University of the Basque Country UPV/EHU

Master in Economics: Empirical Applications and Policies

Territorial Distribution of Immigrants in Europe

Author: Aiert Gurrutxaga Urzaa

Supervisors: María José Gutiérrez & Susan Orbe

2019/20

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Abstract

Uneven distribution of immigrant population has diverse consequences in countries and societies. We call immigrants those that have a nationality different to the reporting country. Some European regions have an important percentage of immigrant population. This articles aims to quantify this unevenness in the distribution from 1999 to 2019. For this we use segregation indices of the evenness dimension. The three indices we use show that immigrant population is unevenly distributed at European level and at country level. However, this heterogeneity has decreased. We also look for macroeconomic determinants of these indices. We find a very interesting relation between GDP and the indices, as there is Kuznets effect. Being aware that there are inequalities and how different socioeconomic variables can affect is helpful in order to adopt successful policies to enjoy the positive effects immigration can provide.

Keywords: NUTS2 regions; Immigrants; Segregation indices; Inequality measures; Kuznets effect

1.- Introduction

The aim of this article is to study the territorial distribution of immigrants across Europe in recent years. This is a very important socioeconomic subject in nowadays Europe, partly because, according to Sardadvar & Rocha (2016), over the past quarter century, Europe has experienced three important events which eased migration within the continent: the dissolution of the Comecon, the Treaty on European Union and the European Union accession of new countries.

One of the reasons of why population exoduses are really important phenomena is that they have a huge impact in the destination country. People leave their country of origin for many reasons, such as improving living condition, or, simply, to escape social distress (Jones, 2015), or from natural disasters (López-Carr, Marter-Kenyon, 2015) or war. Once they make the decision to leave, they search for what might be the best destination. Macroeconomic variables of the destination country, such as, employment, education level or how rich the country is may affect the immigrant's selection. On the other hand, immigrants also affect destination countries in several dimensions, for example, they increase the number of available labor, propelling the economic growth.

However, we can see that for migrant population, or at least for those with some non-native characteristics is much more difficult to obtain certain jobs, as explain Scheve and Slaughter (2001) and Mayda (2006). Another example is the effect they have on demography. Usually immigrants are young and end up contributing to increasing birth rates in destination countries. An example of negative effect could be, for example, that the economic gap between the origin and destiny countries can increase, especially if those leaving the country are the most qualified ones. Also a part of the population does not like foreigners coming to their country and having jobs, they claim that these individuals steal the jobs (Scheve & Slaughter, 2001; Mayda, 2006) and that they are criminals. The truth is that they have less job opportunities, as said before. As a consequence to this statements made by many populist political parties, in some countries with a high share of foreigners there has been a rise in the racist and xenophobic behaviours and ultra-rightist political parties' power. In the second part of the article we focus on how some these macroeconomic variables affect different segregation indices.

The most important thing we want to study when searching for determinants of these segregation metrics is the possible effect of the Gross Domestic Product. One of the objectives will be to see if there is a Kuznets curve between the GDP and different segregation indices used. If this result is obtained we will see that the segregation of immigrants increases as countries become richer, but only until a point, once the country has a per capita GDP higher than that, the relation between indices and GDP will be negative. We can see this evolution on Figure 1.

Figure 1: Example of the Kuznets curve between segregation and GDP

It is because of segregations importance, in all aspects, and because "migration is a ubiquitous phenomenon" (Mazzoli *et al,* 2020) that there are several works in relation to segregation and different ways of studying it. The importance of the subject has an increasing tendency, and even more with the possible crisis that is coming. According to Eurostat, around 9.29% of the population of the European Union (15 countries, EU-15) had a different nationality to the respective country in 2019; this number doubles that of 1999 (4.5%). This shows that the weight of non-national population has increased in Europe during these two decades. However, it must be taken into account that these figures may not represent the real numbers of immigrants for several reasons. Among others, illegal immigrants are difficult to be recorded, as they do not always appear in any register.

	Top 5countries in EU-15		
	1999	2019	
Belgium	7.39%	12.89%	**Austria**
Germany	6.74%	11.36%	**Ireland**
Austria	6.48%	10.57%	**Germany**
France	4.63%	9.05%	**Spain**
Sweden	3.63%	8.89%	**Belgium**

Table 1: Top 5 countries with the highest percentage of immigrant population in EU-15, 1999-2019

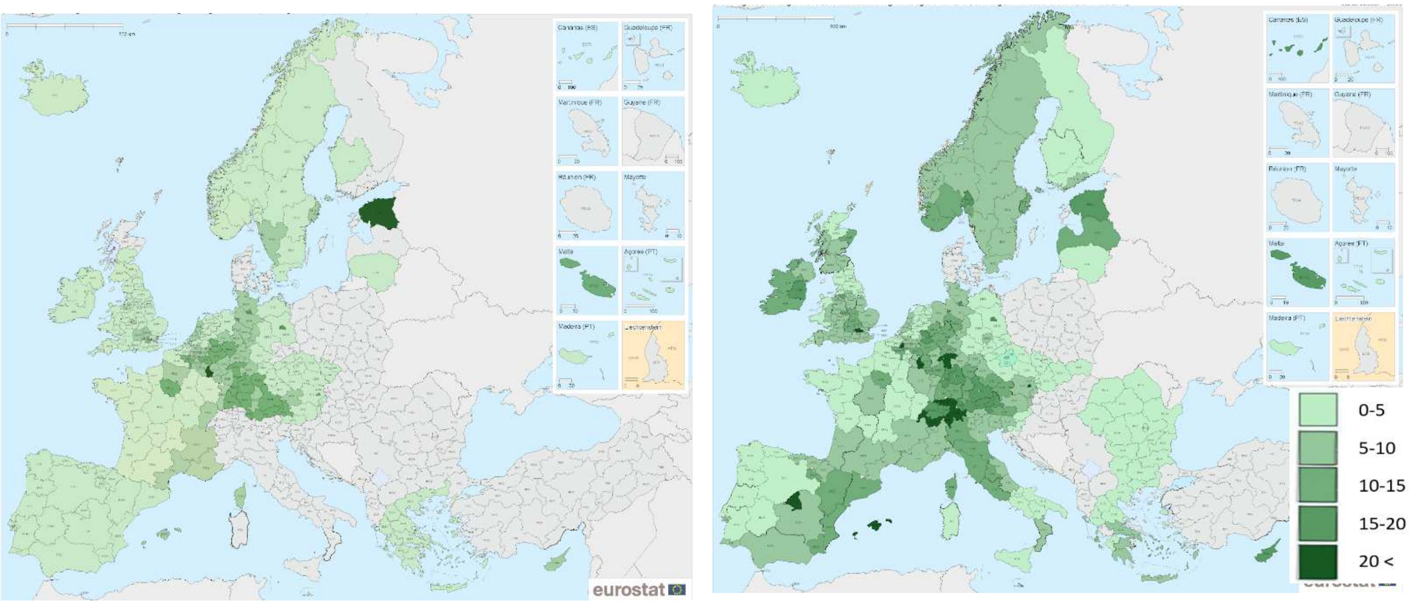
Table 1 shows the five countries of EU-15 with the highest percentage of immigrant population for years 1999 and 2019. We can clearly see that; like Czaika and Di Lillo (2018) point out immigrants are making up a continuously growing proportion of the European population. For example, Belgium is the country with the highest percentage of immigrant population in 1999, but still has a lower percentage than the fifth country in 2019, shows this. During these twenty years the relative importance of France and Sweden in this aspect has decreased, since they do not appear in the top five of 2019, being substituted by Spain and Ireland. As previously said, in some countries ultra-right movements have increased together with the increase of the percentage of immigrant population. This is the case of Austria, where we can see that the percentage has nearly doubled during the time period studied, Austria is one of the countries where the far-right movements more have increased too, having the *Freedom Party Austria* (FPÖ) a high percentage of votes. This phenomenon is not exclusive to Austria, it has been observed in countries like France and Greece.

However, this data is at country level, so differences in internal level are perfectly possible, as we see in the next table.

		Top 5 regions in EU-15			
1999			2019		
Country	**Regions**	%	%	**Regions**	**Country**
Belgium	Région de Bruxelles-Capitale / Brussels Hoofdstedelijk Gewest	26.98%	33.74%	Comunidad de Madrid	Spain
United Kingdom	Inner London	21.32%	33.31%	Région de Bruxelles-Capitale / Brussels Hoofdstedelijk Gewest	Belgium
France	Corse	16.86%	31.29%	Région lémanique	Switzerland
Austria	Wien	15.58%	29.06%	Wien	Austria
Belgium	Prov. Hainaut	14.88%	27.57%	Ticino	Switzerland

Table 2: Top 5 regions with the highest percentage of immigrant population in EU-15, 1999-2019

In Table 2 we see the top 5 regions from EU-15. We observe that there are differences between countries and regions; for example, the second region with the highest percentage of immigrants is Inner London, but United Kingdom does not appear in Table 1. In 2019 the same happens, Swiss regions of Ticino and Région lémanique. We also observe that Comunidad de Madrid is the region with the highest percentage of immirants in 2019, being Spain the second country in this year. Table 2 shows the fact that countries change when taking a look at regions. Apart from that, Table 2, like happened with Table 1, shows that there has been an increase in the weight of immigrant population. Like happened in Table 1, the first region in 1999 has a lower percentage of immigrants than the fifth region in 2019.



