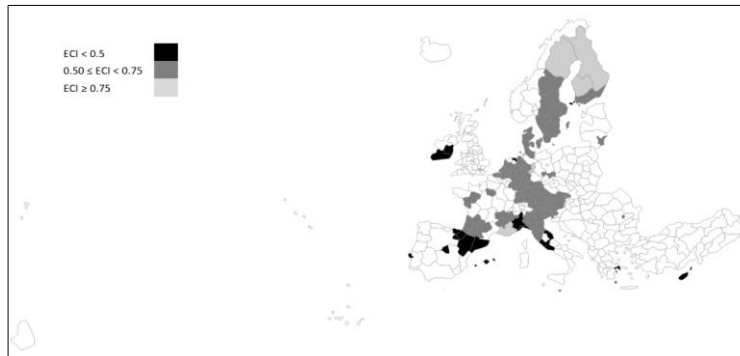
**Figure 7. Economic Cohesion Index: Transition Regions**



Source: Own elaboration based on Eurostat data

Finally, **Figure 8** shows the map with the most developed regions and their cohesion levels.

**Figure 8. Economic Cohesion Index: More Developed Regions**



Country	Name Regions	GEO (Codes)	ECI (GI)	ECI (TH)	ECI (AT)	Factor
1 Greece	Αττική	EL30	0.0000	0.0000	0.0000	0.3983
2 Italy	Lazio	IT14	0.0026	0.0000	0.0000	0.9381
3 Netherlands	Groningen	NL11	0.0099	0.0006	0.0070	0.3632
4 Cyprus	Κύπρος	CY00	0.1572	0.0000	0.0086	0.9544
5 Spain	Illes Balears	ES53	0.1680	0.0622	0.0790	0.9811
6 Spain	Comunidad Foral de Navarra	ES22	0.1940	0.0587	0.0851	0.9635
7 Portugal	Área Metropolitana de Lisboa	PT17	0.2041	0.0325	0.0656	
8 Spain	Cataluña	ES51	0.2378	0.1158	0.1419	0.9723
9 Spain	Aragón	ES24	0.2401	0.0768	0.1119	0.9210
10 Spain	La Rioja	ES23	0.2548	0.1045	0.1419	0.9097
11 Italy	Marche	IT13	0.2590	0.0999	0.1256	0.8157
12 Ireland	Eastern and Midland	IE06	0.3384	0.3148	0.3265	
13 Spain	País Vasco	ES21	0.3569	0.1694	0.2202	0.9726
14 Spain	Comunidad de Madrid	ES30	0.3730	0.2077	0.2558	0.9640
15 Ireland	Southern	IE05	0.3866	0.3680	0.3819	
16 Italy	Piemonte	ITC1	0.4092	0.2293	0.2557	0.8469
17 Italy	Liguria	ITC3	0.4275	0.2753	0.3227	0.8461
18 Netherlands	Zuid-Holland	NL33	0.4727	0.2839	0.3618	0.7930
19 Italy	Friuli-Venezia Giulia	ITH4	0.4865	0.3186	0.3558	0.8965

Source: Own elaboration based on Eurostat data

Observing Table 7, we can conclude that of a total of 116 regions, 19 regions have been identified with low cohesion levels. These regions belong to different countries: five from Italy, two from the Netherlands, two from Ireland, seven from Spain, and Portugal, Cyprus, and Greece.

## Discussion and Conclusions

Comentado [PPR1]: Eliminar

This research study has elaborated the *Economic Cohesion Index (ECI)*, which allows ordering a set of regions/countries based on the **degree of correspondence between the economic development of a region/country and its potential. This potential development is linked to the inequalities presented through a set of indicators within a group of regions/countries, with which their economic growth can be explained. In this regard, a region/country can be highly developed but at the same time have a low level of cohesion according to the inequalities of the indicators and vice versa.**

To measure inequalities, the Gini index, Theil's entropy index, and the Atkinson index have been applied, and similar results were obtained, confirming the robustness of the methodology.

The same region can have a different level of cohesion depending on the group with which it is compared. This paper shows the cohesion levels for the set of 27 EU countries and the 242 regions of which they are composed, at the same time differentiating between less developed regions (116), regions in transition (45) and more developed regions (81).

**Analyzing cohesion by country, we could say that the 27 EU countries are quite cohesive, since a very clear correspondence is shown between the levels of development of each country, and their potential is attributable to the inequalities of the set of indicators.** Of the 27 countries, 23 have a cohesion index (using Gini) between 0.96 (for the Netherlands) and 0.75 (for Luxembourg). At the bottom of the ranking, there is Spain with 0.71, Cyprus and Sweden do not reach 0.4, and Greece with 0.28. Sweden, despite being a highly developed country, presents a very low level of cohesion (below 0.5), which reflects a mismatch between its economic development and its potential. This implies that in certain regions, economic development may also be influenced by other factors that are not only associated with economic growth and may be related to the idiosyncrasy of each region (geographical location, natural resources, infrastructure,

political regime, etc.). These factors could be identified with other metacomponents that would form part of territorial cohesion.

In respect to the 242 NUTS2 regions, there are 34 regions with a cohesion index below 0.5, which shows important imbalances between economic development and its potential. Finally, with regard to economic cohesion by development groups, we can observe that in the regions in transition there are only two regions below 0.5. In the less developed regions, we have identified 23 regions and in the case of the more developed regions, a total of 19 regions present a cohesion index below 0.5.

In any case, as we have already observed, in two particular cases of the less developed regions, namely Andalusia in Spain and Νότιο Αιγαίο in Greece, a low cohesion economic index raises concerns. In this regard, it is essential to check the region's variation of economic development in recent years. Thus, we have seen that Andalusia has remarkably recovered the correspondence between its economic development and its potential, precisely in the last three years, while in the region of Greece the opposite trend can be observed.

This methodology has been implemented under specific econometric software (*EViews*) that allows an analysis of the temporal evolution of the cohesion indices in the different regions, regional groups, and countries based on a continuous update of the indicators in real-time, in line with the publication of new information by Eurostat, as well as the possibility of incorporating new indicators.

Concerning cohesion policies, it would be convenient to gradually reduce the number of regions that present a low level of cohesion, especially for the less developed ones. In this sense, it is important to leverage the resources of policies that allow modifying adequately the value of the indicators in those problematic regions, reducing the inequalities of the group to which they belong, which consequently may result in a higher cohesion of the region in question.

The results of this research study constitute the first step to developing a synthetic index of territorial cohesion, where the other metacomponents that define it would also be taken into account to explain the economic development by incorporating other explanatory factors, as previously mentioned.

From a methodological point of view, future research could consider the possibility of allowing a change of parameters by using the Kalman filter for each region or country. Likewise, in those countries with a large number of regions, it would also be possible to measure their cohesion within the country.

## References

- Arencibia Pareja, A., A. Gómez Loscos, M. de Luis López y G. Pérez-Quirós (2017). «Un modelo de previsión del PIB y de sus componentes de demanda», *Boletín Económico*, 4/2017, Banco de España.
- Atkinson, A. B. (1970). On the measurement of inequality, *Journal of Economic Theory* 2: 244–263. DOI:10.1016/0022-0531(70)90039-6.
- Atkinson, A. B. (1975). *The economics of inequality*, Oxford University Press, Londres. [Traducción castellana: *La economía de la desigualdad*, Editorial Crítica, Barcelona, 1981].
- Bachtler, J., Begg, I., Charles D., and Polverari, L. (2016). *EU Cohesion Policy in Practice. What does it achieve?* London: Rowman and Littlefield.
- Barca, F. (2009). An agenda for a reformed cohesion policy. A place-based approach to meeting European Union challenges and expectations (retrieved from [http://www.europarl.europa.eu/meetdocs/2009\\_2014/documents/regi/dv/barca\\_report\\_/barca\\_report\\_en.pdf](http://www.europarl.europa.eu/meetdocs/2009_2014/documents/regi/dv/barca_report_/barca_report_en.pdf).)
- Bárcena, E. and Imedio, L.J. (2008). The Bonferroni, Gini, and De Vergottini indices. Inequality, welfare, and deprivation in the European union in 2000", Bishop, J. and Zheng, B. (Ed.) *Inequality and Opportunity: Papers from the Second ECINEQ Society Meeting (Research on Economic Inequality, Vol. 16)*, Emerald Group Publishing Limited, Bingley, pp. 231-257. [https://doi.org/10.1016/S1049-2585\(08\)16011-2](https://doi.org/10.1016/S1049-2585(08)16011-2)
- Batur Sir, G. Didem and Çalışkan, Emre. (2019). Assessment of development regions for financial support allocation with fuzzy decision making: A case of Turkey. *Socio-Economic Planning Sciences*, 66(C): 161-169.
- Cabeza, I. and Gutiérrez, F. (2015). Cohesión territorial: de los alcances a la conceptualización. *Revista Geográfica Venezolana*, 56(2): 293–308.
- Camagni, R. (2006). Territorial Impact Assessment (TIA): A Methodological Proposal. *Scienze Regionali - Italian Journal of Regional Science*, 5(2), 135-146.
- Camagni, R., Capello, R., Cerisola, S., & Fratesi, U. (2020). Fighting Gravity: Institutional Changes and Regional Disparities in the EU. *Economic Geography*, 96(2), 108-136. <https://doi.org/10.1080/00130095.2020.1717943>
- Castells, M. and Espasa, M. (2002). Desequilibrios territoriales y políticas de cohesión en la Unión Europea en la Perspectiva de la Ampliación, *Papeles de Economía Española*, nº 21,
- Charles, V., Gherman, T., and Paliza, J.C. (2022). The Gini Index: A Modern Measure of Inequality. In: Charles, V., Emrouznejad, A. (eds) *Modern Indices for International Economic Diplomacy*. Palgrave Macmillan, Cham. [https://doi.org/10.1007/978-3-030-84535-3\\_3](https://doi.org/10.1007/978-3-030-84535-3_3)
- Cuevas, A., Pérez-Quirós, G., Quilis, E.M. (2015). Integrated Model of Short Term. Forecasting of the Spanish Economy, AIREF, Working Paper DT 2015/4.
- Cuevas, A. and Quilis, E.M. (2015). Quarterly Regional GDP Flash Estimates for the Spanish Economy (METCAP model), AIREF, Working Paper DT 2015/4.
- Cuevas, A. y Quilis, E.M. (2017) “Modelo de previsión en tiempo real para la economía de Cataluña (MIPred Cat)”, AIREF, Nota metodológica NM 2017/1.
- Darvas, Z., Mazza, J., Midoes, C. (2019). How to improve European Union cohesion policy for the next decade. *Policy Contribution Issue* 8: 1-21

