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Regional Income Inequalities in Europe: An Updated Measurement and Some Decomposition Results

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Abstract

In this paper well-known summary inequality indexes are used to explore interregional income inequalities in Europe. In particular, we mainly employ Theils'population-weighted index because of its appealing properties. Two decomposition analysis are applied. First, regional inequalities are decomposed by regional subgroups (countries). Second, intertemporal inequality changes are separated into income and population changes. The main results can be summarized as follows. First, data confirm a reduction in crossregional inequality during 1982-97. Second, this reduction is basically due to real convergence among countries. Third, currently the greater part of European interregional disparities is within-country by nature, which introduce an important challenge for the European policy. Fourth, inequality changes are due mainly to income variations, population changes playing a minor role.

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I. INTRODUCTION

The analysis of regional inequalities in Europe has constituted a popular research issue in the last years. Some factors help to explain this situation. First, the deepening of European integration process have raised some concern about the regional distribution of its benefits and costs. Second, the re-emergence of growth theory in the nineties has been partially devoted to analyse the European regional case. And third, the more and better regional data available have promoted a large body of empirical research[1].

In particular, during the last decade there was a wide diffusion of convergence concepts suggested by R. Barro and X. Sala-i-Martin, that is the sicma-convergence and beta-convergence.[2] As is known, the former is devoted to explore the temporal path on the dispersion in incomes (typically, standard deviation of logarithms has been used as dispersion measure). The latter is carried out through estimating a regression equation between income growth and the initial income (jointly with other regressors).

[1] Dunford (1993), Armstrong (1995), Neven and Gouyette (1995), Paci (1997), Magrini (1999) and McCarthy (2000), among others, have investigated the status, and evolution, of European interregional inequalities.
[2] See, for example, Barro and Sala-i-Martin (1991, 1992) and Sala-i-Martin (1994, 1996)

However, less attention has been paid lately to the appealing analytical properties offered by some summary inequality indexes, which have been profusely examined by literature on inequality measurement[3]. The main motivation of this paper is to emphasize these properties, in particular those of the Theil population-weighted index, and to perform an empirical application for the Western European regions (EU member states). In particular, we report the level and intertemporal changes of European regional inequalities by means of a battery of well-recommended inequality indexes and for different cross-regional samples. In addition, we make two decomposition analysis. First, we decompose overall cross-regional disparities into within-group and between-group inequality components, where groupings correspond to countries. Second, intertemporal changes of inequalities are decomposed into income and population changes.

The paper is organised as follows. In Section 2 we review some features of several widely recommended inequality measures, mainly related to the Theil population-weighted index. In Section 3 we present our empirical results obtained for the European regional case. Finally, we summarize our findings in Section 4.

[3] The reader can consult the works due to Theil (1967), Atkinson (1970), Sen (1973), Champernowne (1974), Chakravarty (1990) and Cowell (1995).

II. MEASURING REGIONAL INEQUALITIES AND SOME DECOMPOSITION ANALYSIS

II.1. Good Inequality indexes

An inequality index is a quantitative measure that reflects the degree of dispersion existing in any distribution. The inequality measurement literature has tended to examine the properties of a set of inequality indexes. An axiomatization procedure has been commonly used for identifying a basket of "desirable measures". The main axioms considered have been anonymity, scalar irrelevance, population homogeneity and the important Pigou-Dalton condition[4]. Among the "satisfactory measures", the Gini coefficient, the two Theils indexes (the Theil income-weighted and, the Theil population-weighted) and the Atkinsons indexes have been the more widely recommended. Each one emphasizes in a different way the income changes at various points in the income distribution. Consequently, the picture provided by these inequality indexes can be not coincident.

[4] *Axiom of Anonymity*: If a regional income distribution X is obtained from a regional income distribution Y through a permutation, X will be equivalent to Y.
Axiom of Scale irrelevance: If a regional income distribution X is obtained by means of a proportional change in all regional incomes in a distribution Y, then X will be equivalent to Y.
Axiom of Population Homogeneity: If a regional income distribution X is obtained by means of a replication of each regional income in a distribution Y, then X will be equivalent to Y.
Axiom of Progressive Transfers (Pigou-Dalton Principle or rank-preserving equalization): If a regional income distribution X is obtained from another distribution Y through a positive transfer from a richer region to a poorer one, without altering regional ranking and keeping constant the other incomes, then X will be less unequal than Y.

The Gini coefficient is more sensitive to the income changes occurred at the middle of the income distribution, treating symmetrically the lower and the upper tails of the incomes ranking. On the other hand, the Theil population-weighted index is more sensitive to the transfers occurring at the bottom of the income distribution. The Theil income-weighted index is, however, less sensitive to the lowest observations than the previous index. The Atkinson indexes are characterised by the inclusion of a parameter, which reflects the focused distributive points (ε). If this parameter increases the index will put more weight one the position observed for the lowest observations[5].

Their algebraic expressions are the following (adapted to the European cross-regional analysis):

$$G(x) = \frac{1}{2*m} \sum_i \sum_j p_i * p_j * \left| x_i - x_j \right| \qquad (1)$$

$$L(x) = \sum_i p_i * \ln\left(\frac{m}{x_i}\right) \qquad (2)$$

$$T(x) = \sum_i w_i * \ln\left(\frac{x_i}{m}\right) \qquad (3)$$

[5] The family of Theils indexes can be similarly characterized by the inclusion of a parameter, which reflects different perceptions of inequality. The two Theil indexes mentioned here are particular cases obtained with particular values for the parameter. More precisely, the Theil population-weighted index is a Theil with a parameter equal to zero and the Theil income-weighted index is a Theil with a parameter equal to one. In fact, there exists a relationship between the Theil parameters and the Atkinson parameters. (see, for instance, Cowell (1995)).

$$A(e,x)=\begin{cases}1-\left[\sum_i p_i\left(\frac{x_i}{m}\right)^{1-e}\right]^{\frac{1}{1-e}} & e\neq 1\\ 1-\exp\left[\sum_i p_i * \log_i\left(\frac{x_i}{m}\right)\right] & e=1\end{cases} \qquad (4)^6$$

where x_i and x_j represent the mean income of region "i" and "j", respectively; p_i and p_j denote the corresponding population-shares; ω_i is the income-share associated with region "i"; μ is the European mean income and ln is the natural logarithm. G(x) is the Gini coefficient, L(x) denotes the Theil population-weighted index, T(x) is the Theil income-weighted index and $A(\varepsilon,x)$ is the Atkinson index with a parameter equal to ε.