1999 2019

Figure 2: Percentage of immigrant population at regional level (NUTS2), 1999-2019

Figure 2 shows the evolution and distribution of the immigrants at regional level (NUTS2). For this we have maps for 1999 and 2019. The maps show the percentage of population with a nationality different to the one of the reporting country. We can observe that the immigrants are heterogeneously divided across countries, and the same happens inside the countries, as Table 1 and Table 2 showed. In the case of these maps we have intervals of percentage of immigrants. Those areas with the light green represent countries where the immigrant population is five percent or less of total population. Areas gets darker when there is more percentage of immigrants. The second lightest green shows countries where immigrant population is between five and ten percent of total population. The second darkest green are countries where the percentage of immigrant population is between fifteen and twenty percent. Lastly we have the dark green, which represents countries where immigrant population is above twenty percent.

Notice that data in 2019 covers more countries than data from 1999, we have countries such as Italy or Switzerland, for which we have no data in 1999. We also observe a higher immigrant concentration in 1999. For example, we see that in Spain there is no region that stands out more than the rest; however, this can be because of the intervals selected to colour the map. We can also see that in 2019 countries, and especially regions, are much more differentiated than in 1999.

We have some interesting countries to take a look. As an example we have the case of Estonia and Latvia, where the percentage of non-national population is high. This happens because in both countries an important part of total population came from different countries that were part of the Union of Soviet Socialist Republics (USSR), being the most notorious origin the Russian. We can see that, for example, Switzerland also has a high percentage of immigrant population. This may be explained by the countries location, making border with very important countries such as Italy or France, and because a high amount of people may go to Swiss territory to work. Something similar can explain the evolution of Ireland. Nowadays Ireland has a tax system that is really interesting for companies, and as a consequence some of the biggest companies, such as Apple, moved there, causing the movement of an important amount of individuals from different parts of the world to Ireland.

At this point it is clear that segregation is an important subject. Segregation has been addressed from different points of view in the literature. Some studies use the economic network approach. This is the approach taken, among others, by Schelling (1969) and Easley and Kleinberg (2010). They use networks to explain the segregation phenomenon by using the concept of homophily; which is the tendency individuals will have to be near of other individuals similar to them in some characteristic, such as race or culture. Schelling concludes that segregation is something natural, as human beings prefer being with people similar to them; however, they will not mind being the minority group if their percentage is above a certain threshold.

Figure 3 shows the nature of this approach, and shows clearly what both works talk about. This figure shows the social network of a town’s institute. In the work by Easley & Kleinberg (2010) we can see this image by James Moody, where each race is shown with a different colour. The image seems to be divided in two parts, one depending on race (left to right) and other depending on age and school assistance (up and down). There are more details in this network, but the effects of these two contexts are the ones that stand out the most.

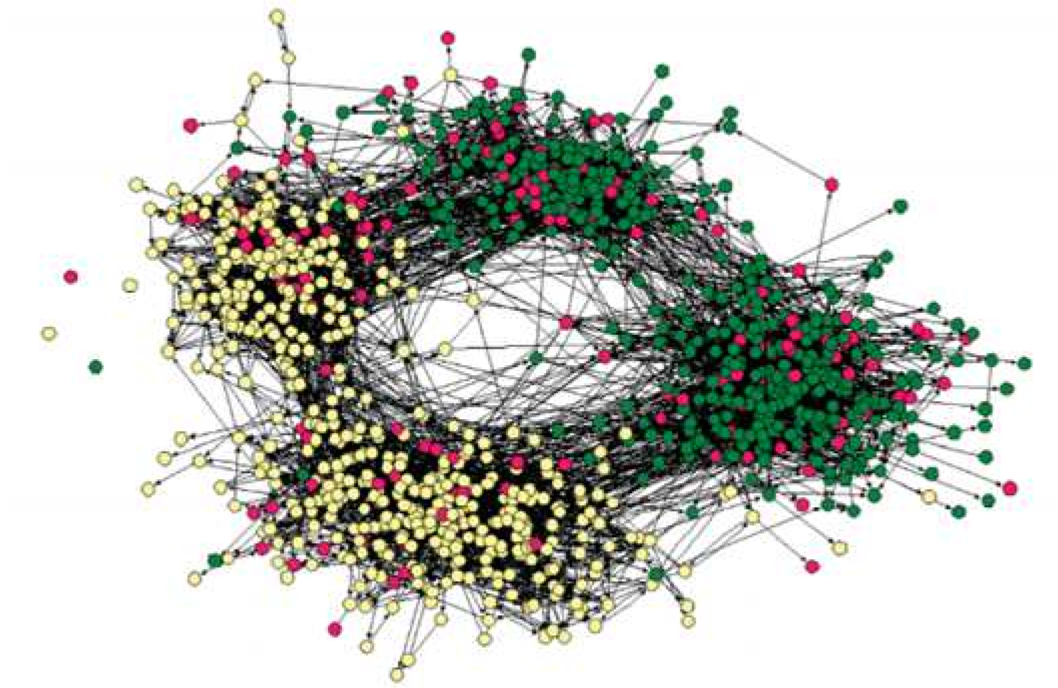


Figure 3: Social network of a secondary education school. Source: "Networks, Crowds and Markets. Reasoning about a highly connected world"

There are also many articles that look at segregation from a more quantitative point of view, by measuring segregation using inequality metrics. One of the pioneering articles in using this approach is that of Massey and Denton (1988). In this work they take a total of 20 indices and analyse the differences between them to see which index is the best for each dimension and depending on what we want to study. This approach has been followed by many other articles. Recently stands out the article by Frankel and Volij (2011) who characterize several multigroup segregation indices that are empirically applied to measure school segregation in the United States. They also study the decomposability property of some indices.

In this article we follow the segregation metrics approach. In particular, we measure how heterogeneously the immigrant population is territorially distributed. Unlike other studies that use microdata from a particular neighbourhood or city, our study uses aggregate data at regional and country level, which, as far as we know, has not been done before. And, as said, research in this subject is important as it will help to design appropriate integration policies. This way a country and its' society can enjoy migrations positive effects.

2.- Data

Data obtained from Eurostat for different countries of the European Union at regional level are used. We obtain data for 27 countries and its regions, which are 256 in total. We work with this data for a time period that comprises from 1999 to 2019, in a yearly basis. Using these data we create a panel data to work with. It is important to say that not all regions report all the information for all the years.

We work with two variables. The first one is region's total population, obtaining the total population of every country as a summation of their regions' data. The second variable will be our main variable, the population with a nationality different to the reporting country; we call individuals with this characteristic "immigrants". It is important to remark which characteristic we will use to define immigrants, since it is a concept with some controversy. This controversy comes from the fact that immigrants' definition is not clear and changes in different works. One of the definitions is "based on record from municipal population registers and correspond to the definition of migration that is identical to the act of crossing an administrative border; actually migrating." (Sardadvar and Rocha, 2016). Other studies use characteristics such as individual's or parents' countries of birth.

For analysing the socio-economic determinants of immigrant distribution, we use macroeconomic variables such as unemployment rate, density or elderly population. We estimate the models using fixed effects.

3.- Segregation metrics

3.1.- Indices

So, in this first part we make an analysis using some indices. Segregation indices measure how immigrants, or any other minority, are mixed with non-immigrants, or any other majority group. These help to measure the segregation in different dimensions, because "segregation is a multidimensional phenomenon" (Massey and Denton, 1988).

Massey and Denton (1988) define a residentially segregated group as a group that is located near the central zone of the cities, distributed in an uneven and concentrated way, causing them to cluster with other individuals of the same group and having little exposure with those from other group. They studied a total of 20 indices, covering the five dimensions mentioned. They do this in order to argue the choice of one index above the rest. Massey and Denton reach the conclusion that segregation should be measured with many indices, not with just one. That is, we have to look for the best index for every dimension, as they represent different parts of segregation and are conceptually different.

Following Massey and Denton (1988), these dimensions are evenness, exposure, concentration, centralization and clustering. The exposure dimension refers to the possibility of, or the extent there is, interaction between groups in a certain place. It is conceptualized as the probability of member of both, majority and minority groups, to share the same region. Although exposure and evenness dimensions explain different parts of the segregation, their indices are really correlated. There are three indices of exposure. These are the interaction index, the isolation index and the correlation ratio.

The concentration dimension “refers to relative amount of physical space occupied by a minority group in the urban environment” (Massey and Denton (1988)). If one group, relatively as big as the other, uses less space, they are more concentrated and, as a consequence, more segregated. Indices measuring this dimension are Delta, absolute concentration and relative concentration.

The centralization measures show to what point is one group located near the centre of the country. It has two indices, the absolute and relative measures of centralization.

The last dimension is the clustering. This measures the extent to which the spaces where the minorities are cluster or get together. A high degree of clustering means that there is segregation. We have five indices in this dimension: absolute clustering, spatial proximity, relative clustering, distance-decay interaction index and the distance-decay isolation index.

Last we have the evenness dimension, which is the one we will work with. Evenness measures the uniformity; this is, how uniformly immigrants are territorially distributed. "A minority group is said to be segregated if it is unevenly distributed over the areal units studied" (Blau 1977).

Correlations of indices have also been studied; indices that measure the evenness dimension are really intercorrelated. That is, they measure essentially the same property of segregation, so it does not matter which one is used. The evenness measures most commonly used are the next ones.