- Davoudi, S. (2005). Understanding territorial cohesion. *Planning, Practice & Research*, 20(4): 433-441.
- Doucet, P. (2006). Territorial Cohesion of Tomorrow: A Path to Cooperation or Competition?, *European Planning Studies*, 14(10): 1473-1485.
- Eliazar, I., Giorgi, G.M. (2020). From Gini to Bonferroni to Tsallis: an inequality-indices trek. *METRON* 78: 119–153. <https://doi.org/10.1007/s40300-020-00171-9>
- ESPON INTERCO (2011), Indicators of territorial cohesion, Scientific Platform and Tools Project 2013/3/2, (Draft) Final Report, Part C, Scientific report, ESPON & University of Geneva, Luxembourg.
- ESPON KITCASP (2012). Key Indicators for Territorial Cohesion and Spatial Planning, Interim Report, Version 31/10/2012, Luxembourg.
- ESPON TeDi (2010). Territorial Diversity. Final Report. The ESPON 2013 Programme. Targeted Analysis 8/2/2013, Version 12/05/2010, Luxembourg.
- Evers, D. (2008). Reflections on Territorial Cohesion and European Spatial Planning, *Tijdschrift voor Economische en Sociale Geografie*, 99(3): 303-315.
- Ezcurra, R., and Pascual, P. (2005). Is there convergence in income inequality levels among the European regions? *Applied Economics Letters*, 12(12): 763–767.
- Faludi, A. (2010). *Cohesion, Coherence, Cooperation: European Spatial Planning Coming of Age?*, London: Routledge.
- Faludi, A. (2013). Territory: An Unknown Quantity in Debates on Territorial Cohesion, *European Journal of Spatial Development*, Refereed article no. 51 (retrieved from <https://repository.tudelft.nl/islandora/object/uuid%3AAdd9603ae-2a9a-4591-b7c5-c8e3c496d5fc>.)
- Farris, Frank A. (2010). The Gini Index and Measures of Inequality. *The American Mathematical Monthly*: 117(10): 851-864. DOI: [10.4169/000298910X523344](https://doi.org/10.4169/000298910X523344)
- Florio, M. (2006). Cost-Benefit Analysis and the European Union Cohesion Fund: on the social cost of capital and labour, *Regional Studies*, 40(2): 211-224.
- Foster, J. E. (1985). Inequality measurement. Publicado en Fair Allocation (H.P. Young, ed.), Proceedings of symposia in Applied Mathematics, vol. 33, Providence, American Mathematical Society, pp. 31-68.
- Frees, E. W., Meyers G., Cummings A. D. (2011). Summarizing insurance scores using a Gini index. *J. Amer. Statist. Assoc.*, 106: 1085-1098
- Gini, C. (1912). Variabilità e mutabilità. Contributto allo studio delle distruzione e delle relazione statistiche. Bologna. Tipografia di Paolo Cuppini. 164 págs.
- Gini, C. (1914). Sulla misura della concentrazione e della variabilità dei caratteri, *Atti del Reale. Istituto Veneto di Scienze, Lettere ed Arti*, 73(2): 1203-1248. (English translation in *Metron*, 2005, 63(1): 3-38).
- Gini, C. (1955). Variabilità e mutabilità; reprinted in *Memorie di Metodologica Statistica*, E. Pizetti and T. Salvemini, eds., Libreria Eredi Virgilio Veschi, Rome.
- Iammarino, S., Rodríguez-Pose, A. and Storper, M. (2017), Why Regional Development matters for Europe’s Economic Future, WP 07/2017, Working Papers the Directorate-General for Regional and Urban Policy, Luxembourg: Publications Office of the European Union.
- Kutan, A., & Yigit, T. (2009). European integration, productivity growth and real convergence: Evidence from the new member states. *Economic Systems*, 33(2): 127–137.
- Kvedaras, V., & Cseres-Gergely, Z. (2020). Convergence of income distributions: Total and inequality-affecting changes in the EU. *Economics Letters*, 188, 108946.

- Lorenz, M. O. (1905). Methods of measuring the concentration of wealth, *J. Amer. Statist. Assoc.* 9: 209–219.
- Medeiros, E. (2016). Territorial Cohesion: An EU concept, *European Journal of Spatial Development*, 60 (retrieved from <http://www.nordregio.se/Global/EJSD/Refereedarticles/refereed60.pdf>.)
- Medeiros, E., Zaucha, J. & Ciołek, D. (2022) Medición de las tendencias de cohesión territorial en Europa. Una correlación con la política de cohesión de la UE, estudios de planificación europea, <https://doi.org/10.1080/09654313.2022.2143713>
- Moreno S., Polido, A, Teles, F., Silva, P., Rodrigues, C. (2020). Territorial innovation models in less developed regions in Europe: ¿the quest for a new research agenda? *European Planning Studies*; Abingdon Tomo 28, N.º 8: 1639-1666.
- Podadera, P. & Calderón F.J. (2019). Rethinking the territorial cohesion in the EU: institutional and functional elements of the concept. *Eastern Journal of European Studies* Volume 10, Issue 2, 41-62.
- Reardon S. F., Bischoff K. (2011). Income inequality and income segregation. *Am. J. Sociol.*, 116: 1092-1153.
- Roemer, J. E. (2009). Equality: Its justification, nature, and domain, in Salverda, W., Nolan, B. and Smeering, T. M. (eds), *The Oxford Handbook of Economic Inequality*. Oxford: Oxford University Press. pp. 3–22.
- Samanthi R. G. M., Wei W., Brazauskas V. (2017). Comparing the riskiness of dependent portfolios via nested L-statistics. *Ann. Actuar. Sci.*, 11: 237-252.
- Schön, P. (2009). Territorial Cohesion - Current Views of the Commission and the Member States of the European Union, in: Kilper, H. (ed.), *German Annual of Spatial Research and Policy 2009*, pp. 7-17. German Annual of Spatial Research and Policy. Berlin, Heidelberg: Springer.
- Sen, A. (1997). From income inequality to economic inequality. *Southern Economic Journal* 64(2): 383–401.
- Sen A., Foster J.E. (1997). *On Economic Inequality*. Oxford University Press, New York.
- Servillo, L. (2010). Territorial Cohesion Discourses: Hegemonic Strategic Concepts in European Spatial Planning, *Planning Theory & Practice*, 11(3): 397-416.
- Stefanescu S.V. (2010). About the Accuracy of Gini Index for Measuring the Poverty. *Romanian Journal of Economic Forecasting* 14 (3): 255-266.
- Suárez-Arbesú, C., Apergis, N., & Delgado, F. J. (2022). Club convergence and factors of income inequality in the European Union. *International Journal of Finance & Economics*, 1–13. <https://doi.org/10.1002/ijfe.2612>
- Sykes, O. (2011). Investigating sub-state Interpretations of European territorial cohesion: The case of the United Kingdom. *International Planning Studies*, 16(4): 377-396.
- Theodorakis P.N, Mantzavinis G.D, Rrumbullaku L, Lionis C, Trelle E. (2006) Measuring health inequalities in Albania: a focus on the distribution of general practitioners. *Hum Resour Health* 2006, 4(5).
- Tutberidze, G., Pipia, Q., Rakviashvili, G. (2018). The measuring of the Gini, Theil and Atkinson indices for Georgia Republic and some other countries. *Globalization and Business* 5: 110–119.
- Villaverde, J., & Maza, A. (2008). Productivity convergence in the European regions, 1980-2003: A sectoral and spatial approach. *Applied Economics*, 40(10): 1299–1313.
- Waterhout, B. (2007). Territorial Cohesion: The Underlying Discourses, in: Faludi, A. (ed.), *Territorial Cohesion and the European Model of Society*, pp. 37-59, Cambridge (MA): Lincoln Institute of Land Policy.

Weckroth, M., & Moio, S. (2020). Territorial Cohesion of What and Why? The Challenge of Spatial Justice for EU's Cohesion Policy. *Social Inclusion*, 8(4), 1-11. <https://doi.org/10.17645/si.v8i4.3241>

Welch, F. (1999). In defence of inequality. *American Economic Review*, 89: 1-17.

Zaucha J. & Böhme, K. (2020) Medir la cohesión territorial no es una misión imposible, *European Planning Studies*, 28(3): 627-649.

## Annex

### Table 1. Unit root tests by countries

GDP pc					hours_worked				
Level					Level				
Method	Statistic	Prob.*	Cross-sections	Obs	Method	Statistic	Prob.*	Cross-sections	Obs
Levin, Lin & Chu	2.36	0.9908	27	378	Levin, Lin & Chu	0.75	0.7726	27	367
Im, Pesaran and Shin W-st	6.15	1.0000	27	378	Im, Pesaran and Shin W-st	0.80	0.7894	26	364
ADF - Fisher Chi-square	19.95	1.0000	27	378	ADF - Fisher Chi-square	57.91	0.3331	27	367
PP - Fisher Chi-square	14.80	1.0000	27	378	PP - Fisher Chi-square	23.00	0.9999	27	367
First difference					First difference				
Method	Statistic	Prob.*	Cross-sections	Obs	Method	Statistic	Prob.*	Cross-sections	Obs
Levin, Lin & Chu	-9.82	0.0000	27	378	Levin, Lin & Chu	-7.60	0.0000	26	364
Im, Pesaran and Shin W-st	-7.49	0.0000	27	378	Im, Pesaran and Shin W-st	-5.61	0.0000	26	364
ADF - Fisher Chi-square	151.78	0.0000	27	378	ADF - Fisher Chi-square	122.36	0.0000	26	364
PP - Fisher Chi-square	152.64	0.0000	27	378	PP - Fisher Chi-square	131.43	0.0000	26	364
unemployment_rate					employment				
Level					Level				
Method	Statistic	Prob.*	Cross-sections	Obs	Method	Statistic	Prob.*	Cross-sections	Obs
Levin, Lin & Chu	-3.18	0.0007	27	378	Levin, Lin & Chu	6.53	1.0000	27	306
Im, Pesaran and Shin W-st	-1.71	0.0433	27	378	Im, Pesaran and Shin W-st	4.04	1.0000	26	303
ADF - Fisher Chi-square	68.97	0.0825	27	378	ADF - Fisher Chi-square	72.96	0.0438	27	306
PP - Fisher Chi-square	44.11	0.8294	27	378	PP - Fisher Chi-square	26.93	0.9992	27	341
First difference					First difference				
Method	Statistic	Prob.*	Cross-sections	Obs	Method	Statistic	Prob.*	Cross-sections	Obs
Levin, Lin & Chu	-7.97	0.0000	27	378	Levin, Lin & Chu	-6.23	0.0000	26	303
Im, Pesaran and Shin W-st	-6.39	0.0000	27	378	Im, Pesaran and Shin W-st	-3.95	0.0000	26	303
ADF - Fisher Chi-square	135.59	0.0000	27	378	ADF - Fisher Chi-square	91.71	0.0006	26	303
PP - Fisher Chi-square	112.13	0.0000	27	378	PP - Fisher Chi-square	75.34	0.0188	26	312
nlpr_hw_pceu27					vehicles_car				
Level					Level				
Method	Statistic	Prob.*	Cross-sections	Obs	Method	Statistic	Prob.*	Cross-sections	Obs
Levin, Lin & Chu	43.60	1.0000	27	367	Levin, Lin & Chu	4.20	1.0000	27	373
Im, Pesaran and Shin W-st	13.69	1.0000	26	364	Im, Pesaran and Shin W-st	7.82	1.0000	27	373
ADF - Fisher Chi-square	32.60	0.9907	27	367	ADF - Fisher Chi-square	13.87	1.0000	27	373
PP - Fisher Chi-square	35.89	0.9727	27	367	PP - Fisher Chi-square	20.08	1.0000	27	373
First difference					First difference				
Method	Statistic	Prob.*	Cross-sections	Obs	Method	Statistic	Prob.*	Cross-sections	Obs
Levin, Lin & Chu	-11.89	0.0000	26	364	Levin, Lin & Chu	-7.22	0.0000	27	371
Im, Pesaran and Shin W-st	-9.06	0.0000	26	364	Im, Pesaran and Shin W-st	-5.77	0.0000	27	371
ADF - Fisher Chi-square	175.07	0.0000	26	364	ADF - Fisher Chi-square	126.95	0.0000	27	371
PP - Fisher Chi-square	194.34	0.0000	26	364	PP - Fisher Chi-square	123.69	0.0000	27	372
tourist_arrivals					employees_comp				
Level					Level				
Method	Statistic	Prob.*	Cross-sections	Obs	Method	Statistic	Prob.*	Cross-sections	Obs
Levin, Lin & Chu	9.99	1.0000	27	365	Levin, Lin & Chu	5.37	1.0000	27	378
Im, Pesaran and Shin W-st	13.41	1.0000	27	365	Im, Pesaran and Shin W-st	6.50	1.0000	27	378
ADF - Fisher Chi-square	2.10	1.0000	27	365	ADF - Fisher Chi-square	23.05	0.9999	27	378
PP - Fisher Chi-square	2.04	1.0000	27	366	PP - Fisher Chi-square	13.94	1.0000	27	378
First difference					First difference				
Method	Statistic	Prob.*	Cross-sections	Obs	Method	Statistic	Prob.*	Cross-sections	Obs
Levin, Lin & Chu	-10.56	0.0000	27	363	Levin, Lin & Chu	-6.24	0.0000	27	378
Im, Pesaran and Shin W-st	-7.02	0.0000	27	363	Im, Pesaran and Shin W-st	-4.32	0.0000	27	378
ADF - Fisher Chi-square	144.20	0.0000	27	363	ADF - Fisher Chi-square	100.74	0.0001	27	378
PP - Fisher Chi-square	145.62	0.0000	27	363	PP - Fisher Chi-square	86.72	0.0031	27	378
employ_rate					income_house				
Level					Level				
Method	Statistic	Prob.*	Cross-sections	Obs	Method	Statistic	Prob.*	Cross-sections	Obs
Levin, Lin & Chu	-0.19	0.4237	27	378	Levin, Lin & Chu	1.38	0.9160	26	364
Im, Pesaran and Shin W-st	1.90	0.9712	27	378	Im, Pesaran and Shin W-st	5.13	1.0000	26	364
ADF - Fisher Chi-square	47.37	0.7261	27	378	ADF - Fisher Chi-square	21.92	0.9999	26	364
PP - Fisher Chi-square	23.15	0.9999	27	378	PP - Fisher Chi-square	13.41	1.0000	26	364
First difference					First difference				
Method	Statistic	Prob.*	Cross-sections	Obs	Method	Statistic	Prob.*	Cross-sections	Obs
Levin, Lin & Chu	-7.20	0.0000	27	378	Levin, Lin & Chu	-8.75	0.0000	26	364
Im, Pesaran and Shin W-st	-5.68	0.0000	27	378	Im, Pesaran and Shin W-st	-6.30	0.0000	26	364
ADF - Fisher Chi-square	122.03	0.0000	27	378	ADF - Fisher Chi-square	127.66	0.0000	26	364
PP - Fisher Chi-square	122.11	0.0000	27	378	PP - Fisher Chi-square	122.14	0.0000	26	364

