History and Prospects of Inequality between Europeans*

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Abstract

This article provides the first study of inequality and poverty in the European Union from 1970 to 2040. The distribution of disposable income shows a large decrease of absolute poverty over the last decades, whereas inequality has not changed since 1980 after a fall in the 70s. The comparison between the two distributions of disposable income and factor income respectively, allows an estimate of redistribution: this becomes more important when factor inequality increases. The total inequality is decomposed between inequality within countries and inequality between countries. The latter accounts for a low and decreasing share of total inequality. Moreover, the study of the convergence processes of GDP per capita and inequality within countries allows, with population projections, to estimate the European distribution for the next 40 years with 27 countries, an enlargement which will entail a large and persistant increase of inequality and of absolute poverty.

The best index of the economic performance of the European Union is the rate of growth of GDP per capita. One could add to this index the weight of the Union in world trade, the rate of growth of total factor productivity since the latter reveals the quality of the governance and the impact of technology growth. But such indexes do not give informations on social aspects which concern Europeans as much as the rate of growth of GDP per capita.

In a social and political perspective, the distribution of disposable income is a pertinent index because tensions in social relations are linked to inequality of disposable income. Social cohesion inside the vast European Union ensemble (the more populated inside OECD) clearly depends on the distribution of disposable income. Tensions are likely to develop when differences between standards of living increase. But in an economic perspective, the best index measures the

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market income inequality, because the most important decisions of the Union like the suppression of tariff or the institution of a single market have an impact on the market income inequality. Another dimension of inequality to be questioned is the evolution of the income distribution over past decades. According to Barro and Sala-I-Martin (1995) analysis who found a convergence process between countries which have common characteristics, we should observe such a process among the countries of the European Union today, even if they were not members of the Union in 1970, because they were integrated in an European economic space and had several common characteristics with the first members.

This paper proceeds as follow. After section 1 on methodology and data, we describe (section 2) the disposable income inequality, the structure of distribution, the decomposition of inequality and poverty. Next section considers market income distribution and redistribution[1]. Such an analysis allows us to distinguish the effects of convergence and the incidence of redistributive policies since 1970 in the European Union. Section 4 and 5 are concerned with econometric analysis of the convergence processes of growth and national income distributions. Our estimates, which are original ones, enable us to forecast the evolution of inequality among Europeans in the next 40 forty years, and in particular to shed light on the consequences of the enlargement.

1 Methodology and data concerning European distribution of income

We have followed the same methodology as in Bourguignon and Morrisson (2002). Estimations of the distribution of income are based on three types of data for each country included in the analysis: real disposable income (or market income) per equivalent adult Y_i, expressed in constant purchasing power parity dollars (PPP), population (N_i) and the distribution of income summarised by nine decile income shares, $D_{ij} = 1...9$ and the top two vintiles shares, $D_{ij} = 10,\ 11$. The European Union distribution is obtained by assuming identical incomes for people in the same quantile. For each country, nine groups are defined of 0.1 N_i people with income $y_{ij} = 10\ Y_i\ D_{ij}$ for $j = 1...9$ and two groups of 0.05 N_i people with income $y_{ij} = 20\ Y_i\ D_{ij}$ for $j = 10, 11$.

These groups are pooled and ranged by income and afterward the Lorenz curve of the European distribution of income is computed. With 15 countries, the function is thus described by 11 x 15 points. Income inequality measures are computed on these 11 x 15 groups. We can also follow the country composition of the various quantiles of the European distribution and the rank of the various quantiles of a given country, answering the following question: what share of the population of country X is in the top European decile, or any other of the

[1] Beblo and Knaus (2001) have estimated inequality in Euroland in 2000. But they have not included Denmark, Sweden and United Kingdom; they look at income before transfers but after taxes which is neither disposable income neither market income, and they use only the Theil index whereas it is necessary to estimate also the distribution by quantile in order to understand the incidence of inequality on social tensions.

European population? Symetrically, the share of each country in the European deciles can also be computed. However, since a country is represented by only 11 groups gathering 5 % or 10% of the national population each, any method based on these 11 groups will lack of precision[2]. Whether a certain group income is slightly below or over any European decile income, the national share of people ranked in this European decile may for instance vary from 0% to 10%. This threshold effect does not provide realistic results, above all when we try to compute the absolute poverty index of the European countries. To solve this problem, we estimate a Gaussian kernel density function for each country and each year. In practice, all the income distributions are smoothed on the same interval given by the absolute minimum and maximum of European income distributions over the period (1970-1998)[3]. As a result, European income distribution estimated on the basis of these kernel country distributions is very similar to the original one. Most of the aggregates (absolute poverty rates, inequality indexes, shares of the deciles) differ only from few decimals.