In the first case we have the dissimilarity index or Delta (D), which is the most widely used index. It measures the percentage of the group's population that would have to change residence for each region to have the same percentage of the groups as the country overall. It ranges from zero to one, being zero minimum segregation and one maximum segregation. The formula used to calculate the index is

$$D = \frac{\sum_{i=1}^{n}[t_i|(p_i - P)|]}{[2TP(1 - P)]}$$

If we use these indices to measure segregation in Europe using data from regions, the variables are defined such as: the number of regions in Europe (n), total population of the region i (t_i), the total population of Europe (T), proportion of immigrant population in region i (p_i), and proportion of immigrant population in Europe (P). In case of measuring it for a specific country, the sub-i variables are regions' data and the capital letters are data at country level; for example, country's total population.

Next we have the entropy or information index (H). This index was proposed by Theil and measures the weighted average deviation of each region from the country diversity. It is bigger when each group is equally represented in the area. It also ranges from zero to one, the latter meaning that the areas contain only one of the groups. We calculate this index this way,

$$H = \sum_{i=1}^{n}\left[\frac{t_i(E - E_i)}{ET}\right]$$

$$where\ E_i = p_i ln\left(\frac{1}{p_i}\right) + (1 - p_i) ln\left(\frac{1}{1 - p_i}\right)$$

$$and\ E = P ln\left(\frac{1}{P}\right) + (1 - P) ln\left(\frac{1}{1 - P}\right)$$

Last we will be using the Atkinson index (A), which allows to weight regions at different points on the distribution. Permitting that where minorities are under or over-represented contribute in a more important way to the overall index. The maximum segregation is represented by a value of a unit, whereas minimum segregation is represented by a value of zero.

$$A = 1 - \left(\frac{P}{1 - P}\right) \left| \sum_{i=1}^{n} \left[\frac{(1 - p_i)^{1-b} p_i^b t_i}{PT} \right] \right|^{\frac{1}{1-b}}$$

In this case, we have “b”, which is the parameter in the Atkinson index for weighting the points of the distribution. If the parameter, that goes from zero to one, has a value equal to 0.5, all points in the distribution are equally weighted. If the parameter has a high value, close to 1, the index becomes more sensitive to changes at the lower end of the distribution. In the same way, as the level of inequality aversion falls, the Atkinson becomes more sensitive to changes in the upper end of the distribution. In our work we will use a parameter value of 0.5.

We can see the information about each of the indices together in Table 3:

	DEFINITION / CHARACTERISTICS	FORMULA
Dissimilarity Index or Delta (D)	The most widely used index. Measures the percentage of the group's population that would have to change residence for each region to have the same percentage of the groups as the country overall.	$\frac{\sum_{i=1}^{n}[t_i\|(p_i - P)\|]}{[2TP(1-P)]}$
Entropy Index or Information Index (H)	It measures the weighted average deviation of each region from the country diversity. It is bigger when each group is equally represented in the area.	$\sum_{i=1}^{n}\left[\frac{t_i(E-E_i)}{ET}\right]$ $E_i = p_i ln\left(\frac{1}{p_i}\right) + (1-p_i)ln\left(\frac{1}{1-p_i}\right)$ $E = Pln\left(\frac{1}{P}\right) + (1-P)ln\left(\frac{1}{1-P}\right)$
Atkinson Index (A)	Allows to weight regions at different points on the distribution. Permitting that where minorities are under or over-represented contribute in a more important way to the overall index.	$1 - \left(\frac{P}{1-P}\right)\left\|\sum_{i=1}^{n}\left[\frac{(1-p_i)^{1-b}p_i^b t_i}{PT}\right]\right\|^{\frac{1}{1-b}}$

Table 3:Definition and formula of dissimilarity, entropy and Atkinson indices

These indexes satisfy some of the four criteria that were established by James and Taeuber (1985). These properties are characteristics to have a good index; this is, indices that fulfil the four principles are good indices. This are the transfer principle, which says that a measure should be sensitive to redistribution of the immigrant population among countries with immigrant proportions above or below the region's. The second criterion is the compositional invariance, so the relative size of the immigrant population should not affect the index. Third we have the size invariance, which states that the measure should not be affected if the number of immigrant and non-immigrant population is multiplied by a constant. And fourth, the organizational equivalence, which means that the index should be unaffected by aggregating units with the same minority composition. The three indices that we study do not fulfil all the principles. In the case of the dissimilarity index, it fails to satisfy the transfer principle. On the other hand, the same happens with the compositional invariance in the case of the entropy index. The Atkinson index is the only index, out of those we use, that satisfies without any problem the four criteria.

Massey & Denton worked with a total of 20 indices, but the reduced the list to five, just one index for each one of the dimensions. So, to summarize, in the evenness case, that is the one in which we are interested, the best option is the dissimilarity index by Duncan and Duncan as it contains most information that the other indices can provide. Apart from that, there are continuity and ease reasons, as most of previously written literature uses this index. As said we will be using two more indices, the entropy index, which is an index that works well too, and it can be divided to see the weight of each one of the groups analysed. This decomposition might be useful to see to which extent the inequalities are generated within groups and to which extent are caused because of differences between groups. However, we do not use that property in this paper; and the Atkinson index, which is also a great choice, since it fulfils the four principles previously explained. That is why we decide to focus on these three indices.

3.2.- Results

We are not interested only in the results obtained by using the indices, we also want to observe the evolution they had during the time period studied, to see how they all evolve in the same way, even if they make the measures in different ways.

We calculate the uniformity in the distribution of immigrants in two levels. First of all, we measure it at European level, using every NUTS2 region from our country sample. Second, we measure it at country level, using every NUTS2 region of each country. This analysis is made for each one of the years of our sample, 1999-2019.

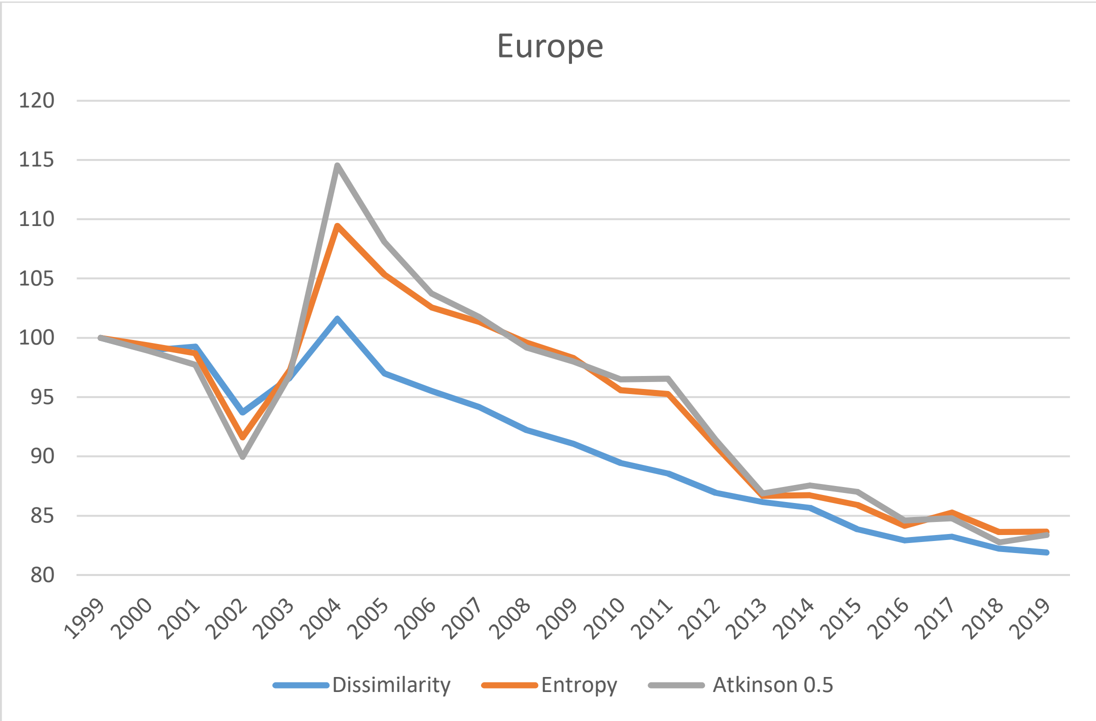


Figure 4:Evolution of dissimilarity, entropy and Atkinson 0.5 indices at European level, 1999-2019

Figure 4 shows the evolution of the dissimilarity index, the entropy index and the Atkinson index with 0.5 parameter for Europe. In this case, in which we study the indices at European level, we analyse Europe as if it was a country as a whole, with all the NUTS2 regions taken inside. In order to see results in a clearer way, the values obtained have been normalized, using 1999 as the base year. It can be observed that the three indices have a similar evolution, and, in general, a negative trend. What means that the immigrant population is more evenly distributed in 2019 than in 1999. These results corroborate the intuition generated from the first glance. This is, the intuition that segregation decreases with time. This could happen because, with the passage of time, immigrants try to move to countries where work possibilities exist but where the first waves of migration did not arrive. We observe an increase in the indices' value in the years 2004 and 2005; this may happen because we obtain data for some countries at first time in this period. Examples of these countries are Italy or Romania, which have not data until these years.

If we take a look to the European indices of dissimilarity, we can see that the dissimilarity index is the one that shows highest values until 2003. After this year it is the one below for every other year. It is also the index with the most uniform trend. With this information we can say that, according to the dissimilarity index, the segregation has been reduced over time. The other two indices will give a similar result, but they show a smaller reduction of the segregation than the dissimilarity index, since during these two decades the value of the dissimilarity index has reduced in 18.1% against the reduction of 16.35% and 16.63% of the entropy and Atkinson indices respectively.