\*\* Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

**Table 2. Unit root tests by regions**

GDP pc						hours_worked					
Level						Level					
Method	Statistic	Prob.*	Cross-sections	Obs		Method	Statistic	Prob.*	Cross-sections	Obs	
Levin, Lin & Chu	7.08	1.0000	242	3388		Levin, Lin & Chu	-3.53	0.0002	241	3179	
Im, Pesaran and Shin W-st	16.25	1.0000	242	3388		Im, Pesaran and Shin W-st	2.49	0.9936	224	3128	
ADF - Fisher Chi-square	197.09	1.0000	242	3388		ADF - Fisher Chi-square	411.15	0.9914	241	3179	
PP - Fisher Chi-square	156.31	1.0000	242	3388		PP - Fisher Chi-square	310.74	1.0000	241	3179	
First difference						First difference					
Method	Statistic	Prob.*	Cross-sections	Obs		Method	Statistic	Prob.*	Cross-sections	Obs	
Levin, Lin & Chu	-34.25	0.0000	242	3388		Levin, Lin & Chu	-34.70	0.0000	224	3127	
Im, Pesaran and Shin W-st	-28.54	0.0000	242	3388		Im, Pesaran and Shin W-st	-27.53	0.0000	224	3127	
ADF - Fisher Chi-square	1677.63	0.0000	242	3388		ADF - Fisher Chi-square	1563.60	0.0000	224	3127	
PP - Fisher Chi-square	1893.31	0.0000	242	3388		PP - Fisher Chi-square	1828.92	0.0000	224	3127	
unemployment_rate						employment					
Level						Level					
Method	Statistic	Prob.*	Cross-sections	Obs		Method	Statistic	Prob.*	Cross-sections	Obs	
Levin, Lin & Chu	-16.75	0.0000	238	3211		Levin, Lin & Chu	-95.72	0.0000	241	2757	
Im, Pesaran and Shin W-st	-5.30	0.0000	238	3211		Im, Pesaran and Shin W-st	-6.57	0.0000	224	2706	
ADF - Fisher Chi-square	612.12	0.0000	238	3211		ADF - Fisher Chi-square	469.21	0.6532	241	2757	
PP - Fisher Chi-square	794.59	0.0000	238	3227		PP - Fisher Chi-square	276.87	1.0000	241	2956	
First difference						First difference					
Method	Statistic	Prob.*	Cross-sections	Obs		Method	Statistic	Prob.*	Cross-sections	Obs	
Levin, Lin & Chu	-34.08	0.0000	238	3194		Levin, Lin & Chu	-29.03	0.0000	224	2615	
Im, Pesaran and Shin W-st	-26.05	0.0000	238	3194		Im, Pesaran and Shin W-st	-20.85	0.0000	224	2615	
ADF - Fisher Chi-square	1577.06	0.0000	238	3194		ADF - Fisher Chi-square	1207.76	0.0000	224	2615	
PP - Fisher Chi-square	1613.21	0.0000	238	3196		PP - Fisher Chi-square	1123.57	0.0000	224	2681	
nlpr_hw_pceuz7						vehicles_car					
Level						Level					
Method	Statistic	Prob.*	Cross-sections	Obs		Method	Statistic	Prob.*	Cross-sections	Obs	
Levin, Lin & Chu	2.88	0.9980	242	3193		Levin, Lin & Chu	4.53	1.0000	229	3052	
Im, Pesaran and Shin W-st	17.77	1.0000	225	3142		Im, Pesaran and Shin W-st	15.97	1.0000	226	3043	
ADF - Fisher Chi-square	257.95	1.0000	242	3193		ADF - Fisher Chi-square	210.07	1.0000	229	3052	
PP - Fisher Chi-square	303.05	1.0000	242	3193		PP - Fisher Chi-square	235.73	1.0000	229	3065	
First difference						First difference					
Method	Statistic	Prob.*	Cross-sections	Obs		Method	Statistic	Prob.*	Cross-sections	Obs	
Levin, Lin & Chu	-38.74	0.0000	225	3141		Levin, Lin & Chu	-27.39	0.0000	226	3031	
Im, Pesaran and Shin W-st	-30.97	0.0000	225	3141		Im, Pesaran and Shin W-st	-20.09	0.0000	226	3031	
ADF - Fisher Chi-square	1731.63	0.0000	225	3141		ADF - Fisher Chi-square	1114.06	0.0000	226	3031	
PP - Fisher Chi-square	2060.72	0.0000	225	3141		PP - Fisher Chi-square	1131.98	0.0000	226	3032	
tourist_arrivals						employees_comp					
Level						Level					
Method	Statistic	Prob.*	Cross-sections	Obs		Method	Statistic	Prob.*	Cross-sections	Obs	
Levin, Lin & Chu	12.97	1.0000	203	2690		Levin, Lin & Chu	21.48	1.0000	241	3374	
Im, Pesaran and Shin W-st	24.79	1.0000	203	2690		Im, Pesaran and Shin W-st	20.53	1.0000	241	3374	
ADF - Fisher Chi-square	93.06	1.0000	203	2690		ADF - Fisher Chi-square	287.33	1.0000	241	3374	
PP - Fisher Chi-square	98.62	1.0000	203	2698		PP - Fisher Chi-square	228.25	1.0000	241	3374	
First difference						First difference					
Method	Statistic	Prob.*	Cross-sections	Obs		Method	Statistic	Prob.*	Cross-sections	Obs	
Levin, Lin & Chu	-36.73	0.0000	203	2663		Levin, Lin & Chu	-24.37	0.0000	241	3374	
Im, Pesaran and Shin W-st	-27.07	0.0000	199	2651		Im, Pesaran and Shin W-st	-18.88	0.0000	241	3374	
ADF - Fisher Chi-square	1414.66	0.0000	203	2663		ADF - Fisher Chi-square	1188.37	0.0000	241	3374	
PP - Fisher Chi-square	1528.48	0.0000	203	2668		PP - Fisher Chi-square	1205.92	0.0000	241	3374	
employ_rate						income_house					
Level						Level					
Method	Statistic	Prob.*	Cross-sections	Obs		Method	Statistic	Prob.*	Cross-sections	Obs	
Levin, Lin & Chu	-12.81	0.0000	236	3217		Levin, Lin & Chu	5.08	1.0000	240	3360	
Im, Pesaran and Shin W-st	-0.92	0.1793	236	3217		Im, Pesaran and Shin W-st	13.50	1.0000	240	3360	
ADF - Fisher Chi-square	564.92	0.0021	236	3217		ADF - Fisher Chi-square	252.07	1.0000	240	3360	
PP - Fisher Chi-square	596.88	0.0001	236	3226		PP - Fisher Chi-square	185.61	1.0000	240	3360	
First difference						First difference					
Method	Statistic	Prob.*	Cross-sections	Obs		Method	Statistic	Prob.*	Cross-sections	Obs	
Levin, Lin & Chu	-33.22	0.0000	236	3203		Levin, Lin & Chu	-33.60	0.0000	240	3360	
Im, Pesaran and Shin W-st	-26.27	0.0000	236	3203		Im, Pesaran and Shin W-st	-25.40	0.0000	240	3360	
ADF - Fisher Chi-square	1566.51	0.0000	236	3203		ADF - Fisher Chi-square	1492.34	0.0000	240	3360	
PP - Fisher Chi-square	1700.63	0.0000	236	3204		PP - Fisher Chi-square	1552.45	0.0000	240	3360	

\*\* Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

**Table 3. Fixed Models (countries and all regions)**

Dependent Variable: GDP_PC (countries)					Dependent Variable: GDP_PC (countries)				
Method: Panel Least Squares					Method: Panel Least Squares				
Sample: 2006 2019					Sample: 2006 2019				
Periods included: 14					Periods included: 14				
Cross-sections included: 27					Cross-sections included: 27				
Total panel (balanced) observations: 378					Total panel (balanced) observations: 378				
White two-way cluster standard errors & covariance (d.f. corrected)					White two-way cluster standard errors & covariance (d.f. corrected)				
Standard error and t-statistic probabilities adjusted for clustering					Standard error and t-statistic probabilities adjusted for clustering				
Variable	Coefficient	Std. Error	t-Statistic	Prob.	Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	126048.9	15171.66	8.308178	0.0000	C	99650.75	13008.05	7.660696	0.0000
GINI (countries)	-2522.684	384.515	-6.560691	0.0000	THEIL (countries)	-1776.075	317.3716	-5.596202	0.0001
Effects Specification					Effects Specification				
Cross-section fixed (dummy variables)					Cross-section fixed (dummy variables)				
R-squared	0.976791	Mean dependent var	26165.08		R-squared	0.974416	Mean dependent var	26165.08	
Adjusted R-squared	0.975	S.D. dependent var	17942.97		Adjusted R-squared	0.972442	S.D. dependent var	17942.97	
S.E. of regression	2837.019	Akaike info criterion	18.81008		S.E. of regression	2978.614	Akaike info criterion	18.90749	
Sum squared resid	2.82E+09	Schwarz criterion	19.10156		Sum squared resid	3.11E+09	Schwarz criterion	19.19896	
Log likelihood	-3527.106	Hannan-Quinn criter.	18.92576		Log likelihood	-3545.516	Hannan-Quinn criter.	19.02317	
F-statistic	545.5605	Durbin-Watson stat	0.250297		F-statistic	493.7215	Durbin-Watson stat	0.273435	
Prob(F-statistic)	0				Prob(F-statistic)	0			
Dependent Variable: GDP_PC (all regions)					Dependent Variable: GDP_PC (all regions)				
Method: Panel Least Squares					Method: Panel Least Squares				
Sample: 2006 2019					Sample: 2006 2019				
Periods included: 14					Periods included: 14				
Cross-sections included: 242					Cross-sections included: 242				
Total panel (balanced) observations: 3388					Total panel (balanced) observations: 3388				
White two-way cluster standard errors & covariance (d.f. corrected)					White two-way cluster standard errors & covariance (d.f. corrected)				
Standard error and t-statistic probabilities adjusted for clustering					Standard error and t-statistic probabilities adjusted for clustering				
Variable	Coefficient	Std. Error	t-Statistic	Prob.	Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	110584.4	9100.131	12.15195	0.0000	C	93370.57	7638.771	12.2325	0.0000
GINI (all regions)	-2392.846	260.6085	-9.181765	0.0000	THEIL (all regions)	-2196.357	250.7709	-8.758422	0.0000
Effects Specification					Effects Specification				
Cross-section fixed (dummy variables)					Cross-section fixed (dummy variables)				
R-squared	0.969371	Mean dependent var	25390.55		R-squared	0.969841	Mean dependent var	25390.55	
Adjusted R-squared	0.967015	S.D. dependent var	13493.48		Adjusted R-squared	0.967521	S.D. dependent var	13493.48	
S.E. of regression	2450.671	Akaike info criterion	18.51513		S.E. of regression	2431.797	Akaike info criterion	18.49967	
Sum squared resid	1.89E+10	Schwarz criterion	18.95466		Sum squared resid	1.86E+10	Schwarz criterion	18.93919	
Log likelihood	-31121.63	Hannan-Quinn criter.	18.67225		Log likelihood	-31095.44	Hannan-Quinn criter.	18.65679	
F-statistic	411.309	Durbin-Watson stat	0.277832		F-statistic	417.9206	Durbin-Watson stat	0.332676	
Prob(F-statistic)	0				Prob(F-statistic)	0			