In this paper we pay particular attention to the Theil population-weighted index, L(x)[7]. This inequality index has a lower bound of zero, which represents perfect equality. Its upper bound is not homogeneously defined, although values near one can be perceived as an indication of very high inequality. Note also that L(x) is not defined if some incomes equal exactly zero. This case, however, is highly implausible in regional analysis.

[6] When Atkinson index'parameter (ε) tends to infinite the index becomes similar to the rawlsian criterion, where only the poorer observation is important. On the other hand, when this parameter tends to zero this index is consistent with the Bentham function, where we only would be interested in the average income, independently of its distribution.

[7] Also called “the mean logarithmic deviation or the second-Theil measure”, this inequality index has also been used in spatial contexts, besides other scholars, by Ram (1992,1995), Duro and Esteban (1998), Theil and Moss (1999), Quadrado et al. (2001) and Duro (2001).

II.2. L(x) and their additively decomposable properties

A major advantage of the second-Theil measure is that it can be partitioned into disjoint subrgroups, which is an attractive analytical property. For an individual analysis groups can be conformed using criteria like race, sex, education level, etc. For a regional analysis a natural partition would be the use of own countries. Nevertheless, other regional subgroups can be conformed[89]. Thus, two different components are identifiable. The first component is a within-group inequality component, which is computed as a weighted mean of the intra-group inequality indexes. The second component is a between-group component, which reflects the inequality that would emerge if only differences were among group means. That is, in our case it would be assumed that each resident of a region receives the national per capita income.

If we adopt a groupings by countries the decomposition of L(x) may be stated as:

$$L(x) = L_W(x) + L_B(x) = \sum_{g=1}^{G} p_g * L(x)_g + \sum_{g=1}^{G} p_g * \ln\left(\frac{m}{x_g}\right) \qquad (5)$$

[8] For example, one may use a criterion like the "geographical proximity" for creating the different groups (see Gripaios and Mangles (1993)). This criterion, however, would have some drawbacks, for instance, linked to internal coherence of selected groups. On the other hand, Gradín (2000) offers an alternative methodology, statistical by nature, for aggregating observations.

$L_W(x)$

where $L_W(x)$ is the aggregate within-country inequality component; $L_B(x)$ is the aggregate between-country inequality component; p_g is the relative population of country "g"; $L(x)_g$ denotes the internal inequality present in country "g" and, finally, x_g represent the national mean income in country "g".

Results derived from this decomposition analysis might be used for testing the usefulness of the selected regional aggregation criterion. If we observe that most of the European inequalities were attributable to intra-national disparities we might derive that informative relevance of our national partitions would be limited. This is because internal cohesion within the groups would be small, loosing the own significance of these groupings. On the other hand, this decomposition seems useful from a policy point of view. If European inequalities were mainly determined by differences among countries it would be convenient to emphasize instruments based on national-levels schemes (i.e. Cohesion Fund). But if inequality were essentially intra-national it would be appropriate to design specific regional-level policies.

[9] In addition, when they are applied to spatial income inequality analysis, L(x) and T(x) are additively separable by income inequality factors, as has been suggested by Duro and Esteban (1998) and Goerlich (2000).

It is worth noting that also the Theil income-weighted index (T(x)) is additively separable in this way[10]. In fact, Shorrocks (1980) pointed out that these two Theils measures are the only inequality measures that are additively decomposable in this way and at the same time satisfy the basic assumptions. Nevertheless, it seems that L(x) is a better measure for several reasons. First, L(x) weights the income-distances by means of the population shares. If our objective is to make a comparison of the well being of population across European regions an inequality measure based on population weights would be preferable. Second, L(x) is a more progressive index, in the sense that it is relatively more sensitive to income changes lower down the scale, which can be interesting for some researchers. Third, L(x) is strictly decomposable in a subgroups way. This means that elimination of between-country inequalities (in our case) would leave the within-country inequality component unchanged. This is due to the fact that the weights used for the computation of the latter factor are population-shares. By contrast, T(x) is only weakly additively decomposable because the weights used (income-shares) are affected by the disappearance of between-country inequalities.

The dispersion statistic widely used for the σ-convergence analysis, the (non-weighted) standard deviation of logarithms of incomes, seems also an inferior

[10] For example, the Gini coefficient is only decomposable if groups do not overlap (Ebert (1988)). It is true that the square of the coefficient of variation can be decomposed in a within-groups and a between groups components but the point is that the within-groups component is not a weighted mean of intra-group indexes because weights do not necessarily sum to unity.

measure. First, this indicator considers the regions in a homogeneous way, ignoring a population weight. Second, the σ-convergence measure violates the crucial Pigou-Dalton criterion for high levels of income. Third, this measure is not additively decomposable.

On the other hand, it is useful to mention that L(x), and also T(x) (when they are applied to spatial income inequality analysis) can be additively separable by means of a supplementary methodology. Thus, Duro and Esteban (1998) and Goerlich (2000) have demostrated that it is possible to decompose territorial income inequality, measured through these indexes, into the sum of the inequality displayed by four factors: productivity per worker, employment rate, participation rate and working-age rate. Duro (2001), for instance, provides the empirical evidence for the European regions[11].

[11] Duro (2001) finds that regional disparities in productivity levels are the main contributor to crossregional European income inequalities, despite their decreasing role. In addition, evidence indicates that labour market factors, that is employment and participation rates, play a significant and growing role in the explanation of global inequalities.

II.3. Decomposing inequality changes into population and income variations

An additional aspect that can be instructive to mention is related to the inequality changes interpretations. Intertemporal changes in regional inequalities have often been perceived in terms of variations in per capita incomes. That is, an upward inequality tendency has been conventionally viewed as an indication of a widening in regional income distances. However, this interpretation can be misleading. We should bear in mind that also population-shares variations can play a significant role.

A simple example can illustrate this point. Imagine a world with only two regions, a poorer and a richer one. The richer region has two times the income of the poorer region, which have a population share of 80%. We can assume that people move from the poorer region to the richer one, finding a better quality of life, to such a point that in the end all the population will be concentrated in the rich area. We also assume that no changes occur in regional mean incomes. In these circumstances, regional inequality will display an initial growth until a point after which a declining pattern would be observed (see Robinson (1976)). Thus, intertemporal changes might be due exclusively to demographic movements.