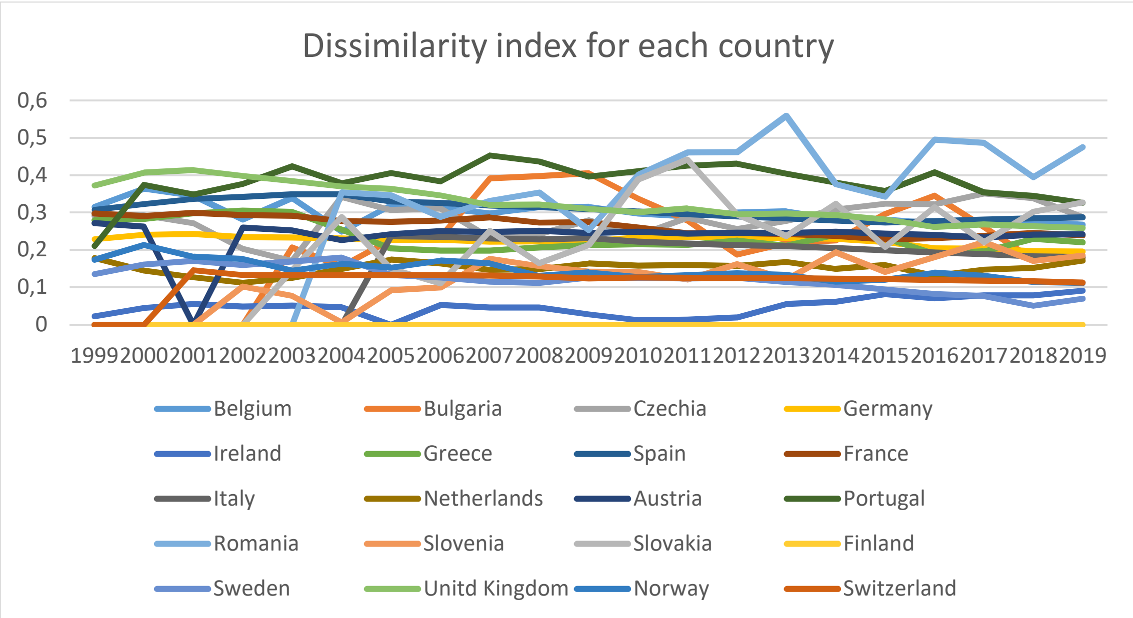


Figure 5:Dissimilarity index for each country, 1999-2019

First of all, we calculate the dissimilarity index, which is the most widely one used. Figure 5 shows the index for the 1999-2019 period for the European countries for which we have available data. We can see that the values are below 0.4 in most cases. The highest value is obtained by Romania, being around 0.55. At the same time, it evidences differences in segregation across countries; which mean that inside each country "immigrants" are not homogeneously distributed. We also observe that the evolution of the index changes between countries. However, during these two decades the value of the index has decreased in most of these countries, which means that heterogeneity in the territorial distribution has decreased according to this index. In this Figure 5 we observe that some countries are missing, this happens because countries such as Luxembourg or Malta have only one regions, and, as a consequence, the index value they obtain is always zero.

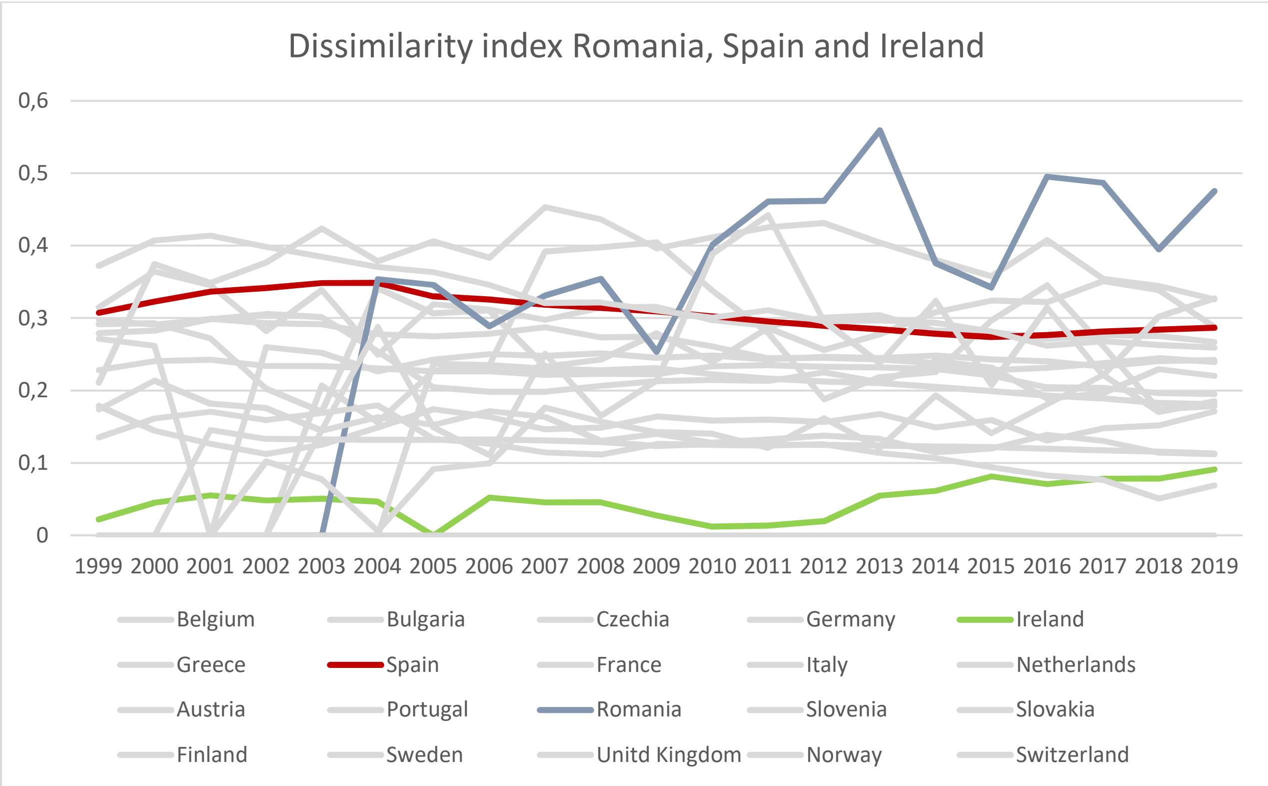


Figure 6: Dissimilarity index for Romania, Spain and Ireland, 1999-2019

Figure 6 shows the evolution of the dissimilarity index in the three chosen countries. In this case we have chosen Romania (blue line), Spain (red line) and Ireland (green line). We can see that, for example, in Romania immigrants are more unevenly distributed than in Spain or Ireland, that is all it shows, it has nothing to do with the number of immigrants. In the case of Romania, we see an irregular increase. It is the country that reaches the highest values and it ends being the country with the highest immigrant concentration. In the case of Spain, we see values that show that it is neither the country where the immigrants more segregated are nor the country with the most homogeneous geographical distribution. We also see that it has a relatively flat curve, which means that in terms of concentration it has not changed too much. Last we have the case of Ireland, where we observe an increase in the unevenness distribution of immigrants. During most part of the period is the country analysed with the lowest index value. There can be many reasons to make this happen, for example, it could be that most immigrants in Romania are there for work reasons and that specific types of jobs are concentrated, causing an irregular distribution of these immigrants.