Dependent Variable: GDP_PC (countries)				
Method: Panel Least Squares				
Sample: 2006 2019				
Periods included: 14				
Cross-sections included: 27				
Total panel (balanced) observations: 378				
White two-way cluster standard errors & covariance (d.f. corrected)				
Standard error and t-statistic probabilities adjusted for clustering				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	98470.55	11311.44	8.705397	0.0000
ATKINSON (countries)	-3921.175	616.2844	-6.362607	0.0000
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.976781	Mean dependent var	26165.08	
Adjusted R-squared	0.97499	S.D. dependent var	17942.97	
S.E. of regression	2837.619	Akaike info criterion	18.81051	
Sum squared resid	2.82E+09	Schwarz criterion	19.10198	
Log likelihood	-3527.185	Hannan-Quinn criter.	18.92619	
F-statistic	545.3246	Durbin-Watson stat	0.243564	
Prob(F-statistic)	0			

Dependent Variable: GDP_PC (all regions)				
Method: Panel Least Squares				
Sample: 2006 2019				
Periods included: 14				
Cross-sections included: 242				
Total panel (balanced) observations: 378				
White two-way cluster standard errors & covariance (d.f. corrected)				
Standard error and t-statistic probabilities adjusted for clustering				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	79330.23	4330.652	18.31831	0.0000
ATKINSON (all regions)	-3986.821	325.8858	-12.2338	0.0000
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.971385	Mean dependent var	25390.55	
Adjusted R-squared	0.969183	S.D. dependent var	13493.48	
S.E. of regression	2368.75	Akaike info criterion	18.44713	
Sum squared resid	1.76E+10	Schwarz criterion	18.88666	
Log likelihood	-31006.44	Hannan-Quinn criter.	18.60425	
F-statistic	441.1648	Durbin-Watson stat	0.303337	
Prob(F-statistic)	0			

**Table 4. Fixed Models by Gini  
(Less developed, transition and more developed regions)**

Dependent Variable: GDP_PC (less developed)				
Method: Panel Least Squares				
Sample: 2006 2019				
Periods included: 14				
Cross-sections included: 81				
Total panel (balanced) observations: 1134				
White two-way cluster standard errors & covariance (d.f. corrected)				
Standard error and t-statistic probabilities adjusted for clustering				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	23777.11	2021.609	11.76148	0.0000
GINI (less developed)	-298.8702	52.81182	-5.659154	0.0001
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.95176	Mean dependent var		12383.6
Adjusted R-squared	0.948045	S.D. dependent var		5433.504
S.E. of regression	1238.488	Akaike info criterion		17.15073
Sum squared resid	1.61E+09	Schwarz criterion		17.51471
Log likelihood	-9642.465	Hannan-Quinn criter.		17.28822
F-statistic	256.2411	Durbin-Watson stat		0.223394
Prob(F-statistic)	0			
Dependent Variable: GDP_PC (transition)				
Method: Panel Least Squares				
Sample: 2006 2019				
Periods included: 14				
Cross-sections included: 45				
Total panel (balanced) observations: 630				
White two-way cluster standard errors & covariance (d.f. corrected)				
Standard error and t-statistic probabilities adjusted for clustering				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	75375.66	4631.644	16.27406	0.0000
GINI (transition)	-2347.654	207.072	-11.33738	0.0000
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.957034	Mean dependent var		22199.21
Adjusted R-squared	0.953723	S.D. dependent var		5636.144
S.E. of regression	1212.447	Akaike info criterion		17.10888
Sum squared resid	8.58E+08	Schwarz criterion		17.43349
Log likelihood	-5343.298	Hannan-Quinn criter.		17.23497
F-statistic	289.0707	Durbin-Watson stat		0.331482
Prob(F-statistic)	0			
Dependent Variable: GDP_PC (more developed)				
Method: Panel Least Squares				
Sample: 2006 2019				
Periods included: 14				
Cross-sections included: 116				
Total panel (balanced) observations: 1624				
White two-way cluster standard errors & covariance (d.f. corrected)				
Standard error and t-statistic probabilities adjusted for clustering				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	272000.6	41290.37	6.587507	0.0000
GINI (more developed)	-9108.724	1579.452	-5.767016	0.0001
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.923292	Mean dependent var		35711.02
Adjusted R-squared	0.917388	S.D. dependent var		10876.87
S.E. of regression	3126.266	Akaike info criterion		19.00238
Sum squared resid	1.47E+10	Schwarz criterion		19.39089
Log likelihood	-15312.94	Hannan-Quinn criter.		19.14654
F-statistic	156.371	Durbin-Watson stat		0.424466
Prob(F-statistic)	0			

**Table 5. Fixed Models by Theil  
(Less developed, transition and more developed regions)**

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	24190.53	2092.357	11.56138	0.0000
THEIL (less developed)	-327.7223	57.80959	-5.668996	0.0001
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.951728	Mean dependent var		12383.6
Adjusted R-squared	0.948012	S.D. dependent var		5433.504
S.E. of regression	1238.892	Akaike info criterion		17.15139
Sum squared resid	1.61E+09	Schwarz criterion		17.51536
Log likelihood	-9642.836	Hannan-Quinn criter.		17.28887
F-statistic	256.0652	Durbin-Watson stat		0.224427
Prob(F-statistic)	0			
Dependent Variable: GDP_PC (transition)				
Method: Panel Least Squares				
Sample: 2006 2019				
Periods included: 14				
Cross-sections included: 45				
Total panel (balanced) observations: 630				
White two-way cluster standard errors & covariance (d.f. corrected)				
Standard error and t-statistic probabilities adjusted for clustering				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	54300.62	2867.453	18.93688	0.0000
THEIL (transition)	-2708.12	241.0417	-11.23507	0.0000
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.960579	Mean dependent var		22199.21
Adjusted R-squared	0.957541	S.D. dependent var		5636.144
S.E. of regression	1161.354	Akaike info criterion		17.02277
Sum squared resid	7.88E+08	Schwarz criterion		17.34738
Log likelihood	-5316.174	Hannan-Quinn criter.		17.14886
F-statistic	316.2322	Durbin-Watson stat		0.385566
Prob(F-statistic)	0			
Dependent Variable: GDP_PC (more developed)				
Method: Panel Least Squares				
Sample: 2006 2019				
Periods included: 14				
Cross-sections included: 116				
Total panel (balanced) observations: 1624				
White two-way cluster standard errors & covariance (d.f. corrected)				
Standard error and t-statistic probabilities adjusted for clustering				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	154667.4	20337.95	7.604864	0.0000
THEIL (more developed)	-5965.005	1003.101	-5.946564	0.0000
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.921644	Mean dependent var		35711.02
Adjusted R-squared	0.915613	S.D. dependent var		10876.87
S.E. of regression	3159.67	Akaike info criterion		19.02364
Sum squared resid	1.50E+10	Schwarz criterion		19.41215
Log likelihood	-15330.2	Hannan-Quinn criter.		19.1678
F-statistic	152.8089	Durbin-Watson stat		0.379968
Prob(F-statistic)	0			

**Table 6. Fixed Models by Atkinson  
(Less developed, transition and more developed regions)**

Dependent Variable: GDP_PC (less developed)				
Method: Panel Least Squares				
Sample: 2006 2019				
Periods included: 14				
Cross-sections included: 81				
Total panel (balanced) observations: 1134				
White two-way cluster standard errors & covariance (d.f. corrected)				
Standard error and t-statistic probabilities adjusted for clustering				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	21641.62	1695.034	12.76766	0.0000
ATKINSON (less developed)	-583.2916	105.9578	-5.504942	0.0001
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.95154	Mean dependent var		12383.6
Adjusted R-squared	0.947808	S.D. dependent var		5433.504
S.E. of regression	1241.31	Akaike info criterion		17.15529
Sum squared resid	1.62E+09	Schwarz criterion		17.51926
Log likelihood	-9645.047	Hannan-Quinn criter.		17.29277
F-statistic	255.018	Durbin-Watson stat		0.231238
Prob(F-statistic)	0			
Dependent Variable: GDP_PC (transition)				
Method: Panel Least Squares				
Sample: 2006 2019				
Periods included: 14				
Cross-sections included: 45				
Total panel (balanced) observations: 630				
White two-way cluster standard errors & covariance (d.f. corrected)				
Standard error and t-statistic probabilities adjusted for clustering				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	49445.79	2192.724	22.54994	0.0000
ATKINSON (transition)	-4631.691	373.7578	-12.39223	0.0000
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.963057	Mean dependent var		22199.21
Adjusted R-squared	0.960211	S.D. dependent var		5636.144
S.E. of regression	1124.254	Akaike info criterion		16.95784
Sum squared resid	7.38E+08	Schwarz criterion		17.28245
Log likelihood	-5295.72	Hannan-Quinn criter.		17.08393
F-statistic	338.3183	Durbin-Watson stat		0.35581
Prob(F-statistic)	0			
Dependent Variable: GDP_PC (more developed)				
Method: Panel Least Squares				
Sample: 2006 2019				
Periods included: 14				
Cross-sections included: 116				
Total panel (balanced) observations: 1624				
White two-way cluster standard errors & covariance (d.f. corrected)				
Standard error and t-statistic probabilities adjusted for clustering				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	155256.3	19521.26	7.95319	0.0000
ATKINSON (more developed)	-13533.13	2169.587	-6.237653	0.0000
Effects Specification				
Cross-section fixed (dummy variables)				
R-squared	0.925969	Mean dependent var		35711.02
Adjusted R-squared	0.920271	S.D. dependent var		10876.87
S.E. of regression	3071.239	Akaike info criterion		18.96687
Sum squared resid	1.42E+10	Schwarz criterion		19.35538
Log likelihood	-15284.1	Hannan-Quinn criter.		19.11103
F-statistic	162.4942	Durbin-Watson stat		0.369981
Prob(F-statistic)	0			