A straightforward way to explore the relevance on income and population changes can be done using the following formula:

$$I\left(x^{T+1}, p^{T+1}\right) - I\left(x^{T}, p^{T}\right) = \left\{I\left(x^{T+1}, p^{T}\right) - I\left(x^{T}, p^{T}\right)\right\} + \left\{I\left(x^{T+1}, p^{T+1}\right) - I\left(x^{T+1}, p^{T}\right)\right\} \quad (6)$$

where I denotes a relative inequality index, x^T and x^{T+1} are the per capita incomes vectors in periods T and T+1, respectively; p^T and p^{T+1} are the population-shares at T and T+1, respectively.

The first term in (6) captures the influence of income changes and it would be obtained by computing a fictitious inequality index, $I(y^{T+1}, p^T)$. The second term in (6) displays the role played by asymmetric population changes over regions, leaving regional incomes constants over time.

III. EMPIRICAL EVIDENCE FOR EUROPEAN REGIONAL INEQUALITIES

III.I. Data

Some points about data seem in place. The data used have been extracted from the REGIO data bank, distributed by Eurostat. This source yields territorially comparable data, with a wide geographical coverage and a fairly large period.

The REGIO compilation facilitates two regional income variables: regional GDP in purchasing power standards (PPS) and GDP in Ecus. We have considered the former because it seems more convenient for a comparison of standards of living in European regions. Note that this indicator has received of widespread use in empirical work and, for instance, has become the basic reference for the EU regional policy[12].

The regional breakdown used is NUTS 2 European units (Basic Administrative Units). This is the regionalization used for the distribution of Structural Funds.

Three different homogeneous regional samples have been considered. One consists of regional data for the twelve EEC countries, which have been taken mainly from REGIO 1999. Regional GDP are ESA 79 estimates. For the UK, this version of REGIO does not offer good data. This is because a new regional classification is included and some temporal points for British regions are lost (no data is offered for 1982, 1983, 1985, 1986 and 1990). Given this, we have

[12] On the other hand, it would be interesting to have disposable incomes at a regional level as a better measure for standards of living.

decided to use the British data contained in REGIO 1998, the previous version. Regions are generally NUTS 2 units, except for the UK case, where we have used NUTS 1 units due to statistical deficiencies. At last, the sample encompasses 143 European regions and covers a fairly large period 1982-95[13]. This is a period characterised, for example, by the southward enlargement of the European Community (with the entrance of two peripheral countries, Spain and Portugal, in 1986), by the deepening of integration schemes among member states (the Single European Act and the Single European Market) and by a spectacular increase in the European structural interventions (mainly since 1988).

The second data set has been included to consider the effects of the German re-unification over the regional inequality values. Data also arise from REGIO 1999, except for the case of UK, and the GDPs are ESA 79 estimates. Given the available data for Eastern German regions, the sample covers the period 1991-95 and, in this case, we also have been also able to include the NUTS 2 units for UK. Obviously, the number of regions is in this case larger, namely 179 regions[14].

[13] We must note that for French regions no data is provided for 1981 (for Corse, in addition, no data for 1980); also no data is offered for Dutch regions for 1980. In these circumstances, we have decided to start the estimations as from 1982, where we can include all these regions. In addition, for the case of the Netherlands we have included a NUTS 1 region, "Oost Nederland", given the available data. Moreover, the Overseas Departments (France) and Açores and Madeira (Portugal) have not been included.

[14] In this sample, the Dutch NUTS1 region "Oost Nederland" has been partitioned in the corresponding NUTS 2 units. Moreover, Açores and Madeira (Portugal) have been included.

Finally, a third data set has been used. It consists of regional data for all current EU countries and, hence, it embodies additionally NUTS2 regions for Austria, Finland and Sweden. These data have been collected from REGIO 2000. Another important feature of this information is that regional GDPs are ESA 95 estimates, the new methodology for computing regional economic aggregates. The available period is now shorter, 1995-97, but it offers the possibility of exploring inequalities for more recent years and for a more comprehensive sample (203 regions).

III.2. Regional Inequalities in Europe

Inequality values depend heavily on the inequality index choice. For this reason, it seems to be useful to consider several different measures of inequality as to obtain a reasonable indication of inequality levels, and their variations. We have computed in Table 1 the Gini coefficient (G(x)), the Theils indexes (L(x) and T(x)), and two Atkinson indexes (A0.5(x) and A20(x)), corresponding with a low and high inequality aversion parameter, respectively. Figure 1 and 2 illustrate the temporal patterns.

First, we will work with sample 1982-1995. In this case, we observe that all inequality indexes show a reduction in their values. Specifically, the reduction faced by A(20) supports the evidence that less favoured areas have also

benefited from high rates of growth. Thus, it seems that the deepening of the integration process has not promoted the regional differences in a significant way. Nevertheless, the magnitude of this decrease (over a period of fourteen years) does not seem very important, indicating some difficulties for the inequality to decrease.

Some phases can be discerned over the whole period. The first one, since 1982 to the mid-1980s, was marked by an increase in the regional divergences; a second period, from 1985 to 1993, was characterised by a downward trajectory; finally, in 1993-1995, one observes a levelling off in the inequality values, and even a slight growth. These findings may support a relationship between macro-economic performance and regional disparities. In such a way that regional imbalances would grow in recessions and they would decrease during expansions (an anti-cyclical nature). If this idea were true the economic growth might be a good help for the reduction on spatial inequalities[15].

Another feature revealed by the results in Table 1 is that inequality reduction is more pronounced if we add Eastern German regions. In this case, L(x) would exhibit a falling of 25% in only four years (1991-95). Obviously, this result is

[15] We note some disimilarity in the pattern showed by G(x), most of all, A20(x). Remember that these gaps are linked to the different weights assigned to observations on the income's rank. In particular, the difference exhibited by A20(x) seems reasonable given its focus in the lower tail of the income distribution.

related to the economic improvement faced Eastern German areas after the re-unification episode. Table 2, for instance, offers detailed information by regions[16].

For a more recent period, 1995-1997, we can include regions from the new entering countries (Austria, Finland and Sweden). Likely the most significant point revealed by these data is the continuation of the declining trajectory of inequality. Specifically, L(x) shows a reduction of a noticeable 5% during 1995-1997. Nevertheless, some caution is needed when interpreting this result. A closer inspection of the data indicates that A20(x), a high-inequality-aversion index, shows an opposite outcome, suggesting that the improvement is far from being general.