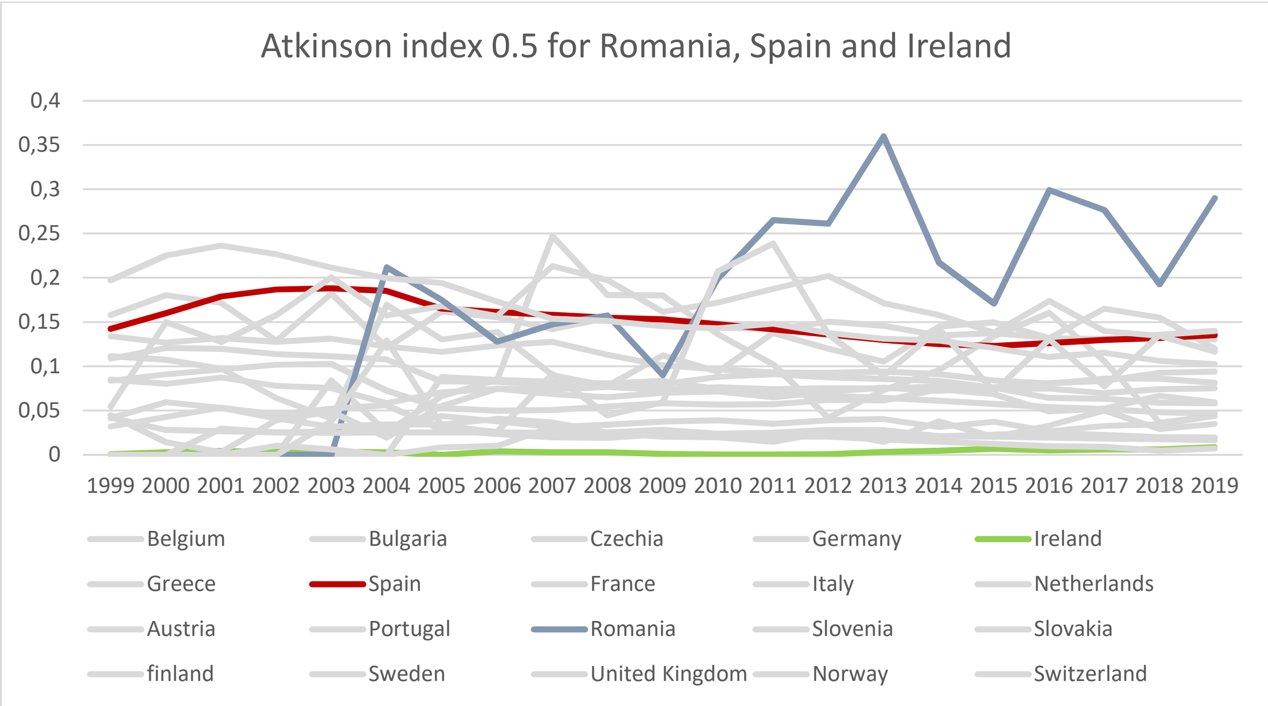


Figure 7: Atkinson 0.5 index for Romania, Spain and Ireland, 1999-2019

In Figure 7 we have the same analysis for the Atkinson index. This index allows us to choose the value of the parameter b. Figure 7 shows the calculated index for b=0.5. This is, as said by Iceland et al. (2002), the index will be more sensitive to changes in the middle part of the distribution, when underrepresented and overrepresented areas contribute equally. In this case we obtain lower values than in the dissimilarity case. Romania has the peak value too, and also the highest value of 2019, while Sweden has the lowest value of this year. We can see that the evolution of different countries is virtually the same that what we have just seen with the dissimilarity index. If we take a look to the same three countries previously projected, we see in a clear way that results are, although quantitatively different, qualitatively similar.

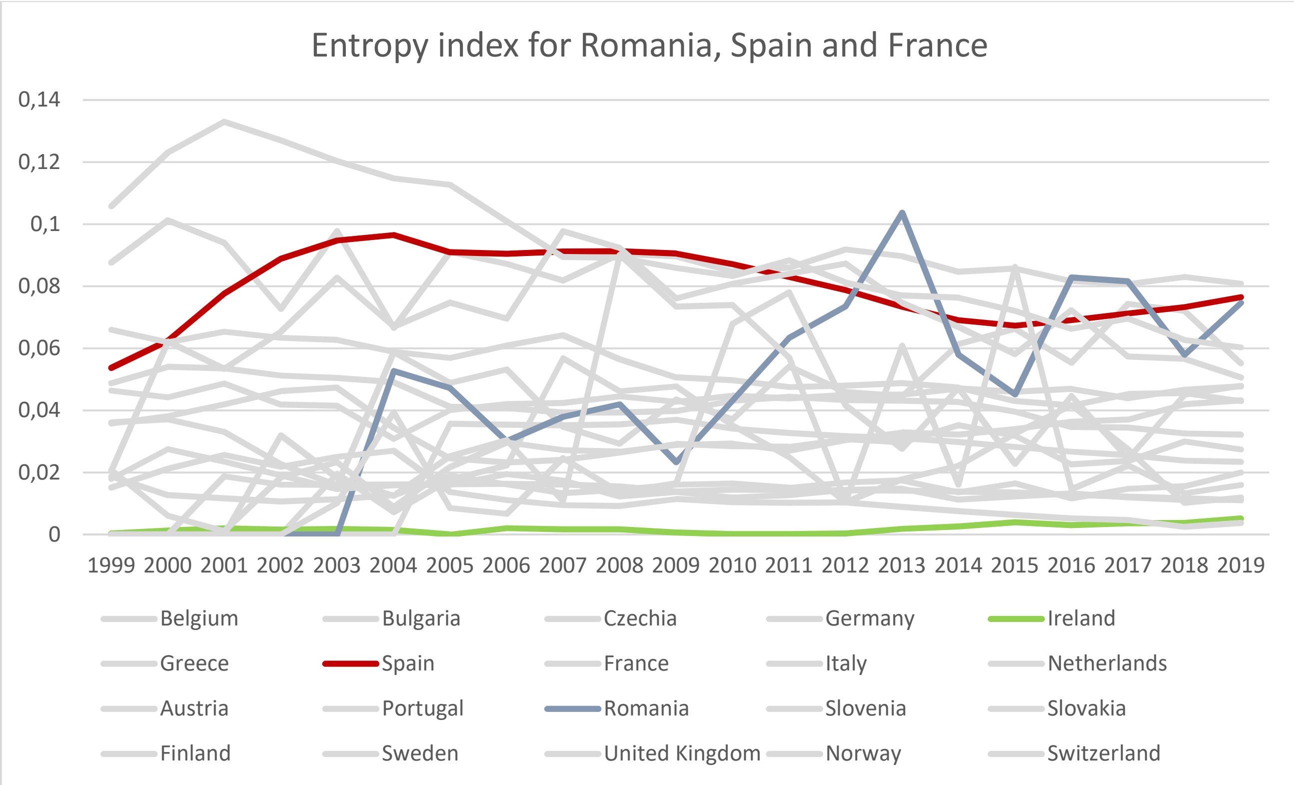


Figure 8: Entropy index for Romania, Spain and Ireland, 1999-2019

Lastly, we have the entropy index, also known as the information index. As we can see in Figure 8, the values obtained are different to the ones obtained above, since they are calculated in a different way. However, we see that in all cases the values are not really high for any country. Once again we observe similar quantitative results than with the other indices used. In the three cases we observe an irregular increase for Romania, a pretty similar trend in Spain and low values with a little increase in Ireland.

To summarize, and as a conclusion of this first part, when analysing at European level, we can see that, in general, the evolution during the period is very similar for the different indices used. Taking a look to the values of the calculated segregation indices presented in Table 11 in appendix, we can see that segregation has decreased at European level between 1999 and 2019. However, with each index the intensity of this trend is different. This strength is bigger in the case of the dissimilarity index, where the value of the index reduces in more or less 18% while in the case of the other two indices we can see that the value is around 16% smaller in 2019 than in 1999.

In the case of the country level analysis, we see that even if the values obtained with each index are different, they show virtually the same. Data shows heterogeneity at country level. Most of the countries show a decreasing trend throughout the years, fulfilling the expectation in this case too. In some countries immigrants are much more concentrated, for example in Romania and Italy, while in other countries the distribution is nearly uniform, the cases of Ireland and Sweden. So with all the three indices we reach the conclusion that immigrants are geographically unevenly distributed. For example, immigrant population is more homogeneously distributed in the territory in Ireland than in Romania. However, the most important and remarkable point is that the results are qualitatively similar even if they are quantitatively different.

4.- Determinants of segregation metrics

In this second part of the paper we want to see what macroeconomic variables have an effect on the segregation indices and how affect them. For this we use all data together taking into account its panel structure. In order to analyse the effect that some macroeconomic variables have over the segregation indices. A fixed effects model is specified,

$$Y_{i,t} = \alpha_i + \beta X_{i,t} + u_{i,t}$$

where the dependent variable, $Y_{i,t}$, is the segregation index. We have an index for each country and year. Subscript i is used to indicate the country, and subindex t indicates the year, we have 19 countries and 21 years in this case. In this part we work with 19 countries because we do not use countries with only one region, like Luxembourg or Estonia, because the value of their indices is always zero. $X_{i,t}$ is the regressor. These regressors are some macroeconomic variables that can be a priori determinants of the segregation. Last, $u_{i,t}$ is the error term. With these fixed country and time effects, Bentivogli and Pagano (1999) state that regional net migration is sensitive to changes in income disparities, but unresponsive to changes in the relative unemployment rates.

The macroeconomic variables we will be using are: Unemployment rate, Density, Elderly population, R&D expenditure, Gross Domestic Product, Foreigners, Fertility rate, New citizenship, Education and Government expenditure. We can see how each one is measured in Table 4.

Variables	Measures
Unemployment rate	Percentage of labor force that is jobless
Density	Population per square kilometre
Elderly population	Percentage of population with age over 65
R&D Expenditure	Percentage of gross domestic product used in R&D
GDP	In thousands per capita
Foreigners	Percentage of non-national population
Fertility rate	Average number of children that would be born to a woman over her lifetime.
New citizenship	The population that each year has received the nationality of the reporting country as percentage of total population
Education	Adult population with tertiary education as percentage of total population
Government expenditure	Percentage of the Gross Domestic Product