**Table 7. Less developed regions**

	Country	Name Regions	GEO (Codes)	ECI (GI)	ECI (TH)	ECI (AT)	Factor
1	Greece	Βόρειο Αιγαίο	EL41	0.0000	0.0000	0.0000	
2	Greece	Νότιο Αιγαίο	EL42	0.0000	0.0000	0.0000	0.9208
3	Greece	Κρήτη	EL43	0.0000	0.0000	0.0000	0.3780
4	Greece	Ανατολική Μακεδονία, Θράκη	EL51	0.0000	0.0000	0.0000	0.5378
5	Greece	Κεντρική Μακεδονία	EL52	0.0000	0.0000	0.0000	0.6125
6	Greece	Δυτική Μακεδονία	EL53	0.0000	0.0000	0.0000	
7	Greece	Ήπειρος	EL54	0.0000	0.0000	0.0000	0.6512
8	Greece	Θεσσαλία	EL61	0.0000	0.0000	0.0000	0.4303
9	Greece	Ιόνια Νησιά	EL62	0.0000	0.0000	0.0000	0.5782
10	Greece	Δυτική Ελλάδα	EL63	0.0000	0.0000	0.0000	0.6774
11	Greece	Στερεά Ελλάδα	EL64	0.0000	0.0000	0.0000	0.6802
12	Greece	Πελοπόννησος	EL65	0.0000	0.0000	0.0000	0.2524
13	Spain	Ciudad de Melilla	ES64	0.0000	0.0000	0.0000	
14	Italy	Molise	ITF2	0.0000	0.0000	0.0000	0.8920
15	Spain	Canarias	ES70	0.0532	0.0482	0.0513	0.9423
16	Spain	Ciudad de Ceuta	ES63	0.0568	0.0538	0.0538	
17	Italy	Sicilia	ITG1	0.1512	0.1488	0.1492	0.7643
18	Spain	Andalucía	ES61	0.2534	0.2442	0.2494	0.9718
19	Spain	Castilla-La Mancha	ES42	0.3497	0.3445	0.3476	0.9393
20	Croatia	Panonska Hrvatska	HR02	0.4194	0.4252	0.4113	
21	Italy	Calabria	ITF6	0.4257	0.4306	0.4300	0.8613
22	Italy	Campania	ITF3	0.4417	0.4298	0.4346	0.9168
23	Spain	Región de Murcia	ES62	0.4433	0.4270	0.4355	0.9071
24	France	Guyane	FRY3	0.5375	0.5549	0.5431	
25	France	Guadeloupe	FRY1	0.7221	0.7249	0.7221	
26	Spain	Extremadura	ES43	0.7362	0.7351	0.7360	0.9016
27	Hungary	Pest	HU12	0.7363	0.7220	0.7230	
28	Italy	Sardegna	ITG2	0.8065	0.8109	0.8009	0.8531
29	Croatia	Sjeverna Hrvatska	HR06	0.8086	0.8048	0.7976	
30	Portugal	Alentejo	PT18	0.8094	0.7937	0.8060	
31	Czech Republic	Severozápad	CZ04	0.8126	0.8296	0.8127	0.8065
32	Italy	Basilicata	ITF5	0.8153	0.7949	0.8024	0.6836
33	Croatia	Jadranska Hrvatska	HR03	0.8282	0.8299	0.8242	0.8118
34	Portugal	Região Autónoma dos Açores	PT20	0.8467	0.8470	0.8460	
35	Italy	Puglia	ITF4	0.8523	0.8390	0.8518	0.9039
36	Slovakia	Západné Slovensko	SK02	0.8735	0.8918	0.8742	0.8352
37	Portugal	Centro (PT)	PT16	0.8778	0.8678	0.8747	
38	Slovakia	Stredné Slovensko	SK03	0.8800	0.8981	0.8804	0.8012
39	Poland	Świętokrzyskie	PL72	0.8895	0.8993	0.8822	
40	Hungary	Észak-Magyarország	HU31	0.8898	0.8689	0.8788	0.7962
41	Hungary	Közép-Dunántúl	HU21	0.8901	0.8706	0.8794	0.8218
42	Hungary	Dél-Dunántúl	HU23	0.9120	0.9025	0.9017	0.5513
43	Czech Republic	Moravskoslezsko	CZ08	0.9152	0.9300	0.9191	0.9045
44	Slovenia	Vzhodna Slovenija	SI03	0.9185	0.9208	0.9124	
45	Latvia	Latvija	LV00	0.9186	0.9071	0.9033	0.9557
46	Poland	Opolskie	PL52	0.9189	0.9245	0.9113	
47	Slovakia	Východné Slovensko	SK04	0.9220	0.9357	0.9210	0.8463
48	Portugal	Norte	PT11	0.9223	0.9151	0.9182	
49	Belgium	Prov. Luxembourg (BE)	BE34	0.9233	0.9136	0.9196	0.5990
50	Hungary	Észak-Alföld	HU32	0.9238	0.9136	0.9149	0.5651
51	Hungary	Nyugat-Dunántúl	HU22	0.9280	0.9114	0.9217	0.7705
52	Poland	Śląskie	PL22	0.9295	0.9379	0.9262	
53	Poland	Lubelskie	PL81	0.9308	0.9357	0.9250	
54	Hungary	Dél-Alföld	HU33	0.9329	0.9173	0.9196	0.7450
55	Poland	Podlaskie	PL84	0.9338	0.9387	0.9276	
56	Poland	Warmińsko-mazurskie	PL62	0.9362	0.9400	0.9293	
57	Poland	Zachodniopomorskie	PL42	0.9374	0.9386	0.9280	
58	France	Mayotte	FRY5	0.9394	0.9372	0.9373	
59	Poland	Mazowiecki regionalny	PL92	0.9405	0.9445	0.9365	
60	Poland	Łódzkie	PL71	0.9411	0.9438	0.9346	
61	France	Martinique	FRY2	0.9423	0.9410	0.9383	
62	Poland	Podkarpackie	PL82	0.9441	0.9459	0.9360	
63	Poland	Kujawsko-pomorskie	PL61	0.9445	0.9467	0.9373	
64	Poland	Lubuskie	PL43	0.9463	0.9451	0.9381	
65	Romania	Sud-Vest Oltenia	RO41	0.9492	0.9427	0.9381	0.5963
66	Romania	Nord-Vest	RO11	0.9548	0.9451	0.9447	0.8865
67	Romania	Sud-Munténia	RO31	0.9589	0.9558	0.9494	0.5806
68	Poland	Pomorskie	PL63	0.9591	0.9618	0.9539	
69	Poland	Małopolskie	PL21	0.9614	0.9616	0.9547	
70	Romania	Vest	RO42	0.9629	0.9579	0.9553	0.8630
71	Bulgaria	Югоизточен	BG34	0.9631	0.9689	0.9687	0.6886
72	Bulgaria	Южен централен	BG42	0.9635	0.9684	0.9638	0.5634
73	Romania	Sud-Est	RO22	0.9638	0.9569	0.9527	0.6179
74	Romania	Centru	RO12	0.9648	0.9587	0.9566	0.7994
75	Bulgaria	Североизточен	BG33	0.9670	0.9738	0.9646	0.6871
76	Belgium	Prov. Hainaut	BE32	0.9674	0.9675	0.9654	0.8105
77	Romania	Nord-Est	RO21	0.9681	0.9607	0.9567	0.8604
78	Bulgaria	Северозападен	BG31	0.9709	0.9751	0.9694	0.6477
79	Lithuania	Vidurio ir vakarų Lietuvos regionas	LT02	0.9733	0.9699	0.9665	
80	Bulgaria	Северен централен	BG32	0.9737	0.9761	0.9707	0.7316
81	France	La Réunion	FRY4	0.9766	0.9691	0.9696	

**Table 8. Transition regions**

	Country	Name Regions	GEO (Codes)	ECI (GI)	ECI (TH)	ECI (AT)	Factor
1	Ireland	Northern and Western	IE04	0.2296	0.0557	0.0705	
2	Italy	Umbria	IT12	0.2499	0.0217	0.0417	0.9464
3	France	Corse	FRM0	0.5617	0.8517	0.8337	
4	France	Haute-Normandie	FRD2	0.5942	0.8426	0.8246	
5	Spain	Comunitat Valenciana	ES52	0.6099	0.2200	0.2917	0.9748
6	Germany	Thüringen	DEG0	0.6218	0.8362	0.8328	0.8992
7	Spain	Principado de Asturias	ES12	0.6504	0.2682	0.3406	0.9605
8	Germany	Lüneburg	DE93	0.6516	0.8655	0.8602	0.5601
9	Austria	Burgenland	AT11	0.6726	0.8776	0.8764	0.7568
10	Germany	Brandenburg	DE40	0.6777	0.8709	0.8745	0.4987
11	Spain	Cantabria	ES13	0.6789	0.2880	0.3653	0.9544
12	Germany	Sachsen-Anhalt	DEE0	0.6841	0.8897	0.8871	0.6402
13	Germany	Chemnitz	DED4	0.6862	0.8622	0.8672	0.7973
14	Germany	Mecklenburg-Vorpommern	DE80	0.6991	0.8853	0.8901	0.5850
15	Belgium	Prov. Namur	BE35	0.7030	0.9135	0.9129	0.6580
16	France	Poitou-Charentes	FR13	0.7293	0.9056	0.9045	
17	Poland	Dolnośląskie	PLS1	0.7345	0.9400	0.9375	
18	France	Limousin	FR12	0.7619	0.7500	0.7838	
19	Italy	Abruzzo	ITF1	0.7629	0.9158	0.9109	0.9139
20	France	Basse-Normandie	FRD1	0.7647	0.9049	0.9166	
21	Belgium	Prov. Liège	BE33	0.7751	0.9234	0.9353	0.8127
22	France	Auvergne	FRK1	0.7767	0.8531	0.8719	
23	Estonia	Eesti	EE00	0.7947	0.8816	0.9004	0.8948
24	Poland	Wielkopolskie	PL41	0.7962	0.9375	0.9516	
25	France	Bretagne	FRH0	0.7974	0.8067	0.8363	
26	Bulgaria	Юросанаџен	BG41	0.7976	0.9264	0.9442	0.8553
27	France	Champagne-Ardenne	FRF2	0.7984	0.8293	0.8407	
28	France	Lorraine	FRF3	0.8123	0.7212	0.7681	
29	France	Picardie	FRE2	0.8203	0.9268	0.9369	
30	France	Centre — Val de Loire	FRB0	0.8363	0.8877	0.9078	
31	France	Franche-Comté	FRC2	0.8385	0.5843	0.6622	
32	France	Bourgogne	FRC1	0.8397	0.8916	0.9166	
33	France	Nord-Pas de Calais	FRE1	0.8495	0.9300	0.9560	
34	France	Languedoc-Roussillon	FRJ1	0.8572	0.9337	0.9577	
35	Netherlands	Friesland (NL)	NL12	0.8679	0.9314	0.9522	0.8572
36	Netherlands	Drenthe	NL13	0.8810	0.8005	0.8386	0.9230
37	Portugal	Algarve	PT15	0.8872	0.6069	0.6840	
38	Czech Republic	Jihovýchod	CZ06	0.8879	0.9535	0.9775	0.9272
39	Spain	Castilla y León	ES41	0.8889	0.5709	0.6530	0.9705
40	Czech Republic	Střední Morava	CZ07	0.8939	0.9385	0.9692	0.8004
41	Portugal	Região Autónoma da Madeira	PT30	0.8943	0.6476	0.7235	
42	Spain	Galicia	ES11	0.9070	0.6530	0.7377	0.9594
43	Czech Republic	Jihozápad	CZ03	0.9232	0.9326	0.9646	0.9533
44	Czech Republic	Severovýchod	CZ05	0.9314	0.9172	0.9555	0.9273
45	Czech Republic	Střední Čechy	CZ02	0.9486	0.8744	0.9235	0.8730