Data on GDP and population are those from Maddison (2001). The GDP is given in constant PPP dollars (Geary-Khamis 1990). Maddison used the OECD series and we refer also to these series for 2000 because 1998 is the last year included in Maddison's tables. Since Germany's reunification took place in 1990, we estimated GDP and population in January and in December 1990 (before and after reunification). Using GDP per capita instead of mean personal income may bias the estimation of the evolution of European inequality, because the share of non-household income in GDP may vary from one country to another or from one year to another in the same country. In a first step the GDP per capita was retained. However a better approximation of differences in average living standards could be obtained if the ratio household income / GDP was taken into account. In view of these assumptions, it would be unwise to take the resulting estimates of national income distribution at face value. The risk of slight errors for GDP per capita estimates exists as well, and in order to gauge the resulting imprecision in European distribution estimate, measurement errors were generated randomly on Y_i and D_{ij} and MonteCarlo experiments were conducted to determinate plausible confidence intervals for European inequality measures.

Multiplicative measurement errors on GDP per capita are assumed to be distributed log-normally with mean unity and a standard deviation of 2.5 percent for every year. This seemed reasonable order of magnitude. For distribution data, stochastic deviations from central estimates D_{ij} were specified as:

$$D_{ij} = D_{ij}^0 + u_i(D_{ij}^M - D_{ij}^0) + u_i(D_{ij}^m - D_{ij}^0) \quad (1)$$

where u_i and v_i are two independant, normally distributed, zero-mean random

[2] This problem did not occur for the world income distribution since each group in this case represented less than 1.5% of total population

[3] The calibration of the bandwidth h, which drives the smoothness of the density estimates, is the most important issue: we chose $h = 0.3\ sd\ n^{-1/5}$ where sd is the standard deviation of the deciles income series and $n = 11$; this value is smaller that the asymptotic optimal value in order to take into account the finite sample size.

variables with identical standard deviation, and D_{ij}^M and D_{ij}^m are two arbitrary reference distributions corresponding to the most and the least inegalitarian distributions among all directly observed distributions. The standard deviation of the measurement error terms, u_i and v_i, was calibrated so that the resulting standard deviation of the Gini coefficient averaged 1 percentage point. With the width of the 95-percent confidence intervalle approximately equal to double this value, this seemed reasonable order of magnitude. Indeed, a Gini coefficient of 0.312 rather than 0.300 would today imply a significant difference in our knowledge of the distribution. All these measurement errors are drawn independantly for all countries for all dates, for GDP per capita, and for the distribution of income.

Household disposable income is defined as the sum of market income and cash transfers from the State, less income taxes and social security contributions of wage-earners. Household disposable income is adjusted for differences in household size to obtain equivalent household disposable income (with an "equivalence-scale elasticity" of 0.5, the value used by OECD estimates of income distribution). The equivalent household income is attributed equally to all individuals in the household and individuals are ranked by the levels of their equivalent disposable income (Atkinson et al. 1995).

In order to obtain a consistent set of data for all countries, we have systematically chosen estimates of income distribution in a given year by the same author(s), applying the same methodology. When we compare disposable income distribution and market income distribution, we also chose estimates of the two distribution by the same author(s). At last, income distribution data for 1998 are specific. They are based on extrapolation of statistics for 1995 and hypotheses on the distribution of some taxes, social security contributions, social benefits between household instead of observed disposable income. Consequently the homogeneous estimates concern only the period 1970-1995.

2 Evolution of the European distribution of disposable income since 1970

Table 1 shows the evolution between 1970 and 1998. Because of German reunification, the period is divided into two parts: 1970-January 1990 and December 1990-1995. In 1990 East Germany had a GDP/capita lower than that of any other country in the European Union (the average European income is more than three times higher and in the poorest country of the Union, Greece, it amounts to the double of East Germany average income). The reunification entailed such a rise in inequality that the right comparisons should look at January 1990 versus 1970 and 1995 versus December 1990.

From 1970 to January 1990, the decrease of the Gini and other inequality measures is unambiguous (the variations exceed widely the standard error margin). In spite of a very small increase during the 1980s, the inequality in January 1990 remains smaller than that in 1970 and the difference is significant. The

share of the bottom 40% increased by 1.2 point in 20 years, which is equal to the decrease of the top quintile's share. The population of the bottom 40% benefited from this trend since their average income increased in 20 years by 10% more than the average European income. Moreover the distribution in 1970 is strictly dominated by the two others. If we refer to generalised Lorenz dominance (which compares the absolute income of successively poorer segments of the population) to gauge changes in European social welfare, we observe that the average income of both bottom 20% and bottom 40% increased continuously and more rapidly than that of other people. During this period the European Union, in spite of two oil shocks, combined fast growth (+2.3% annually for average European income) and decreasing inequality.

These performances explain an important and rapid reduction of absolute poverty (cf. Table 1). We use two thresholds (less than 10$ or 20$ a day) which amounts to 5 or 10 times the World Bank threshold of 2$ a day. With the first index, the percentage of poor decreases from 10% to 1%, with the second one, from 35% to 9%. With 600$ or circa Euros per month the second index exceeds the minimum income guaranteed by the State to poor in any country of the European Union. As a result in 20 years, the population who required help decreased by three quarters. The second period covers December 1990 to 1998 (or 1995 if one prefers more homogeneous data). From 1990 to 1998 we observe a very small increase in inequality and the contrary trend if we refer to 1995.