Table 4: Macroeconomic variables and their measure

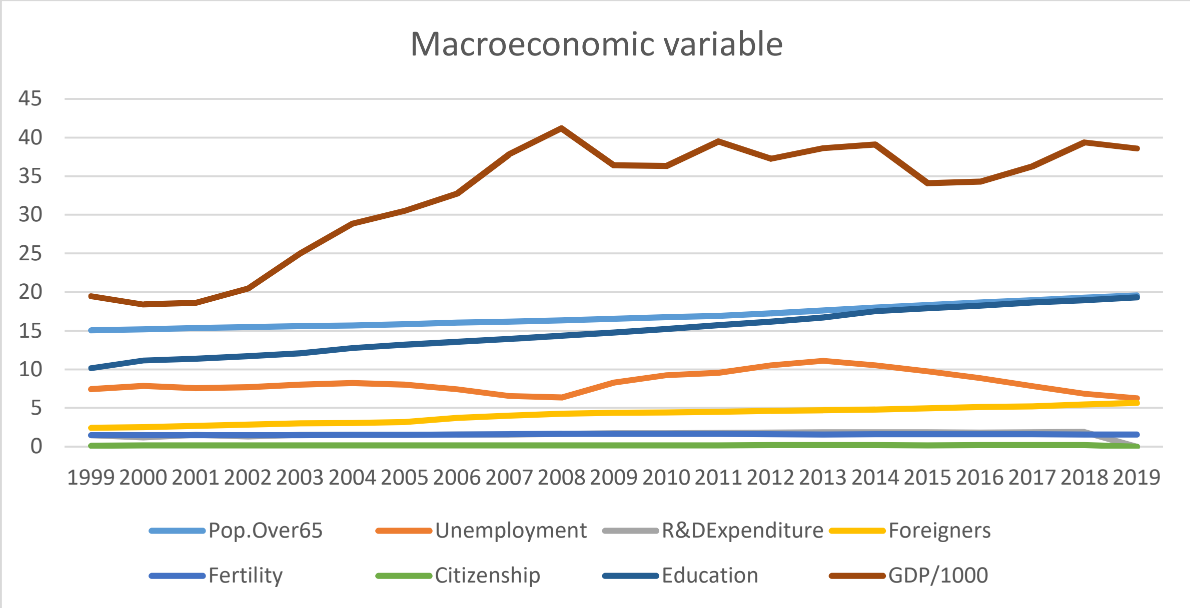


Figure 9:Evolution of different macroeconomic variables, 1999-2019

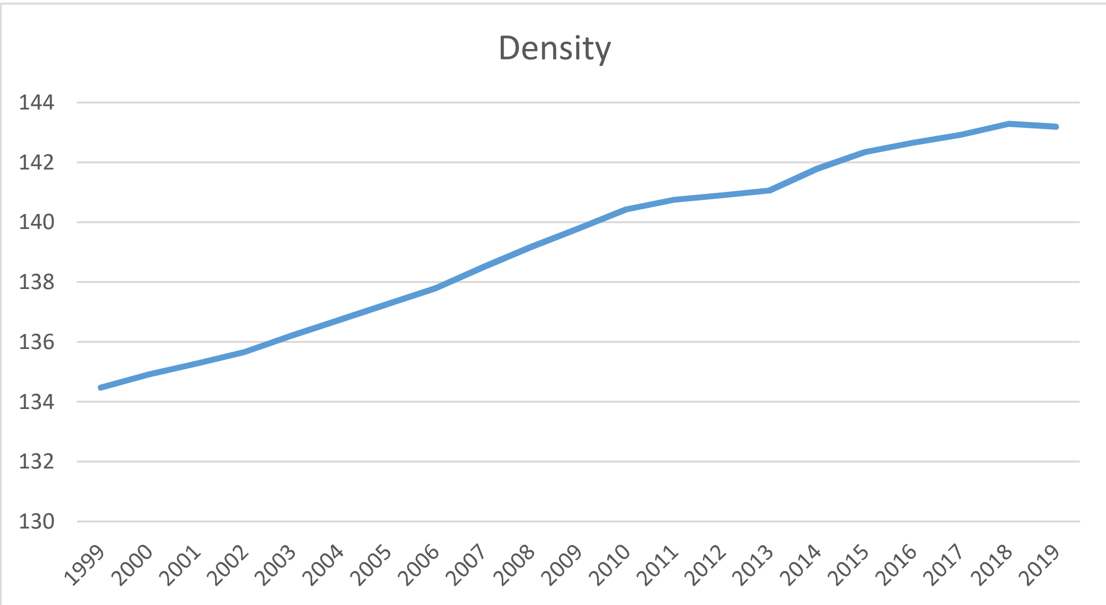


Figure 10: Evolution of density, 1999-2019

In Figure 9 we can see the evolution of most of these macroeconomic variables. Taking a look to Figure 9, we can see three groups. In the first group we have those variables that have a little change during this period. In this first group we have “New citizenship”, “R&D Expenditure”, “Fertility rate” and “Unemployment rate”. Then we have variables that have increased through time, mostly in a uniform way. Examples of this are “Foreign population”, “Elderly population” and

“Education”. Last we have the “GDP” in thousands per capita. This variable shows a positive trend in general, although there are some moments with decreases. It goes from 20 to 40; what means that the mean per capita Gross Domestic Product has increased from 20,000 to nearly 40,000. This last variable is really important because, as previously said, we want to test whether there is a Kuznets effect; that is, quadratic relation between GDP per capita and the indices. Figure 10 shows the evolution of density, which goes increasing with time

The fixed effect model is estimated using robust deviations in order to cope with possible heterocedastic and autocorrelated issues in the error term. Table 6 presents the estimation results: estimated coefficients, t-statistics, goodness of fit and some error criteria. Asterisks indicate the significance of the variables, “*” are significant with p-value smaller than 0.1, variables with “**” and “***” are significant with p smaller than 0.05 and 0.01 respectively.

The first index analysed is the dissimilarity index. So we specify a first model with all the variables above defined, to see which variables are significant to explain the index. In Table 5 we see the evolution from the first model, where we took all the variables, to the definite one. We have the coefficients, the significance and the values of the error criteria, as is what we have based on to choose the best model. In this Table 5 we also see the R-square and the p-value of the contrast that we use to reject the equality of the intercepts in the estimated models.

	Model 1			Model 2			Model 3		
	Coefficient	**Significance**	**R^2, error criteria and p value**	**Coefficient**	**Significance**	**R^2, error criteria and p value**	**Coefficient**	**Significance**	**R^2, error criteria and p value**
Elderly population	0.0073	**	R^2= 0.811367 Schwarz criteria= -1,007.235 Akaike criteria= -1,122.015 Hannan-Quinn criteria= -1,076.275 p-value= 7.98e-050	0.0067	**	R^2= 0.813123 Schwarz criteria= -1,029.448 Akaike criteria= -1,140.994 Hannan-Quinn criteria= -1,096.576 p-value= 1.09e-049	0.0068	**	R^2= 0.813113 Schwarz criteria= -1,035.275 Akaike criteria= -1,142.976 Hannan-Quinn criteria= -1,100.089 p-value= 1.53e-049
Unemployment rate	-0.0015			-0.0018	*		-0.0017	*	
GDP	0.0035	***		0.0032	***		0.0032	***	
GDP_sq	-2.62e-05	***		-2.41e-05	***		-2.37e-05	***	
R&D Expenditure	0.0012			0.0021			0.0017		
Density	-0.0026	***		-0.0026	***		-0.0025	***	
Foreigners	-0.0051	**		-0.0053	**		-0.0052	**	
Fertility rate	0.0037			-0.0039					
New citizenship	0.0071								
Gov. Expenditure	0.0005			0.0006			0.0006		
Education	-0.0002			-3.72e-05			0.0001		

Table 5: Estimation of the empirical model for the dissimilarity index

	Model 4			Model 5		
	Coefficient	Significance	R^2, error criteria and p value	Coefficient	Significance	R^2, error criteria and p value
Elderly population	0.0067	***	R^2= 0.813112 Schwarz criteria= -1,041.119 Akaike criteria= -1,144.973 Hannan-Quinn criteria= -1,103.618 p-value= 8.40e-048	0.0064	***	R^2= 0.812859 Schwarz criteria= -1,046.498 Akaike criteria= -1,146.506 Hannan-Quinn criteria= -1,106.682 p-value= 3.56e-049
Unemployment rate	-0.0018	*		-0.0015	*	
GDP	0.0032	***		0.0033	***	
GDP_sq	-2.37e-05	***		-2.49e-05	***	
R&D Expenditure	0.0016			0.0026		
Density	-0.0026	***		-0.0025	***	
Foreigners	-0.0053	***		-0.0050	***	
Fertility rate						
New citizenship						
Gov. Expenditure	0.0006					
Education						

Fixed effects, using 346 observations
Dependent variable: Dissimilarity Index
Beck-Katz standard deviations

	Coefficiente	*t-statistic*	
Constant	0.4268	13.08	***
Elderly population	0.0058	3.896	***
Unemployment rate	-0.0016	-2.296	**
GDP	0.0029	5.568	***
GDP_sq	-2.23e-05	-5.283	***
Density	-0.0023	-7.751	***
Foreigners	-0.0053	-4.397	***

R-square MCVF (LSDV)	0.802992		
Log-likelihood	634.0464	Akaike criteria	-1218.093
Schwarz criteria	-1120.255	Hannan-Quinn criteria	-1179.231
rho	0.534341	Durbin-Watson	0.860146

Robust contrast for different intercepts in groups -
Null hypothesis: Groups have a common intercept
Contrast statistic: Welch F (18, 126.8) = 49.7004
with p-value = P (F(18, 126.8) > 49.7004) = 1.41e-048

Table 6. Econometric model of dissimilarity index

After different approaches the model of Table 6 is the best model we find to explain the dissimilarity index, which is the dependent variable in this case. In order to decide whether it is the best model or not we have used the log-likelihood and the errors. In this case the log-likelihood obtained is the highest and the values of the Akaike criteria, Schwarz criteria and the Hannan-Quinn criteria are the lowest obtained. We can see that 80.2992% of the variability of the dependent variable is explained by the variability of the independent variables here used, so we have a good adjustment.