**Table 9. More developed regions**

	Country	Name Regions	GEO (Codes)	ECI (GI)	ECI (TH)	ECI (AT)	Factor
1	Greece	Αττική	EL30	0.0000	0.0000	0.0000	0.3983
2	Italy	Lazio	IT14	0.0026	0.0000	0.0000	0.9381
3	Netherlands	Groningen	NL11	0.0099	0.0006	0.0070	0.3632
4	Cyprus	Κύπρος	CY00	0.1572	0.0000	0.0086	0.9544
5	Spain	Illes Balears	ES53	0.1680	0.0622	0.0790	0.9811
6	Spain	Comunidad Foral de Navarra	ES22	0.1940	0.0587	0.0851	0.9635
7	Portugal	Área Metropolitana de Lisboa	PT17	0.2041	0.0325	0.0656	
8	Spain	Cataluña	ES51	0.2378	0.1158	0.1419	0.9723
9	Spain	Aragón	ES24	0.2401	0.0768	0.1119	0.9210
10	Spain	La Rioja	ES23	0.2548	0.1045	0.1419	0.9097
11	Italy	Marche	IT13	0.2590	0.0999	0.1256	0.8157
12	Ireland	Eastern and Midland	IE06	0.3384	0.3148	0.3265	
13	Spain	Pais Vasco	ES21	0.3569	0.1694	0.2202	0.9726
14	Spain	Comunidad de Madrid	ES30	0.3730	0.2077	0.2558	0.9640
15	Ireland	Southern	IE05	0.3866	0.3680	0.3819	
16	Italy	Piemonte	ITC1	0.4092	0.2293	0.2557	0.8469
17	Italy	Liguria	ITC3	0.4275	0.2753	0.3227	0.8461
18	Netherlands	Zuid-Holland	NL33	0.4727	0.2839	0.3618	0.7930
19	Italy	Friuli-Venezia Giulia	ITH4	0.4865	0.3186	0.3558	0.8965
20	Finland	Åland	FI20	0.3627	0.7498	0.7018	
21	Slovenia	Zahodna Slovenija	SI04	0.5159	0.3172	0.3977	
22	Netherlands	Flevoland	NL23	0.5196	0.3144	0.3751	0.7099
23	Hungary	Budapest	HU11	0.5419	0.3117	0.3951	
24	Italy	Emilia-Romagna	ITH5	0.5537	0.4417	0.4726	0.8713
25	Italy	Veneto	ITH3	0.5582	0.4263	0.4605	0.8534
26	Netherlands	Utrecht	NL31	0.5667	0.3797	0.4732	0.9275
27	Netherlands	Noord-Holland	NL32	0.5883	0.5067	0.5683	0.8751
28	Croatia	Grad Zagreb	HR05	0.5905	0.3432	0.4350	
29	Belgium	Région de Bruxelles-Capitale/ Br	BE10	0.5952	0.5614	0.6076	0.3640
30	Italy	Toscana	ITI1	0.6018	0.4234	0.4891	0.8289
31	Belgium	Prov. Brabant Wallon	BE31	0.6053	0.5080	0.5851	0.0996
32	Malta	Malta	MT00	0.6098	0.6550	0.6916	
33	Germany	Hamburg	DE60	0.6159	0.6352	0.6805	0.5100
34	Netherlands	Overijssel	NL21	0.6166	0.4520	0.5384	0.9050
35	Romania	Bucureşti-Ilfov	RO32	0.6259	0.5531	0.6257	0.8618
36	Italy	Lombardia	ITC4	0.6283	0.3852	0.4533	0.8566
37	Denmark	Sjælland	DK02	0.6304	0.6228	0.6557	0.5545
38	Denmark	Midtjylland	DK04	0.6322	0.5869	0.6303	0.7595
39	Denmark	Hovedstaden	DK01	0.6345	0.6982	0.7332	0.3631
40	Germany	Köln	DEA2	0.6366	0.6759	0.7138	0.5568
41	Netherlands	Limburg (NL)	NL42	0.6368	0.5466	0.6044	0.7616
42	Germany	Dresden	DED2	0.6404	0.6986	0.7326	0.7494
43	Denmark	Nordjylland	DK05	0.6419	0.6616	0.6981	0.8442
44	Netherlands	Gelderland	NL22	0.6432	0.4846	0.5673	0.8915
45	Austria	Vorarlberg	AT34	0.6481	0.7220	0.7573	0.6693
46	Italy	Valle d'Aosta/Vallée d'Aoste	ITC2	0.6502	0.2096	0.3021	0.8047
47	France	Midi-Pyrénées	FRJ2	0.6586	0.7303	0.7635	
48	Slovakia	Bratislavský kraj	SK01	0.6589	0.6753	0.7536	0.6846
49	Sweden	Sydsverige	SE22	0.6613	0.8732	0.8311	0.9426
50	Czech Republi	Praha	CZ01	0.6688	0.4361	0.5341	0.8260
51	Sweden	Stockholm	SE11	0.6690	0.9215	0.8960	0.8729
52	Netherlands	Noord-Brabant	NL41	0.6702	0.5655	0.6343	0.9039
53	Luxembourg	Luxembourg	LU00	0.6719	0.7792	0.8211	0.6923
54	Finland	Helsinki-Uusimaa	FI18	0.6729	0.5874	0.6598	0.8146
55	Germany	Kassel	DE73	0.6738	0.7557	0.7843	0.7211
56	France	Alsace	FRF1	0.6739	0.5884	0.6647	
57	Belgium	Prov. Vlaams-Brabant	BE24	0.6750	0.7054	0.7526	0.6885
58	Lithuania	Sostinės regionas	LT01	0.6807	0.6631	0.7244	

**Table 9. More developed regions (continuation).**

	Country	Name Regions	GEO (Codes)	ECI (GI)	ECI (TH)	ECI (AT)	Factor
59	Germany	Berlin	DE30	0.6826	0.6424	0.7019	0.7059
60	Germany	Koblenz	DEB1	0.6833	0.7514	0.7870	0.7632
61	Belgium	Prov. West-Vlaanderen	BE25	0.6846	0.7207	0.7613	0.7842
62	Germany	Düsseldorf	DEA1	0.6865	0.6434	0.7121	0.9094
63	Austria	Tirol	AT33	0.6866	0.7436	0.7882	0.7455
64	Denmark	Syddanmark	DK03	0.6883	0.7370	0.7804	0.6734
65	Germany	Darmstadt	DE71	0.6896	0.6960	0.7367	0.7508
66	Belgium	Prov. Antwerpen	BE21	0.6927	0.6951	0.7419	0.7631
67	Germany	Gießen	DE72	0.6942	0.6817	0.7305	0.9320
68	Belgium	Prov. Oost-Vlaanderen	BE23	0.6948	0.7249	0.7689	0.5122
69	Germany	Leipzig	DED5	0.6960	0.7823	0.8221	0.3422
70	Germany	Detmold	DEA4	0.6963	0.7602	0.8017	0.8907
71	Germany	Oberfranken	DE24	0.6974	0.7678	0.8008	0.6444
72	Germany	Rheinhesen-Pfalz	DEB3	0.6995	0.8120	0.8405	0.5680
73	Germany	Schleswig-Holstein	DEF0	0.7022	0.7191	0.7702	0.8190
74	Germany	Oberbayern	DE21	0.7024	0.7786	0.8060	0.6315
75	Sweden	Västsverige	SE23	0.7029	0.9299	0.8936	0.9131
76	Germany	Trier	DEB2	0.7078	0.8026	0.8365	0.4530
77	Germany	Bremen	DE50	0.7082	0.7942	0.8152	0.8554
78	Germany	Oberpfalz	DE23	0.7092	0.7918	0.8273	0.8579
79	Italy	Provincia Autonoma di Trento	ITH2	0.7123	0.5288	0.6199	0.7563
80	Sweden	Mellersta Norrland	SE32	0.7127	0.8447	0.8474	0.7261
81	Austria	Niederösterreich	AT12	0.7141	0.6999	0.7625	0.9169
82	Nederlands	Zeeland	NL34	0.7156	0.5786	0.6659	0.6740
83	Germany	Mittelfranken	DE25	0.7159	0.7750	0.8174	0.9496
84	Germany	Niederbayern	DE22	0.7184	0.7980	0.8313	0.8142
85	Germany	Schwaben	DE27	0.7187	0.8030	0.8361	0.8552
86	Sweden	Småland med öarna	SE21	0.7203	0.9192	0.8826	0.9433
87	Germany	Freiburg	DE13	0.7218	0.7824	0.8209	0.9321
88	France	Pays de la Loire	FRG0	0.7222	0.6813	0.7479	
89	Germany	Saarland	DECO	0.7247	0.7960	0.8184	0.8951
90	France	Ile-de-France	FR10	0.7262	0.7074	0.7746	0.7177
91	Austria	Steiermark	AT22	0.7264	0.7402	0.7960	0.8307
92	Germany	Karlsruhe	DE12	0.7276	0.7464	0.7899	0.8804
93	Belgium	Prov. Limburg (BE)	BE22	0.7281	0.7291	0.7775	0.8847
94	Germany	Arnsberg	DEA5	0.7282	0.7473	0.8011	0.9196
95	Germany	Stuttgart	DE11	0.7306	0.7964	0.8215	0.7439
96	Germany	Weser-Ems	DE94	0.7319	0.7808	0.8260	0.6326
97	Finland	Etelä-Suomi	FI1C	0.7336	0.6655	0.7186	0.8052
98	Austria	Oberösterreich	AT31	0.7357	0.7651	0.8215	0.9017
99	Sweden	Norra Mellansverige	SE31	0.7380	0.9258	0.8971	0.9512
100	Poland	Warszawski stoleczny	PL91	0.7411	0.6549	0.7403	
101	Germany	Unterfranken	DE26	0.7444	0.8156	0.8469	0.8194
102	Germany	Tübingen	DE14	0.7465	0.7909	0.8297	0.9135
103	Germany	Hannover	DE92	0.7469	0.7431	0.7953	0.8595
104	Germany	Münster	DEA3	0.7470	0.7068	0.7686	0.8875
105	Sweden	Östra Mellansverige	SE12	0.7485	0.9467	0.9223	0.8928
106	Austria	Salzburg	AT32	0.7500	0.7670	0.8203	0.7398
107	France	Rhône-Alpes	FRK2	0.7500	0.6338	0.7094	
108	Italy	Provincia Autonoma di Bolzano/ItH1	ITH1	0.7525	0.7490	0.8120	0.4985
109	France	Aquitaine	FR11	0.7567	0.6739	0.7385	
110	Austria	Kärnten	AT21	0.7596	0.7174	0.7883	0.8635
111	Austria	Wien	AT13	0.7601	0.6626	0.7490	0.8092
112	Germany	Braunschweig	DE91	0.7651	0.7676	0.8097	0.5149
113	Finland	Pohjois- ja Itä-Suomi	FI1D	0.7747	0.7366	0.7909	0.8786
114	France	Provence-Alpes-Côte d'Azur	FRLO	0.7862	0.7497	0.8174	
115	Finland	Länsi-Suomi	FI19	0.8190	0.7114	0.7928	0.9020
116	Sweden	Övre Norrland	SE33	0.8339	0.8445	0.8682	0.8767