Finally, given these numbers, what can we say about the level of European regional inequalities? Although a definitive answer to this question is difficult, some comments can be made. A natural answer may consist in comparing the observed inequality values with the statistical maximum level which might be observable. In that case, we see that values are near to zero. Nevertheless, a low-inequality interpretation might be questioned. Thus, policy-makers might consider that the inequality is not small enough because it exceeds a maximum level that is socially and politically tolerable. Also the statistical values can be higher than the observed

[16] Note that this harmonization has reduced the gap existing between sample 82-95 and sample 1991*-95*.

in other geographical areas. In this sense, the typical reference handled has been USA, a large federal country with a similar size (economically speaking) to Europe. If we accept this reference we discover that European regional inequalities are clearly greater. Disparities among European regions would exceed 300% the exhibited by inter-state American inequality. Even, the inter-county American inequality is somewhat lower than the European value[17].

III.3. Decomposing Inequalities by Regional Subgroups (Countries)

The appealing properties displayed by the Theil population-weighted index (especially those related to its decomposition by (regional) disjoint subgroups) have been pointed out earlier. Thus, it is possible to decompose the overall degree of regional inequality, reflected by L(x), in two different components: the within-group inequality factor and the between-group inequality factor. The most natural partition would be using national boundaries. It seem interesting then to examine to what extent the European inequality levels, and their changes, can be attributed to within-country inequalities or to between-country inequalities. The answer can be useful, for instance, from a policy perspective (and also from a statistical point of view). This information is given in Table 3, and Figures 3 and 4 depict the temporal patterns.

[17] Specifically, L for USA states shed a value of 0.0095 at 1995. If the computation were referred to counties (3114 observations) the value would be 0.0327. These data have been

First, we will work with the sample 1982-95. The main advantage of this data set is the possibility of analysing intertemporal changes in inequality for a fairly large period[18]. The evidence reflected by Table 3 indicates that at the root of the recent reduction in European disparities has been the declining pattern of the inter-country inequality element, mainly since 1985. Four countries can be identified for its convergent behaviour (Table 4). Ireland experiments an important differential growth which has induced an improvement of its GDP per capita in 13 percentuals points; Portugal also has traced a positive evolution (improvement in 7 pp); Spain faced a progress of 5 pp and also France helps to explain the smaller role of inter-country inequalities, although in this case through a backward movement (loosing 13 pp).

In fact, it seems that the inter-country inequality component shows a cyclical pattern. This point can be better seen if we investigate its position in a more extended period. Figure 5 depicts its evolution over the large period 1960-2000[19]. European cross-country inequality levels have been computed for the twelve EEC countries and for the current EU member states. Its anti-cyclical character is being reaffirmed. It is interesting to note its spectacular reduction during the expansion period of the sixties (dropping 68% over 1960-73); the

taken from the Bureau of the Census.

[18] Molle (1980) collected regional data for some previous temporal points 1950, 1960 and 1970. Nevertheless, these estimates seem to have a questionable quality, for instance, in terms of their temporal comparability. In addition, its spatial coverage is limited, given the exclusion of Greek, Portuguese and Spanish regions.

deterioration in the values emerged (from 1973 to 1984 L rises 38%), coinciding with the sharp variation in the business cycle; and, finally, the new decline from 1984 to 2000, where intercountry disparities fall a notable 60%[20]. Economic growth would seem to be, then, a good tool for alleviating national disparities and European regional inequalities as a whole.

With regard to intra-country component, one observes that it has hampered the above-mentioned convergent pattern of regional inequalities. Table 5 demonstrates that the majority of European countries displayed an exacerbation in their interregional disparities, which can be a matter of concern[21]. Specifically, this is true for the large countries. The inequality index for Italy exhibits a growth of a 15%, a 24% for Germany, a 27 % in the case of France and even more marked for Spain and UK (30%). Internal disparities only declined in Belgium, Netherlands and Portugal. Table 6 decomposes global within-country inequality into national contributions. These contributions depend, as we know, not only on the previous internal indexes but also on national population weights. We discern that growth in the global component is attributed, in the first place to France, and, to a lesser extent, to Italy, Germany and Spain[22].

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[19] Data have been taken from "European Economy", nº 70, 2000.

[20] An interesting point is that European international inequalities have followed their decreasing trend since 1997 to 2000, for which regional data are still unavailable.

[21] Notice that L shows zeros for Denmark, Ireland and Luxembourg given that these countries are not regionally divided in NUTS2 units.

[22] It is useful to note that both, France and Spain, have been responsible for the decline with respect to inter-national inequality component and also for the rise with respect to intra-

On the other hand, if we examine the information provided by sample 1991*-1995*, where we have been able to incorporate ex-GDR regions, one observes that reduction in cross-regional inequality is now explained basically by the intra-national component, instead by the between-country convergence. The spectacular economic harmonisation developed by the Unified Germany is clearly behind this result. According to the data, German interregional inequality declined 56% in only four years (moving from 0.0972 in 1991 to 0.0416 in 1995)[23].

Finally, computations based on ESA-95 estimates, 1995**-1997**, offer the opportunity to explore inequality levels for more recent years and when all EU membres are embodied. In this case, some comments are in place:

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country inequality component. For the Spanish case, this result relies on the differential growth showed by some of the more successful economies (like Madrid and Catalunya), while some low-developed regions faced a declining process (like Andalucia and Galicia). Observe that this position would generate a policy problem as the attempt for national convergence with EU standards will be likely followed by internal divergence tendencies. On the other hand, the situation followed by France is illustrative. While Ile de France, the richer French region, has registered the most important growth among the French regions, the majority of the remaining regions depicted a decline in their relative income (to the European mean). This information is available upon request.

[23] Observe, in addition that the sharp increase in the interregional inequality value showed by UK (with NUTS 2 regions) compared with its value in sample 1982-1995 (with NUTS 1 regions). This behavior is associated with the relationship existing between measured inequality and the number of regions considered. Thus, and ceteris paribus, if the number of regions increases, also increases the level of spatial breakdown and this tend to augment the statistical level of inequality. This "breakdown effect" must be considered in order to be able to interpret numbers in cross-sectional comparisons. Obviously, it is irrelevant for the case on intertemporal comparisons.

First, near 80% of European cross-regional inequalities in 1997 would be due to the within-country inequality component. Germany, Italy, United Kingdom and France would be the main contributors. In fact, these four countries would account more than 80% of the intra-country inequality value. This evidence would imply, among other points, that if we were able to remove interregional inequalities in "poor" countries like Spain, Portugal and Greece still a sizeable inequality amount would persist. Note, in addition, that this evidence would strengthen the convenience of designing policies based on regional-schemes, avoiding any attempt to generalize.