We observe that in this last model all the variables are significant, but each one in a different way. In the case of elderly population, the sign is positive, so if the percentage of population older than 65 increases in one percent, the estimated increase in the expected segregation index is 0.0058. This means that the distribution of immigrants will be more uneven than in the origin. This may be because the workplace of those that retired was concentrated, so that immigrants that occupy now those positions will be concentrated. In the case of the unemployment rate the effect is just the opposite. If this rate gets an increase of one percent, the estimated decrease in the segregation index is 0.0016, so the immigrant population will be more uniformly distributed in the territory. This can be caused due to the movement of both national and non-national population through the territory seeking for a new job, causing a mix between these two population groups. In the case of density, the same happens, as the sign continues being negative. So if the population per square kilometre increases in one unit, immigrant population will be more homogeneously distributed. This could happen because a high density means that there is population in all the geography of that country, as it measures how population is distributed. So, when immigrants arrive they have to distribute throughout all territory because it would be impossible for all to be in the same points, having, as a consequence, a lower territorial segregation. Something similar happens when observing the effect of foreign population. This variable will, logically, have a negative effect. So, if the percentage of foreign population increases in one point, the estimated decrease in the segregation index is 0.0053, so there will be a more even distribution of the immigrant population. This may happen for a reason similar than in the density case. When there is a high foreign population they cannot all locate in the same places, so they will mix with national population, having, as a consequence, a lower territorial segregation.

Unlike with the other regressors, the dependent variable does not have a linear relation with GDP, but a quadratic relation. We can observe that the coefficient of the linear relation is positive, whereas the coefficient of the quadratic is negative. This means that we have a bell shaped curve. So, the response to our question about the GDP having a Kuznets effect turns out positive. This basically means that when GDP increases in a country the immigrant distribution will be more uneven at the beginning. Once a point is reached; which we call the "threshold of GDP", the relation will be the opposite, value of the segregation index will decrease while the GDP increases. In order to know which that threshold is in this case we will derive the expected segregation index respect to the GDP and set it equal to zero. The threshold parameter obtained evaluating it on the minimum possible estimated value of the coefficient and clearing the equation. In this case this threshold will be 29.3529. So, countries with a per capita GDP bigger than 29,352.9 will have a negative relation between GDP and the segregation index. These countries are Belgium, Germany, Ireland, Spain, France, Italy, Netherlands, Austria, Finland, Sweden, United Kingdom and Norway.

Next analysis is for the Atkinson index with parameter 0.5. Table 7 shows some of the specification changes the model has gone through until having the chosen one. In the table we see the coefficients, the significance of the variables in each model, the R-square, the values of the error criteria; that are important on our model choice, and the p-value of the contrast we have used to reject the equality of the intercepts in the estimated models.

	Model 1			Model 2		
	Coefficient	Significance	R^2, error criteria and p value	Coefficient	Significance	R^2, error criteria and p value
Elderly population	0.0005		R^2= 0.787739 Schwarz criteria= -1,282.430 Akaike criteria= -1,397.298 Hannan-Quinn criteria= -1,351.528 p-value=1.25e-055	0.0004		R^2= 0.789555 Schwarz criteria= -1,313.996 Akaike criteria= -1,425.710 Hannan-Quinn criteria= -1,381.234 p-value=3.02e-057
Unemployment rate	-0.0009			-0.0013	*	
GDP	0.0012	**		0.0011	**	
GDP_sq	-9.41e-06	**		-9.20e-06	**	
R&D Expenditure	0.0078			0.0085		
Density	-0.0018	***		-0.0018	***	
Foreigners	-0.0043	**		-0.0042	**	
Fertility rate	0.0088			0.0087		
New citizenship	-0.0027					
Gov. Expenditure	0.0002			0.0003		
Education	0.0017			0.0018		

Table 7: Estimation for the empirical model for the Atkinson 0.5 index

	Model 3			Model 4		
	Coefficient	**Significance**	**R^2, error criteria and p value**	**Coefficient**	**Significance**	**R^2, error criteria and p value**
Elderly population			R^2= 0.789536 Schwarz criteria= -1,319.817 Akaike criteria= -1,427.678 Hannan-Quinn criteria= -1,384.737 p-value= 2.92e-055			R^2= 0.789425 Schwarz criteria= -1,325.486 Akaike criteria= -1,429.495 Hannan-Quinn criteria= -1,388.087 p-value=6.13e-056
Unemployment rate	-0.0013	*		-0.0014	**	
GDP	0.0012	**		0.0013	***	
GDP_sq	-9.41e-06	**		-1.01e-05	***	
R&D Expenditure	0.0087			0.0094	*	
Density	-0.0019	***		-0.0019	***	
Foreigners	-0.0044	***		-0.0045	***	
Fertility rate	0.0078					
New citizenship						
Gov. Expenditure	0.0003			0.0003		
Education	0.0020	*		0.0020	*	

Fixed effects, using 348 observations Dependent variable: Atkinson 0.5 Index Beck-Katz standard deviations			
	Coefficient	*t-statistic*	
Constant	0.3099	9.544	***
Unemployment rate	-0.0013	-2.302	**
GDP	0.0013	3.510	***
GDP_sq	-1.07e-05	-3.686	***
R&D Expenditure	0.0099	1.897	*
Density	-0.0019	-6.663	***
Foreigners	-0.0043	-3.444	***
Education	0.0019	1.869	*

R-square MCVF (LSDV)	0.789250		
Log-verosimilitud	741.6032	Akaike criteria	-1431.206
Schwarz criteria	-1331.049	Hannan-Quinn criteria	-1391.332
rho	0.450756	Durbin-Watson	0.997583

Robust contrast for different intercepts in groups -
Null hypothesis: Groups have a common intercept
Contrast statistic: Welch F (18, 119.5) = 77.0527
with p value = P (F (18, 119.5) > 77.0527) = 6.51e-057

Table 8: Econometrical model of the Atkinson 0.5 index

As before, many specifications have been estimated and compared in terms of error criteria. The estimation results for the selected specification is shown in Table 8. Some significant variables are familiar from the dissimilarity index analysis: unemployment rate, density and foreigners. These variables maintain the same sign they had before; this is; the three variables affect in a negative way. So, if unemployment increases in one percent, the immigrant population will be more evenly distributed, as the value of the index is lower. In the same way, if density increases, or the population of foreigners increases in one percent, the immigrant population will be more homogeneously distributed in the territory. We also see that the adjustment is good, since 78.925% of the variability of the Atkinson index with parameter 0.5 is explained by the variability of these independent variables. Like happened in the analysis of the dissimilarity index, the log-likelihood obtained by this model is the highest out of the specifications used, also the values of the criteria are the lowest.

In this case we have new significant variables, the “R&D Expenditure” and “Education”. In both cases the effect is positive. So, if the expenditure made in R&D, as percentage of GDP, increases in one percent, the estimated increase in the expected segregation index is 0.0099, so the distribution of immigrant population will be more uneven. This may be because Research and Development may concentrate qualified work. In the case of education, if adult population with tertiary education, as percentage of total population, increases in one unit, the estimated increase in the expected segregation index is 0.0019, causing a more heterogeneous distribution of immigrant population. This might be caused due to qualified jobs requiring this type of education being geographically concentrated.

If we take a look to the GDP and its’ square we can see that the Kuznets effect we saw in the dissimilarity index case is still present. So, those countries with GDP above minimum threshold have a negative relation between GDP and the index. This is, when GDP increases the value of the index decreases in these countries. Following the same process previously done, we get that the minimum threshold GDP is, in this case, 22.067. This means that the relation between these two variables will be negative when the GDP per capita is bigger than 22,067. This threshold is smaller than in the previous case, so those countries plus some new will be included. These additional countries are the Czech Republic, Portugal and Slovenia.

Last, we will analyse the entropy index. In the same way than in previous cases, many specifications have been estimated. Table 9 shows this process until having obtained the last model. In this case we reject the equality of the intercepts in the estimated models too.

	Model 1			Model 2			Model 3		
	Coefficient	**Significance**	**R^2, error criteria and p value**	**Coefficient**	**Significance**	**R^2, error criteria and p value**	**Coefficient**	**Significance**	**R^2, error criteria and p value**
Elderly population	0.0006		R^2= 0.824461 Schwarz criteria= -1,852.645 Akaike criteria= -1,967.425 Hannan-Quinn criteria= -1,921.685 p-value= 1.76e-049	0.0006		R^2= 0.824437 Schwarz criteria= -1,858.425 Akaike criteria= -1,969.379 Hannan-Quinn criteria= -1,925.164 p-value= 1.41e-049	0.0005		R^2= 0.822473 Schwarz criteria= -1,901.886 Akaike criteria= -2,009.586 Hannan-Quinn criteria= -1,966.699 p-value= 1.39e-051
Unemployment rate	-0.0003			-0.0003			-0.0003		
GDP	0.0009	***		0.0009	***		0.0009	***	
GDP_sq	-6.48e-06	***		-6.64e-06	***		-6.39e-06	***	
R&D Expenditure	0.0107	***		0.0109	***		0.0106	***	
Density	-0.0007	***		-0.0007	***		-0.0007	***	
Foreigners	-0.0007			-0.0007			-0.0006		
Fertility rate	0.0017								
New citizenship	0.0033			0.0032					
Gov. Expenditure	0.0002			0.0002			0.0002		
Education	-0.0006			-0.0006			-0.0006		