**Table 10. All regions**

	Country	Name Regions	GEO (Codes)	ECI (GI)	ECI (TH)	ECI (AT)	Factor
1	Greece	Αττική	EL30	0.0000	0.0000	0.0000	0.4584
2	Greece	Βόρειο Αιγαίο	EL41	0.0000	0.0000	0.0000	
3	Greece	Νότιο Αιγαίο	EL42	0.0000	0.0000	0.0000	0.9034
4	Greece	Κρήτη	EL43	0.0000	0.0000	0.0000	0.3562
5	Greece	Ανατολική Μακεδονία, Θράκη	EL51	0.0000	0.0000	0.0000	0.5099
6	Greece	Κεντρική Μακεδονία	EL52	0.0000	0.0000	0.0000	0.6101
7	Greece	Δυτική Μακεδονία	EL53	0.0000	0.0000	0.0000	
8	Greece	Ήπειρος	EL54	0.0000	0.0000	0.0000	0.6364
9	Greece	Θεσσαλία	EL61	0.0000	0.0000	0.0000	0.4604
10	Greece	Ιόνια Νησιά	EL62	0.0000	0.0000	0.0000	0.5757
11	Greece	Δυτική Ελλάδα	EL63	0.0000	0.0000	0.0000	0.6803
12	Greece	Στερεά Ελλάδα	EL64	0.0000	0.0000	0.0000	0.6620
13	Greece	Πελοπόννησος	EL65	0.0000	0.0000	0.0000	0.2119
14	Netherlands	Groningen	NL11	0.0000	0.0000	0.0000	0.4325
15	Italy	Molise	ITF2	0.0497	0.0160	0.0053	0.8853
16	Spain	Ciudad de Melilla	ES64	0.0892	0.0479	0.0229	
17	Finland	Åland	FI20	0.0941	0.1504	0.1997	
18	Sweden	Mellersta Norrland	SE32	0.1821	0.2301	0.2956	0.7316
19	Italy	Lazio	IT14	0.2126	0.1484	0.1057	0.9404
20	France	Guyane	FRY3	0.2162	0.2624	0.3412	
21	Ireland	Northern and Western	IE04	0.2209	0.2137	0.1568	
22	Sweden	Stockholm	SE11	0.2246	0.2908	0.3577	0.8709
23	Sweden	Norra Mellansverige	SE31	0.2338	0.3040	0.3568	0.9514
24	Sweden	Sydsverige	SE22	0.2411	0.3125	0.3608	0.9473
25	Italy	Umbria	IT12	0.2465	0.1778	0.1334	0.9467
26	Sweden	Ostra Mellansverige	SE12	0.2652	0.3382	0.3971	0.8870
27	Sweden	Småland med Öarna	SE21	0.2692	0.3458	0.3967	0.9436
28	Sweden	Övre Norrland	SE33	0.2836	0.3283	0.3949	0.8888
29	Spain	Ciudad de Ceuta	ES63	0.3089	0.2221	0.1865	
30	Sweden	Västsverige	SE23	0.3231	0.4046	0.4605	0.9142
31	Spain	Canarias	ES70	0.3340	0.2581	0.2014	0.9506
32	Italy	Valle d'Aosta/Vallée d'Aoste	ITC2	0.4976	0.4251	0.4663	0.8186
33	France	Guadeloupe	FRY1	0.3704	0.4266	0.5115	
34	Slovakia	Bratislavský kraj	SK01	0.4752	0.4947	0.6066	0.6886
35	Italy	Sicilia	ITG1	0.5106	0.4173	0.3642	0.7760
36	France	Corse	FRM0	0.5421	0.5659	0.6680	
37	Luxembourg	Luxembourg	LU00	0.5532	0.6037	0.6964	0.6852
38	France	Haute-Normandie	FRD2	0.5553	0.5974	0.6893	
39	Germany	Rhein Hessen-Pfalz	DEB3	0.5693	0.6281	0.7082	0.5690
40	Cyprus	Κύπρος	CY00	0.5826	0.4568	0.4381	0.9551
41	Germany	Niederbayern	DE22	0.5918	0.6450	0.7245	0.8411
42	Spain	Andalucía	ES61	0.6057	0.5211	0.4616	0.9729
43	Germany	Thüringen	DEG0	0.6092	0.6677	0.7420	0.8919
44	Germany	Saarland	DEC0	0.6141	0.6735	0.7385	0.8982
45	Slovakia	Západné Slovensko	SK02	0.6143	0.6212	0.7339	0.8480
46	Germany	Trier	DEB2	0.6166	0.6742	0.7510	0.4204
47	Germany	Leipzig	DED5	0.6176	0.6701	0.7492	0.2880
48	Germany	Lüneburg	DE93	0.6200	0.6695	0.7486	0.4908
49	Germany	Oberpfalz	DE23	0.6224	0.6776	0.7551	0.8697
50	Slovakia	Stredné Slovensko	SK03	0.6243	0.6268	0.7389	0.8128
51	Germany	Bremen	DE50	0.6299	0.6971	0.7536	0.8580
52	Germany	Schwaben	DE27	0.6310	0.6896	0.7621	0.8712
53	Spain	Comunitat Valenciana	ES52	0.6340	0.5631	0.5020	0.9715
54	Germany	Unterfranken	DE26	0.6391	0.6989	0.7693	0.8491
55	Germany	Stuttgart	DE11	0.6392	0.6960	0.7606	0.7610
56	Germany	Freiburg	DE13	0.6445	0.6941	0.7699	0.9308
57	France	Mayotte	FRY5	0.6508	0.6980	0.7734	
58	France	Martinique	FRY2	0.6534	0.6909	0.7769	
59	Germany	Weser-Ems	DE94	0.6558	0.7052	0.7840	0.6046
60	Germany	Oberfranken	DE24	0.6570	0.7119	0.7808	0.6664
61	Austria	Burgenland	AT11	0.6586	0.7111	0.7862	0.7526
62	Austria	Vorarlberg	AT34	0.6597	0.7069	0.7776	0.6953
63	Spain	Principado de Asturias	ES12	0.6605	0.5504	0.5169	0.9550
64	Germany	Oberbayern	DE21	0.6606	0.7192	0.7829	0.6519
65	Germany	Sachsen-Anhalt	DEE0	0.6613	0.7089	0.7875	0.6280
66	Germany	Brandenburg	DE40	0.6636	0.7105	0.7879	0.4990
67	Germany	Detmold	DEA4	0.6656	0.7165	0.7899	0.8919
68	Germany	Mittelfranken	DE25	0.6659	0.7183	0.7925	0.9529
69	Germany	Kassel	DE73	0.6669	0.7247	0.7913	0.6789
70	Germany	Koblenz	DEB1	0.6676	0.7186	0.7880	0.7719
71	Slovakia	Východné Slovensko	SK04	0.6707	0.6844	0.7874	0.8520
72	Germany	Tübingen	DE14	0.6721	0.7251	0.7973	0.9135
73	Austria	Oberösterreich	AT31	0.6785	0.7214	0.8042	0.9001
74	Germany	Mecklenburg-Vorpommern	DE80	0.6792	0.7156	0.7963	0.6030
75	Austria	Tirol	AT33	0.6798	0.7282	0.8009	0.7588
76	France	Poitou-Charentes	FR13	0.6807	0.7182	0.7969	
77	Germany	Chemnitz	DED4	0.6817	0.7331	0.8025	0.8198
78	Poland	Dolnośląskie	PL51	0.6835	0.6903	0.7922	
79	Germany	Arnsberg	DEA5	0.6864	0.7252	0.8061	0.9165
80	Austria	Salzburg	AT32	0.6887	0.7341	0.8130	0.7532

**Table 10. All regions (continuation)**

	Country	Name Regions	GEO (Codes)	ECI (GI)	ECI (TH)	ECI (AT)	Factor
81	Denmark	Hovedstaden	DK01	0.6906	0.7388	0.8063	0.4023
82	Denmark	Syddanmark	DK03	0.6909	0.7387	0.8131	0.6785
83	Belgium	Prov. Namur	BE35	0.6916	0.7286	0.8136	0.5881
84	France	Midi-Pyrénées	FRJ2	0.6928	0.7479	0.8064	
85	France	Limousin	FRJ2	0.6979	0.7356	0.7699	
86	France	Provence-Alpes-Côte d'Azur	FRLO	0.7002	0.7329	0.8155	
87	Germany	Dresden	DED2	0.7009	0.7474	0.8110	0.7445
88	Italy	Provincia Autonoma di Bolzano	ITBH	0.7044	0.7424	0.8212	0.5247
89	Germany	Karlsruhe	DE12	0.7044	0.7473	0.8185	0.8779
90	France	Ile-de-France	FR10	0.7077	0.7346	0.8227	0.7223
91	Spain	Cantabria	ES13	0.7083	0.6101	0.5677	0.9556
92	Bulgaria	Югоизточен	BG34	0.7088	0.7623	0.8325	0.6977
93	Poland	Lubelskie	PL81	0.7103	0.7194	0.8171	
94	France	Champagne-Ardenne	FRF2	0.7107	0.6839	0.7530	
95	Poland	Mazowiecki regionalny	PL52	0.7119	0.7222	0.8167	
96	Croatia	Panonska Hrvatska	HR02	0.7140	0.6030	0.6127	
97	Austria	Steiermark	AT22	0.7152	0.7581	0.8340	0.8324
98	Spain	Castilla-La Mancha	ES42	0.7167	0.6258	0.5775	0.9418
99	Germany	Hannover	DE92	0.7210	0.7639	0.8336	0.8369
100	Belgium	Prov. Oost-Vlaanderen	BE23	0.7216	0.7678	0.8371	0.4838
101	Germany	Braunschweig	DE91	0.7218	0.7636	0.8415	0.5585
102	Spain	Región de Murcia	ES62	0.7238	0.6657	0.6192	0.9163
103	Poland	Warmińsko-mazurskie	PL62	0.7240	0.7284	0.8251	
104	Belgium	Prov. West-Vlaanderen	BE25	0.7243	0.7737	0.8373	0.7932
105	Germany	Köln	DEA2	0.7256	0.7673	0.8291	0.5822
106	France	Basse-Normandie	FRD1	0.7265	0.7402	0.8275	
107	Poland	Warszawski stoleczny	PL51	0.7271	0.7305	0.8263	
108	Germany	Schleswig-Holstein	DEF0	0.7273	0.7692	0.8365	0.8274
109	Poland	Lódzkie	PL71	0.7274	0.7339	0.8284	
110	Romania	Sud-Est	RO22	0.7277	0.7624	0.8358	0.6393
111	Belgium	Prov. Vlaams-Brabant	BE34	0.7284	0.7740	0.8418	0.6784
112	Malta	Malta	MT00	0.7286	0.7704	0.8307	
113	Austria	Kärnten	AT21	0.7317	0.7573	0.8397	0.8666
114	Poland	Podlaskie	PL84	0.7325	0.7303	0.8285	
115	Poland	Podkarpackie	PL82	0.7342	0.7390	0.8332	
116	Belgium	Prov. Hainaut	BE32	0.7403	0.7717	0.8508	0.8196
117	Bulgaria	Северозападен	BG33	0.7405	0.7589	0.8471	0.6937
118	Bulgaria	Северен централен	BG32	0.7407	0.7698	0.8504	0.7459
119	Finland	Länsi-Suomi	FI19	0.7413	0.7597	0.8450	0.9069
120	France	Auvergne	FRK1	0.7420	0.7814	0.8348	
121	Lithuania	Vidurio ir vakarų Lietuvos regionai	LT02	0.7421	0.7781	0.8537	
122	France	Picardie	FRF2	0.7429	0.7481	0.8296	
123	Belgium	Prov. Limburg (BE)	BE22	0.7438	0.7886	0.8546	0.8776
124	Italy	Abruzzo	ITF1	0.7444	0.7588	0.8334	0.9091
125	Austria	Niederösterreich	AT12	0.7447	0.7757	0.8536	0.9158
126	Poland	Opolskie	PL52	0.7463	0.7372	0.8349	
127	Ireland	Southern	IE05	0.7468	0.7582	0.7618	
128	Austria	Wien	AT13	0.7480	0.7611	0.8508	0.8179
129	Poland	Śląskie	PL22	0.7494	0.7453	0.8422	
130	Poland	Wielkopolskie	PL41	0.7500	0.7612	0.8499	
131	Poland	Lubuskie	PL43	0.7519	0.7600	0.8467	
132	Germany	Darmstadt	DE71	0.7530	0.7960	0.8544	0.7457
133	Latvia	Latvija	LV00	0.7562	0.7893	0.8448	0.9586
134	Germany	Hamburg	DE60	0.7564	0.7889	0.8515	0.5147
135	France	Lorraine	FRF3	0.7576	0.7731	0.8002	
136	Estonia	Eesti	EE00	0.7589	0.7972	0.8561	0.8939
137	Denmark	Sjælland	DK02	0.7592	0.7945	0.8352	0.5732
138	Belgium	Prov. Antwerpen	BE21	0.7604	0.8011	0.8647	0.7638
139	Germany	Münster	DEA3	0.7611	0.7914	0.8659	0.8864
140	Poland	Kujawsko-pomorskie	PL61	0.7616	0.7636	0.8543	
141	France	Bourgogne	FRF1	0.7620	0.7642	0.8381	
142	Belgium	Prov. Liège	BE33	0.7634	0.7865	0.8655	0.8002
143	France	Pays de la Loire	FRG0	0.7639	0.7873	0.8643	
144	Lithuania	Sostinės regionas	LT01	0.7648	0.7950	0.8635	
145	Finland	Pohjois- ja Itä-Suomi	FI1D	0.7670	0.8103	0.8722	0.8865
146	Italy	Campania	ITF3	0.7681	0.6981	0.6494	0.9154
147	Poland	Świętokrzyskie	PL72	0.7683	0.7437	0.8412	
148	Poland	Pomorskie	PL63	0.7727	0.7782	0.8657	
149	Germany	Gießen	DE72	0.7731	0.8104	0.8716	0.9229
150	Bulgaria	Югозападен	BG41	0.7732	0.7642	0.8550	0.8512
151	Poland	Małopolskie	PL21	0.7737	0.7808	0.8659	
152	Germany	Düsseldorf	DEA1	0.7739	0.7924	0.8717	0.9059
153	France	Bretagne	FRH0	0.7745	0.8140	0.8481	
154	Poland	Zachodniopomorskie	PL42	0.7747	0.7682	0.8575	
155	Nederlands	Drenthe	NL13	0.7749	0.7112	0.7794	0.9059
156	Spain	Illes Balears	ES53	0.7773	0.7339	0.6741	0.9837
157	Italy	Calabria	ITF6	0.7805	0.6848	0.6639	0.8663
158	France	Aquitaine	FRJ1	0.7806	0.8011	0.8688	
159	Italy	Marche	ITI3	0.7816	0.7313	0.6852	0.8136
160	Bulgaria	Южен централен	BG42	0.7888	0.8003	0.8763	0.5563