Second, we can stress that only 20% (one fifth) of global inequalities are explained by inter-country inequalities[24]. Table 5 reproduces the relative GDP (per capita) for selected years. Four clusters can be identified: three countries located below the European mean (Greece, Portugal and Spain), six countries positioned near to the mean (Finland, Italy, France, Sweden, United Kingdom and Ireland), five countries whose relative GDP per capita is clearly above the European mean (Germany, Belgium, Austria, Netherlands, Denmark) and Luxembourg, which is located far from the European average.

[24] If we compare this weight with the emerged from sample 1982-95 we detect a significant reduction. This discrepancy is due to the exclusion in 1995 of Eastern German regions, which generate a rise in the German mean income and, therefore, tends to augment the international disparity value. In particular, at 1995 the relative per capita income showed by Germany (West) was 1.20, while a value of 1.10 emerge when we include Eastern German lander.

Third, we can remark that the international convergence process also prevails in the explanation of the downward inequality trajectory in the last years. Near 80% of the decrease in European regional disparities between 1995 to 1997 associated with a new reduction in the inter-country inequality component. Therefore, when the re-unification effect is nearly removed it seems that the international component continues to play a prominent role in explaining the falling of European regional inequalities.

Therefore, the small value currently reached by the intercountry inequality component would suggest that future reductions in the global inequality value should be based on the within-country component, which implies a qualitative change related to the past downward inequality trajectory. The persistence and growth in intra-national disparities in the last years illustrate the difficulties inherent to this goal. In addition, EMU might become a supplementary problem in this sense.

III.4. Decomposing inequality changes into income and population changes

Intertemporal changes in inequality values are conventionally perceived in terms of variations in per capita incomes. For instance, the observed reduction in European regional disparities would be interpreted as a strengthening in regional income gaps. However, this is not necessarily true because the most widely diffused inequality indexes are also affected by population-shares change.

It is instructive to know the role played by each factor because implications can be very different. For instance, if income changes had been the relevant factor we might think about the existence of income mobility across regions and that regional income is not a immutable condition. On the contrary, if were population changes were the main explanatory variable we might derive that migration can be necessary to ameliorate standards of living and that origin regions have not been able to offer enough opportunities.

This further insight is explored in Table 7. We have applied the decomposition methodology expressed in (6), for the samples 1982-1995 (and selected subperiods), 1991*-1995* and 1995**-1997**. Evidence shows the sharp predominance of income changes, independently of periods and samples used. Therefore, it seems that no significant influence should attribute to population

changes in explaining the recent evolution of European regional inequalities, at least in the periods considered. Nevertheless, if migration waves increase in the future, which may be possible, this result might change.

IV. CONCLUDING REMARKS

In this paper we use well-known inequality indexes in order to measure regional inequalities in Europe. In particular, we stress the appealing properties associated with Theil's population-weighted index. In addition, we perform two decomposition exercises, based on this index. Some significant points stem from the empirical work:

First, our data confirm a reduction in the cross-regional inequality over the period 1982-95, which can be welcome. Nevertheless, this decline has not been very large. Introduction of Eastern German regions in the analysis produces an increase in the inequality levels, and also an important drop in them over 1991-95. The latest estimations, corresponding to 1995-1997 and including additional regions from the new member states, also show a reduction, offering no evidence that regional convergence has ended.

Second, this intertemporal reduction in the European disparities is largely attributable to the convergence in international inequalities. However, for the

period 1991-1995, for which we include Eastern German regions, the reduction is mainly explained by the sharp falling on German regional inequalities.

Third, currently most of the European regional disparities are within-country in nature. The cross-country inequalities account for only 20% of overall inequalities. This position would imply the convenience of designing specific regional-level policies, which would additionally claim to perform detailed case studies of the economic conditions of low-developed regions (not only located in poorer countries). The goal of reducing within-country inequalities constitutes an importance challenge for European policy and it implies a change in the past inequality-decrease pattern.

Fourth, changes in cross-regional inequalities in Europe are largely due to income variations. This fact would imply an irrelevant role of demographic changes in explaining recent inequality evolution.

Finally, it may be interesting to extend these results when EMU starts off in 2002. Thus, it would be interesting to examine how the intra-national inequality path develop in an increasing competition framework.

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Table 1: Regional Inequalities in Europe measured through Synthetic Indexes

	G(x)	L(x)	T(x)	A0.5(x)	A20(x)
1982	0.1472	0.0364	0.0356	0.0178	0.4147
1983	0.1460	0.0361	0.0353	0.0177	0.4336
1984	0.1479	0.0370	0.0360	0.0181	0.4240
1985	0.1506	0.0383	0.0372	0.0187	0.4398
1986	0.1505	0.0386	0.0370	0.0187	0.4877
1987	0.1476	0.0373	0.0358	0.0181	0.4777
1988	0.1454	0.0356	0.0345	0.0174	0.4622
1989	0.1444	0.0351	0.0341	0.0171	0.4631
1990	0.1473	0.0361	0.0354	0.0177	0.4426
1991	0.1452	0.0347	0.0344	0.0171	0.4296
1992	0.1452	0.0346	0.0344	0.0171	0.4115
1993	0.1414	0.0329	0.0328	0.0163	0.3982
1994	0.1425	0.0331	0.0330	0.0164	0.4020
1995	0.1432	0.0333	0.0331	0.0164	0.3953
1991*	0.1679	0.0505	0.0470	0.0240	0.5752
1992*	0.1631	0.0447	0.0431	0.0217	0.4614
1993*	0.1557	0.0395	0.0390	0.0194	0.3975
1994*	0.1537	0.0377	0.0376	0.0187	0.3932
1995*	0.1535	0.0375	0.0372	0.0185	0.3874
1995**	0,1529	0,0378	0,0386	0,0189	0,3873
1996**	0,1505	0,0367	0,0375	0,0184	0,3850
1997**	0,1486	0,0359	0,0367	0,0180	0,3952

Note: * Results referred to 179-regions sample, where we have been able to include Eastern German regions, and Nuts 2 units for UK.
** Results referred to 203-regions sample, where we have been able to include additionally Nuts 2 units for Austria, Finland and Sweden.