Table 9: Estimation for the empirical model for the entropy index

	Model 4			Model 5			Model 6		
	Coefficient	**Significance**	**R^2, error criteria and p value**	**Coefficient**	**Significance**	**R^2, error criteria and p value**	**Coefficient**	**Significance**	**R^2, error criteria and p value**
Elderly population	0.0004		R^2= 0.822196 Schwarz criteria= -1,907.191 Akaike criteria= -2,011.045 Hannan-Quinn criteria= -1,969.690 p-value= 6.58e-061			R^2= 0.822066 Schwarz criteria= -1,912.786 Akaike criteria= -2,012.793 Hannan-Quinn criteria= -1,972.970 p-value= 3.41e-059			R^2= 0.821696 Schwarz criteria= -1,917.913 Akaike criteria= -2,014.074 Hannan-Quinn criteria= -1,975.782 p-value= 3.48e-059
Unemployment rate	-0.0002			-0.0002			-0.0003		
GDP	0.0009	***		0.0009	***		0.0008	***	
GDP_sq	-6.76e-06	***		-6.89e-06	***		-6.47e-06	***	
R&D Expenditure	0.0109	***		0.0111	***		0.0102	***	
Density	-0.0007	***		-0.0007	***		-0.0007	***	
Foreigners	-0.0005			-0.0007			-0.0009	*	
Fertility rate									
New citizenship									
Gov. Expenditure									
Education	-0.0006			-0.0004					

Fixed effects, using 350 observations Dependent variable: Entropy Index Beck-Katz standard deviations			
	Coefficient	*t-statistic*	
Constant	0.1212	10.54	***
GDP	0.0008	4.281	***
GDP_sq	-5.84e-06	-4.164	***
R&D Expenditure	0.0101	3.015	***
Density	-0.0008	-8.814	***
Foreigners	-0.0009	-1.867	*

R-square MCVF (LSDV)	0.819703		
Log-likelihood	1042.936	Akaike criteria	-2037.872
Schwarz criteria	-1945.282	Hannan-Quinn criteria	-2001.018
rho	0.398579	Durbin-Watson	1.100795

Robust contrast for different intercepts in groups -
Null hypothesis: Groups have a common intercept
Contrast statistic: Welch F (18, 119.8) = 80.0174
with p-value = P (F(18, 119.8) > 80.0174) = 6.49e-058

Table 10: Econometric model of entropy index

Once having gone through different models, we decide that the one shown in Table 10 is the best one, in terms of log-likelihood and error criteria. We observe that 81.9703% of the entropy indexes' variability is explained by the variability of the regressors of this definitive model. This is the best adjustment out of the three indices' models, and this happens being this the model with least variables out of everyone that has been done. We observe an increase in log-likelihood at the same time that errors decrease, giving a higher reliability to this last model, in the case where the entropy index is the dependent variable. We see that "R&D Expenditure", "Density" and "Foreigners" are significant variables. We are not going to explain again what this means, as they maintain the sign seen before for the other indices.

In this last analysis there still is presence of Kuznets effect. So, like in the previous cases we calculate the minimum threshold of GDP, to see the relation between these two variables in different countries. So, following the procedure previously done we see that the threshold has a value of 15.7201, being the smallest threshold out of the three. this means that countries with a GDP higher than 15,720.1 will have a negative relation between GDP and the segregation index.

If we take a look to which countries, from the studied ones, are these, we have all the previous ones plus Greece and Slovakia. In these countries and increase of the GDP in thousand per capita will cause a decrease in the value of the index, so the immigrant population will be more unevenly distributed. This may happen because in countries rich enough they need more individuals everywhere, so immigrants will be distributed in all territory.

As we see through this part of the work, different macroeconomic variables affect to segregation indices. However, a variable being significant to explain certain index does not mean that it will be significant in every other index; we observe this with the variable “Education”. Each variable affects in different ways to indices. There are some variables we thought of that happen to never be significant. This is the case of “Fertility rate”, “New citizenship” and “Government expenditure”. The other variables are significant at least once, being remarkable the cases of “Density” and “Foreigners” that are always significant. Some of the variables that are significant have a positive effect in the index value; this is the case of “Elderly population”, “R&D Expenditure” and “Education”. An increase of these variables means an increase in the immigrant segregation, meaning that immigrant population will be geographically more unevenly distributed. We also have variables like “Unemployment rate”, “Density” and “Foreigners” that decrease the immigrant segregation. So, if these variables increase the immigrant population will be territorially distributed in a more homogeneous way. This does not mean that we have to discourage the education or the expenditure in R&D; it also does not mean that we have to adopt policies that increase unemployment.

It is very important to remark the nonlinear relation of the GDP, as it shows that the effect of the GDP in the segregation index is what we were looking for, a Kuznets curve. We have seen that this Kuznets effect is present in the three models. We have also seen that this allows us to calculate where the minimum threshold is, in order to see in which countries the negative relation between GDP and the dependent variable is present. For example, we see that in Romania, where the GDP is below the threshold, if the GDP in thousand per capita, increases in one unit, the value of the index will increase, being translated in a more uneven distribution of the immigrant population. However, in other countries such as Norway, where the GDP is above the threshold of the GDP, an increase of the GDP, in thousand per capita, in one unit means an estimated decrease of the segregation index; that is, the immigrant population will be more homogeneously distributed in the territory.

5.- Conclusions

The gold of this paper is twofold. First, measuring the unevenness of the territorial distribution of immigrant population in Europe with regions' aggregate data. It is also interesting to see how these indices evolved throughout the period studied, since this quantification enables the trend of the unevenness to be analysed. Second, studying the macroeconomic variables that affect the geographical unevenness of immigrants' location. In particular, we find that the variable that most affect to immigrant territorial distribution is GDP. We analyse the relation between the GDP and the indices, focusing in trying to see if there was a Kuznets effect.

Regarding with the unevenness quantification, we observe that, even if the values of the segregation indices used are different, the evolution is similar in the three cases. So, we see that the results are qualitatively similar even if they are quantitatively different. We also see in a clear way that segregation decreases over time, fulfilling the expectation. This may be because as time goes by immigrants arrive to regions where there are employment opportunities but where first wave immigrants did not arrive. We can say that at European level immigrant population is more evenly distributed in 2019 than in 1999. When the analysis is carried out at country level the conclusion is similar; unevenness in the geographical distribution of immigrant population has reduced.

Regarding the search of determinants of the segregation indices used. We choose some variables that we consider representatives. In relation with the macroeconomic determinants of the geographical distribution of immigrants, we obtain some interesting results. First, we find that variables, like density, affect negatively to the indices. So that regions being denser in terms of populations will lead to a lower territorial dispersion of immigrant population. This relation may reflex that when the density is higher the immigrant population has to distribute in order to fix in a better way. In the same way, others like “Elderly population” increase the value of the indices. This means that when the percentage of elderly population increases, immigrant population is more unevenly distributed. This might be caused because of the workplaces of those that just retire being more concentrated. Talking about the relation between these indices and the GDP, the relation is interesting, as the existence of the Kuznets effect in this case is proved. This is interesting for policymakers, since depending of a countries situation the priorities will change.

The conclusion of the second part is especially relevant for policymakers, in order to adopt different policies to enjoy the benefits of immigration. This does not mean that it is a good idea to make drastic changes in those variables that increase the value of the indices; that is, that increase the uneven distribution. But it helps to think about other policies in order to minimize the negative effects some decisions can have in this aspect.

For further research it could be interesting to use the decomposability property some indices have. This property allows us to analyse the inequality in the distribution of immigrant population in Europe, distinguishing between the inequality given between different countries and the inequality given within countries; this is, between regions inside a country. It would also be interesting to see to what extent the presence of far-right parties with some power affects to these indices, as they are winning power in many countries. For example, apart from Austria that was mentioned before, in Sweden there is *Sverigedemokraterna*; the *Dansk Folkeparti* in Denmark, the *Schweizerische Volkspartei* in Switzerland, the *Alternative for Germany* in Germany, or *The United Kingdom Independence Party* in United Kingdom. With so many cases it could be interesting to see how this affects to the homogeneity in the territorial distribution of immigrant population.

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APPENDIX

	Dissimilarity Europe		Entropy Europe		Atkinson 0.5 Europe	
	Value	**Nº index**	**Value**	**Nº index**	**Value**	**Nº index**
1999	0.3757	100	0,1049	100	0,2137	100
2000	0.3718	98,9536	0,1043	99,3759	0,2114	98,9242
2001	0.3730	99,2694	0,1036	98,7153	0,2089	97,7488
2002	0.3521	93,7091	0,0962	91,6170	0,1923	89,9768
2003	0.3632	96,6557	0,1021	97,2828	0,2071	96,9021
2004	0.3818	101,6175	0,1149	109,4411	0,2448	114,5626
2005	0.3645	96,9995	0,1106	105,3554	0,2310	108,1089
2006	0.3589	95,5267	0,1077	102,5617	0,2217	103,7354
2007	0.3539	94,1888	0,1064	101,3513	0,2175	101,7514
2008	0.3466	92,2314	0,1046	99,5899	0,2120	99,1955
2009	0.3422	91,06411	0,1032	98,3026	0,2095	98,0116
2010	0.3362	89,4526	0,1004	95,5940	0,2062	96,4945
2011	0.3327	88,5534	0,1000	95,2587	0,2063	96,5401
2012	0.3267	86,9413	0,0954	90,8902	0,1954	91,4229
2013	0.3237	86,1575	0,0910	86,6738	0,1857	86,8907
2014	0.3219	85,6659	0,0911	86,7379	0,1871	87,5581
2015	0.3151	83,8550	0,0902	85,9238	0,1859	87,0233
2016	0.3115	82,9128	0,0884	84,1591	0,1808	84,6083
2017	0.3128	83,2508	0,0895	85,2782	0,1812	84,7791
2018	0.3089	82,2201	0,0878	83,6309	0,1769	82,7523
2019	0.3078	81,9062	0,0878	83,6525	0,1782	83,3702

Table 11: Dissimilarity, entropy and Atkinson 0.5 indices' value and number index at European level, 1999-2019