**Table 10. All regions (continuation)**

	Country	Name Regions	GEO (Codes)	ECI (GI)	ECI (TH)	ECI (AT)	Factor
161	Germany	Berlin	DE30	0.7888	0.8143	0.8812	0.6844
162	Portugal	Área Metropolitana de Lisboa	PT17	0.7892	0.6750	0.6671	
163	Belgium	Prov. Brabant Wallon	BE31	0.7908	0.7840	0.8545	0.1612
164	Ireland	Eastern and Midland	IE06	0.7910	0.8157	0.7890	
165	France	Centre – Val de Loire	FR80	0.7921	0.8122	0.8687	
166	Denmark	Nordjylland	DK05	0.7944	0.8463	0.8914	0.8501
167	Finland	Etelä-Suomi	FI1C	0.7980	0.8342	0.8793	0.8132
168	Romania	Sud-Muntenia	RO31	0.7990	0.8065	0.8781	0.5838
169	Hungary	Nyugat-Dunántúl	HU22	0.7992	0.8334	0.8715	0.7737
170	Italy	Basilicata	ITF5	0.7993	0.8164	0.8265	0.6907
171	Belgium	Région de Bruxelles-Capitale/ Br	BE10	0.7999	0.8210	0.8692	0.3885
172	Nederlands	Zeeland	NL34	0.8032	0.7957	0.8834	0.6691
173	Nederlands	Friesland (NL)	NL12	0.8037	0.7619	0.8533	0.8535
174	France	Nord-Pas de Calais	FRE1	0.8068	0.8032	0.8859	
175	France	La Réunion	FRY4	0.8083	0.8428	0.8996	
176	Hungary	Pest	HU12	0.8117	0.7690	0.7990	
177	Italy	Provincia Autonoma di Trento	ITH2	0.8129	0.7929	0.8632	0.7458
178	Spain	Comunidad Foral de Navarra	ES22	0.8146	0.7424	0.7086	0.9622
179	Finland	Helsinki-Uusimaa	FI1B	0.8159	0.8221	0.8981	0.8231
180	Romania	București-Ilfov	RO32	0.8160	0.8189	0.8925	0.8578
181	Bulgaria	Северозападен	BG31	0.8215	0.8316	0.9028	0.6443
182	France	Languedoc-Roussillon	FRJ1	0.8219	0.8056	0.8901	
183	France	Alsace	FRF1	0.8229	0.8301	0.9042	
184	Italy	Piemonte	ITC1	0.8247	0.8010	0.7646	0.8547
185	Romania	Nord-Est	RO21	0.8291	0.8476	0.9056	0.8567
186	Belgium	Prov. Luxembourg (BE)	BE34	0.8320	0.8301	0.8809	0.5876
187	France	Rhône-Alpes	FRK2	0.8352	0.8454	0.9135	
188	Spain	La Rioja	ES23	0.8403	0.7661	0.7569	0.9191
189	Italy	Friuli-Venezia Giulia	ITH4	0.8417	0.8187	0.8167	0.8972
190	Czech Repub	Jihovýchod	CZ06	0.8455	0.8122	0.8985	0.9096
191	Spain	Aragon	ES24	0.8472	0.7715	0.7487	0.9213
192	Spain	Cataluña	ESS1	0.8498	0.8079	0.7707	0.9737
193	France	Franche-Comté	FRC2	0.8564	0.7992	0.8084	
194	Nederlands	Noord-Holland	NL32	0.8568	0.8587	0.9115	0.8701
195	Romania	Centru	RO12	0.8572	0.8712	0.9247	0.8077
196	Hungary	Közép-Dunántúl	HU21	0.8582	0.8688	0.8928	0.8259
197	Romania	Nord-Vest	RO11	0.8626	0.8727	0.9198	0.8860
198	Nederlands	Noord-Brabant	NL41	0.8633	0.8675	0.9275	0.9002
199	Nederlands	Utrecht	NL31	0.8647	0.8160	0.8861	0.9213
200	Romania	Sud-Vest Oltenia	RO41	0.8652	0.8605	0.9172	0.6190
201	Czech Repub	Severozápad	CZ04	0.8654	0.7943	0.8705	0.8102
202	Romania	Vest	RO42	0.8658	0.8699	0.9279	0.8704
203	Czech Repub	Moravskoslezsko	CZ08	0.8660	0.8452	0.9214	0.9116
204	Italy	Emilia-Romagna	ITH5	0.8673	0.8851	0.8834	0.8749
205	Hungary	Dél-Alföld	HU33	0.8675	0.8701	0.9103	0.7608
206	Hungary	Észak-Magyarország	HU31	0.8690	0.8801	0.8945	0.8071
207	Denmark	Midtjylland	DK04	0.8708	0.9128	0.9412	0.7596
208	Czech Repub	Střední Morava	CZ07	0.8750	0.8514	0.9272	0.7790
209	Nederlands	Limburg (NL)	NL42	0.8804	0.8928	0.9401	0.7526
210	Italy	Liguria	ITC3	0.8880	0.8636	0.8691	0.8419
211	Nederlands	Gelderland	NL22	0.8890	0.8680	0.9318	0.8897
212	Nederlands	Zuid-Holland	NL33	0.8907	0.8396	0.8863	0.7984
213	Nederlands	Overijssel	NL21	0.8914	0.8646	0.9314	0.9063
214	Italy	Sardegna	ITG2	0.8918	0.8314	0.8810	0.8553
215	Portugal	Alentejo	PT18	0.8960	0.8762	0.8760	
216	Italy	Veneto	ITH3	0.8963	0.9063	0.9025	0.8528
217	Czech Repub	Praha	CZ01	0.8964	0.8533	0.9263	0.8463
218	Italy	Puglia	ITF4	0.8973	0.9065	0.9089	0.9054
219	Portugal	Norte	PT11	0.9005	0.8857	0.9253	
220	Hungary	Észak-Alföld	HU32	0.9009	0.8855	0.9284	0.5701
221	Czech Repub	Jihozápad	CZ03	0.9038	0.8721	0.9375	0.9422
222	Slovenia	Vzhodna Slovenija	SI03	0.9064	0.8724	0.9339	
223	Portugal	Algarve	PT15	0.9097	0.8826	0.8585	
224	Spain	Castilla y León	ES41	0.9122	0.8339	0.8230	0.9700
225	Portugal	Centro (PT)	PT16	0.9134	0.8931	0.9149	
226	Portugal	Região Autónoma dos Açores	PT20	0.9134	0.8618	0.9026	
227	Croatia	Grad Zagreb	HR05	0.9147	0.8555	0.9155	
228	Italy	Toscana	ITI1	0.9153	0.8979	0.9258	0.8329
229	Spain	Galicia	ES11	0.9183	0.8584	0.8729	0.9532
230	Czech Repub	Severovýchod	CZ05	0.9211	0.8896	0.9505	0.9124
231	Hungary	Dél-Dunántúl	HU23	0.9220	0.9039	0.9416	0.5800
232	Croatia	Sjeverna Hrvatska	HR06	0.9239	0.8720	0.8978	
233	Portugal	Região Autónoma da Madeira	PT30	0.9246	0.8659	0.8677	
234	Spain	Pais Vasco	ES21	0.9266	0.8648	0.8650	0.9741
235	Spain	Extremadura	ES43	0.9267	0.8629	0.8710	0.9092
236	Hungary	Budapest	HU11	0.9323	0.8739	0.9134	
237	Spain	Comunidad de Madrid	ES30	0.9327	0.8847	0.8811	0.9653
238	Nederlands	Flevoland	NL23	0.9350	0.9006	0.9137	0.7059
239	Czech Repub	Střední Čechy	CZ02	0.9351	0.8925	0.9465	0.8833
240	Slovenia	Zahodna Slovenija	SI04	0.9384	0.8892	0.9346	
241	Italy	Lombardia	ITC4	0.9421	0.9098	0.9393	0.8630
242	Croatia	Jadranska Hrvatska	HR03	0.9564	0.9022	0.9335	0.8046

**Table 11. Countries**

	<b>Country</b>	<b>ECI (GI)</b>	<b>ECI (TH)</b>	<b>ECI (AT)</b>	<b>Factor</b>
1	Greece	0.0000	0.0000	0.0000	0.5648
2	Sweden	0.3869	0.2508	0.3723	0.9033
3	Cyprus	0.3885	0.4461	0.3831	0.9563
4	Spain	0.7066	0.8568	0.7678	0.9724
5	Luxembourg	0.7539	0.5649	0.7252	0.6420
6	Ireland	0.7861	0.8536	0.8373	0.6027
7	Slovakia	0.8072	0.5761	0.7490	0.8201
8	Latvia	0.8298	0.7796	0.8819	0.9486
9	Germany	0.8502	0.7005	0.8302	0.8819
10	Italy	0.8522	0.8996	0.8942	0.9352
11	Estonia	0.8710	0.7741	0.8838	0.8905
12	Austria	0.8729	0.7049	0.8452	0.9242
13	Poland	0.8781	0.6960	0.8461	
14	Lithuania	0.8808	0.7498	0.8791	0.8590
15	Finland	0.8832	0.7685	0.8915	0.8623
16	France	0.8902	0.7420	0.8752	0.9410
17	Denmark	0.8907	0.7731	0.8853	0.7226
18	Belgium	0.8959	0.7490	0.8726	0.7771
19	Malta	0.8972	0.7646	0.8744	
20	Bulgaria	0.9213	0.7346	0.8725	0.8186
21	Hungary	0.9285	0.8920	0.9491	0.7579
22	Croatia	0.9303	0.8911	0.9316	0.8181
23	Portugal	0.9418	0.9346	0.9430	0.9580
24	Romania	0.9480	0.8524	0.9555	0.8715
25	Czech Republ	0.9514	0.8128	0.9175	0.9260
26	Slovenia	0.9615	0.8963	0.9641	0.9043
27	Nederlands	0.9623	0.8570	0.9535	0.8491