Table 2: Relative Income (to European mean) in Eastern German regions

	1991*	1995*	1995**	1997**	91*-95*	95**-97**
Berlin	0.9530	1.0483	1,1322	1,0877	+0,0953	-0,0445
Brandenburg	0.4123	0.6585	0,7152	0,7405	+0,2462	+0,0253
Meckelenburg	0.3797	0.6076	0,6549	0,6586	+0,2279	+0,0037
Sachsen	0.3750	0.6314	0,6715	0,7489	+0,2564	+0,0774
Dessau	0.3433	0.5507	0,5937	0,6006	+0,2074	+0,0069
Halle	0.3997	0.6825	0,7113	0,6980	+0,2828	-0,0133
Magdeburg	0.3715	0.5787	0,6163	0,6147	+0,2072	-0,0016
Thuringen	0.3365	0.5999	0,6321	0,6510	+0,2634	+0,0189

Note: * Results referred to 179-regions sample, where we have been able to include Eastern German regions, and Nuts 2 units for UK.
** Results referred to 203-regions sample, where we have been able to include additionally Nuts 2 units for Austria, Finland and Sweden.

Table 3: European Regional Inequalities. Decomposition by Subgroups

(Countries)

	L(x)	L(within)	L(between)
1982	0.0364	0.0188	0.0175
		(51.79%)	(48.21%)
1985	0.0383	0.0194	0.0189
		(50.65%)	(49.35%)
1990	0.0361	0.0204	0.0157
		(56.51%)	(43.49%)
1995	0.0333	0.0211	0.0122
		(63.36%)	(36.64%)
1991*	0.0505	0.0399	0.0106
		(79.01%)	(20.99%)
1995*	0.0375	0.0281	0.0094
		(74.96%)	(25.04%)
1995**	0,0378	0,0287	0.0091
		(75.95%)	(24.05%)
1997**	0,0359	0,0283	0.0077
		(78.64%)	(21.36%)

Note: * Results referred to 179-regions sample, where we have been able to include Eastern German regions, and Nuts 2 units for UK.
** Results referred to 203-regions sample, where we have been able to include additionally Nuts 2 units for Austria, Finland and Sweden.

Table 4: GDP per capita by countries

	1982	1985	1990	1995	1991*	1995*	1995**	1997**
Belgium	1.0879	1.0617	1.0454	1.1026	1.0748	1.1207	1.1197	1.1092
Denmark	1.0730	1.1297	1.0330	1.1414	1.0829	1.1601	1.1789	1.1975
Germany	1.1588	1.1781	1.2006	1.1950	1.0720	1.1042	1.0992	1.0787
Greece	0.6236	0.6114	0.5790	0.6516	0.6088	0.6623	0.6582	0.6564
Spain	0.7163	0.7075	0.7598	0.7713	0.8092	0.7840	0.7806	0.7947
France	1.1668	1.1264	1.0893	1.0449	1.1255	1.0621	1.0600	1.0133
Ireland	0.6173	0.6124	0.7340	0.9465	0.7764	0.9620	0.9216	1.0180
Italy	1.0233	1.0288	1.0175	1.0200	1.0554	1.0368	1.0317	1.0128
Luxembourg	1.1629	1.3213	1.5004	1.6874	1.5843	1.7151	1.7460	1.7537
Netherlands	1.0333	1.0412	1.0016	1.0509	1.0193	1.0681	1.0916	1.1245
Portugal	0.6227	0.5764	0.6126	0.6931	0.6432	0.6945	0.6992	0.7292
UK	0.9578	0.9894	0.9852	0.9427	0.9658	0.9582	0.9543	1.0158
Austria							1.1025	1.1137
Finland							0.9663	0.9908
Sweden							1.0232	1.0146

Note: * Results referred to 179-regions sample, where we have been able to include Eastern German regions, and Nuts 2 units for UK.
** Results referred to 203-regions sample, where we have been able to include additionally Nuts 2 units for Austria, Finland and Sweden.

Table 5: Internal National Indexes. Selected years.

	1982	1985	1990	1995	1995**	1997**
Belgium	0.0308	0.0272	0.0265	0.0237	0,0233	0,0248
Denmark	0.0000	0.0000	0.0000	0.0000	0,0000	0,0000
Germany	0.0142	0.0155	0.0175	0.0176	0,0369	0,0354
Greece	0.0047	0.0057	0.0066	0.0079	0,0079	0,0088
Spain	0.0172	0.0174	0.0209	0.0224	0,0224	0,0229
France	0.0233	0.0262	0.0289	0.0296	0,0296	0,0297
Ireland	0.0000	0.0000	0.0000	0.0000	0,0000	0,0000
Italy	0.0339	0.0313	0.0345	0.0389	0,0389	0,0399
Luxembourg	0.0000	0.0000	0.0000	0.0000	0,0000	0,0000
Netherlands	0.0232	0.0285	0.0056	0.0055	0,0057	0,0065
Portugal	0.0295	0.0254	0.0222	0.0174	0,0172	0,0170
UK	0.0061	0.0068	0.0091	0.0079	0,0320	0,0296
Austria					0,0300	0,0270
Finland					0,0169	0,0218
Sweden					0,0056	0,0053

Note: ** Results referred to 203-regions sample, where we have been able to include additionally Eastern German regions and Nuts 2 units for UK, Austria, Finland and Sweden.

Table 6: Decomposition of L(within) among countries

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	1982	1985	1990	1995	1991*	1995*	1995**	1997**
Belgium	0.0010	0.0008	0.0008	0.0007	0.0007	0.0007	0,0006	0,0007
	(5%)	(4%)	(4%)	(3%)	(2%)	(2%)	(2%)	(2%)
Denmark	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0,0000	0,0000
	(0%)	(0%)	(0%)	(0%)	(0%)	(0%)	(0%)	(0%)
Germany	0.0027	0.0029	0.0033	0.0034	0.0225	0.0097	0,0081	0,0078
	(14%)	(15%)	(16%)	(16%)	(56%)	(34%)	(28%)	(27%)
Greece	0.0001	0.0002	0.0002	0.0003	0.0002	0.0002	0,0002	0,0002
	(0%)	(0%)	(1%)	(1%)	(0%)	(1%)	(1%)	(1%)
Spain	0.0021	0.0021	0.0025	0.0026	0.0024	0.0025	0,0024	0,0024
	(11%)	(11%)	(12%)	(13%)	(6%)	(9%)	(8%)	(9%)
France	0.0040	0.0045	0.0051	0.0052	0.0049	0.0049	0,0046	0,0046
	(21%)	(23%)	(25%)	(25%)	(12%)	(18%)	(16%)	(16%)
Ireland	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0,0000	0,0000
	(0%)	(0%)	(0%)	(0%)	(0%)	(0%)	(0%)	(0%)
Italy	0.0060	0.0056	0.0060	0.0067	0.0053	0.0064	0,0060	0,0061
	(32%)	(29%)	(30%)	(32%)	(13%)	(23%)	(21%)	(22%)
Luxembourg	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0,0000	0,0000
	(0%)	(0%)	(0%)	(0%)	(0%)	(0%)	(0%)	(0%)
Netherlands	0.0010	0.0013	0.0003	0.0003	0.0003	0.0003	0,0002	0,0003
	(6%)	(7%)	(1%)	(1%)	(1%)	(1%)	(1%)	(1%)
Portugal	0.0009	0.0008	0.0006	0.0005	0.0008	0.0005	0,0005	0,0005
	(5%)	(4%)	(3%)	(2%)	(2%)	(2%)	(2%)	(2%)
UK	0.0011	0.0012	0.0016	0.0014	0.0029	0.0029	0,0050	0,0047
	(6%)	(6%)	(8%)	(7%)	(7%)	(10%)	(18%)	(17%)
Austria							0,0006	0,0006
							(2%)	(2%)
Finland							0,0002	0,0003
							(1%)	(1%)
Sweden							0,0001	0,0001
							(0%)	(0%)
T(0) intra	*0.0188*	*0.0194*	*0.0204*	*0.0211*	*0.0399*	*0.0281*	*0,0287*	*0,0283*

Note: * Results referred to 179-regions sample, where we have been able to include Eastern German regions, and Nuts 2 units for UK.

** Results referred to 203-regions sample, where we have been able to include additionally Nuts 2 units for Austria, Finland and Sweden.

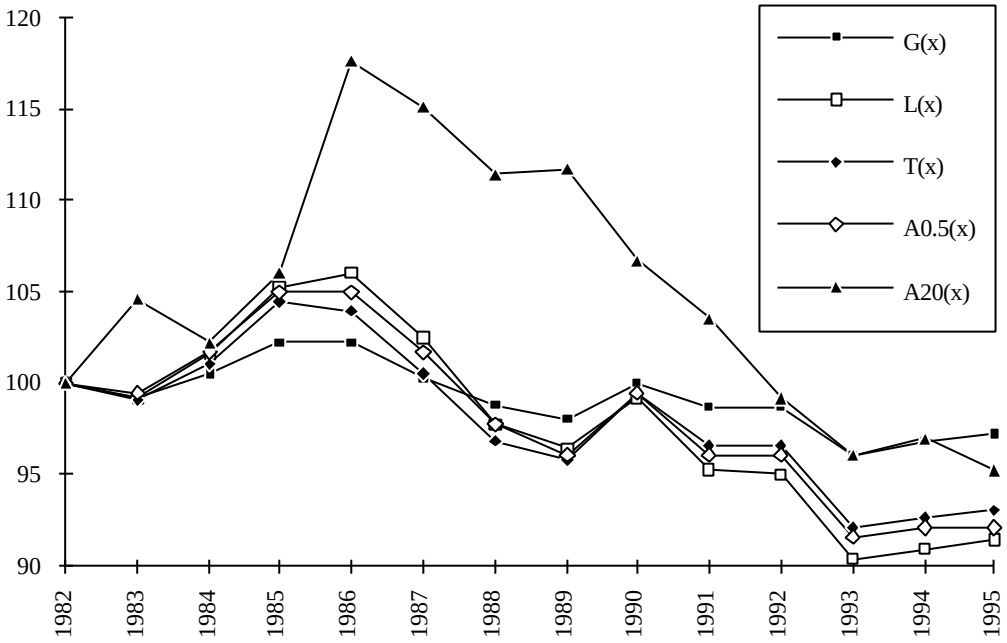
Table 7: Decomposition of overall inequality changes by income and population changes

	1982-95	1982-85	1985-90	1990-95	1991*-95*	1995**-97**
- Income Changes	-0.0032 (103%)	+0.0017 (89%)	-0.0022 (105%)	-0.0028 (97%)	-0.0129 (99%)	-0,0018 (100%)
- Population Changes	+0.0001 (-3%)	+0.0002 (11%)	+0.0001 (-5%)	-0.0001 (3%)	-0.0001 (1%)	0,0000 (0%)
- *Total Change*	*-0.0031*	*+0.0019*	*-0.0021*	*-0.0029*	*-0.0130*	*-0,0018*

Note: * Results referred to 179-regions sample, where we have been able to include Eastern German regions, and Nuts 2 units for UK.
** Results referred to 203-regions sample, where we have been able to include additionally Nuts 2 units for Austria, Finland and Sweden.

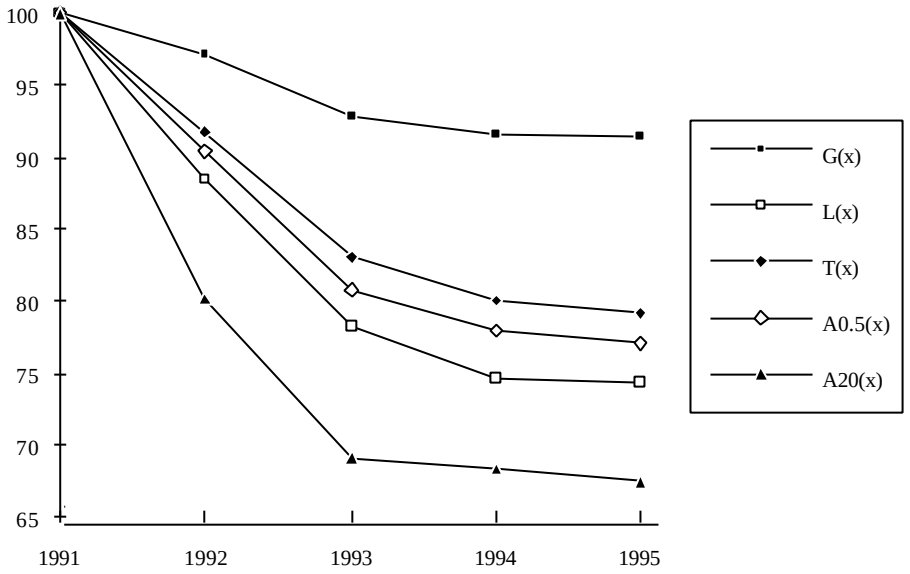
Figure 1: Temporal Patterns of Cross-regional inequalities in Europe,

1982-95



Note: The inequality values have been indexed (1982=100).

Figure 2: Temporal Patterns of Cross-regional inequalities in Europe, 1991*-95*



Note: The inequality values have been indexed (1991=100).

Figure 3: European Regional Inequalities decomposed by Subgroups (Countries),

Sample 1982-95

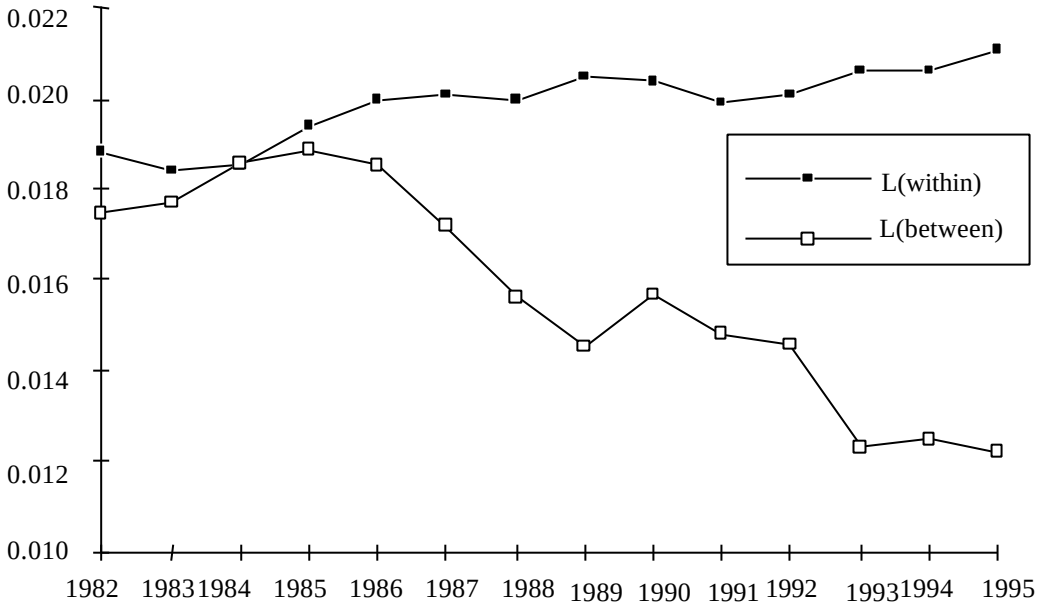


Figure 4: European Regional Inequalities decomposed by Subgroups (Countries),

Sample 1991*-95*

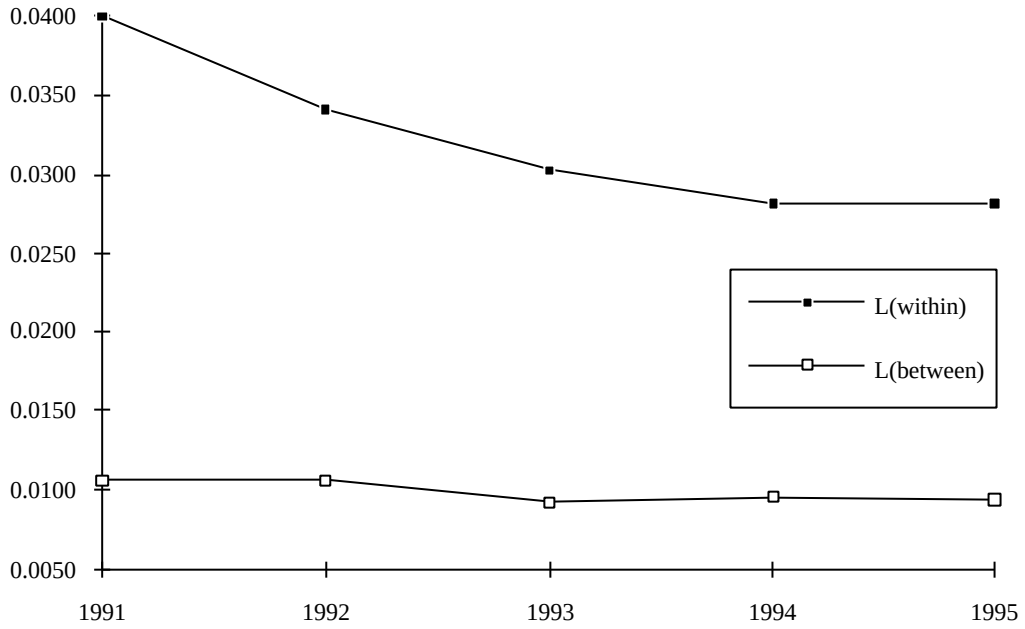
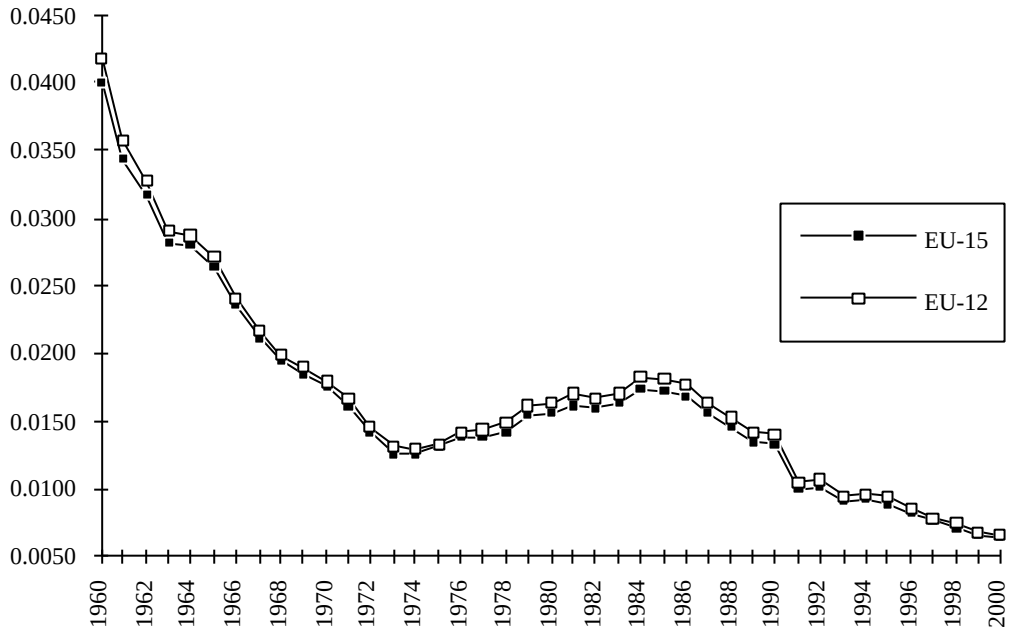


Figure 5: Between-Country Inequality Component. 1960-2000.



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