In order to assess the evolution between 1970 and 1995, excluding German reunification, we must take into account the impact of this major event. For example, the Gini coefficient increased by 0.005 in between january and december 1990. Had reunification not taken place, the Gini coefficient would have been 0.298 (0.303 - 0.005) in 1995, and in 25 years the decrease of inequality would have exceed the apparent variation with lower Gini coefficient and Theil index. These figures are the most pertinent to draw up an assessment of the inequality trend, without reunification and the uncertainty about the homogeneity of data (due to the estimates for 1998 resulting from simulations). If we prefer to keep the two estimates for 1995 and 1998 at their face value, the average value of inequality measures is the same as those for the December 1990 estimate. In this case we may conclude to stability during the 1990s, with a decrease in inequality for the three decades equal to the 1970-January 1990 variation. But we must remember that in any case the variations of inequality between 1980 and 1995/1998 are very small. The only significant decrease (taking into account the error margin) took place during the 1970s before Greece, Portugal and Spain joined the European Union, followed in 1995 by Austria, Finland and Sweden. Since the European Union has reached 10 members in 1981 the term stability is the most appropriate to qualify its income distribution excluding the impact of German reunification.

Table 2 on the disposable income distribution of historical Union is the complementary of table 1 : we estimated the distribution for the members of the European Union (from 6 in 1970, 9 in 1980 to 15 in 1995). We understand better the incidence of enlargement on inequality with the historical distribution. For the period 1990-1998, there is no significant difference between the inequality

measures of table 1 and table 2, and it is the same for 1970-1980. On the contrary, the estimates of inequality are significantly different for the 1980-1990 period. Table 2 shows an increase of the Gini coefficient and of the Theil index, whereas these measures are nearly the same in 1990 than in 1980 if we look at the virtual table including 15 countries since 1970 (table 1). These results mean that the stability of inequality measures in table 1 results from opposite factors : a convergence effect as in 1970-1980 and an increase of inequality linked to the entry of 3 countries which were at that time relatively poor (the mean income of Greece, Spain and Portugal in 1980 was circa 60/70 % of the average income of the 9 members of the Union).

Even if inequality variations are an important topic for testing convergence in an economic union, the inequality level calls also attention. Among developed countries, the USA is the only reference for comparison (cf. table 3). From Foster (2000) we know that the Gini coefficient estimated with the same methodology reached 0.337 in 1985, with 18.2% for the bottom 40%. If we compare these figures with the European Union estimates for 1980 and 1990, the inequality is surely lower in the European Union (the difference exceeds largely the standard error). In particular, the situation of the relatively poor (the bottom 40%) is less satisfactory in the US with a lower share, even if their income is higher than it would be in the European Union due to the GDP gap. Moreover the economic integration in the European Union is not achieved like in the US. We will see below that this process of integration reduces the mean income disparities between European countries. So the difference in inequality between the USA and the European Union could be larger at the end of this process.

The table 3 gives also the world distribution data for 1970 and 1992 (Bourguignon and Morrisson 2002). In some respect no comparison is possible between the world distribution and the European distribution: the world Theil index is more than 5 times higher, the share of the bottom 40% 3 times smaller. This means that the gap between the mean income of the"poor" in the European Union and the mean income of the bottom 40% in the world reaches 13/1 instead of 4/1 for the ratio European Union/world mean income. As the "poor" of the European Union are ranked in the 9 th decile of the world income distribution, we can say that they are considered as privilegied people by 80% of the world population. Nearly all Europeans belong to the top quintile of the world distribution. The world distribution put in a much different perspective inequality within European Union. European inequality appears as concerning only relatively rich people.

Another difference between European Union distribution and world distribution concerns the decomposition of inequality. Tables 1 and 3 also decompose total inequality into that due to mean income disparities between countries and that due to income inequality within a country. The within country component of inequality is estimated by difference and corresponds to average country inequality weighted by total income for the Theil index or total population for the MLD. The between country component represents the inequality that could be observed if incomes were identical within each country.

For the European Union the between country component amounts to a maximum of 10% of total inequality in 1970 before decreasing to 5% in 1995 and 1998. The 1970-January 1990 period shows an interesting variation: the Theil index (between countries component) decreases by one third. This trend confirms the prediction of theory about the convergence of GDP per capita when countries belong to an homogeneous economic zone. In 1990 the reunification increased inequality in Germany and consequently the within country component. From December 1990 to 1998, the variations (of the between countries component) are very small but they are in line with the 1970-1990 decrease.

Table 3 shows a decomposition of the world income distribution which is completely different: the between country component amounts to 60% of total inequality instead of 5 to 10% in the European Union. The values of the Theil index reveal such a gap between European Union and world that no comparison is possible. In a world perspective, the European Union appears as an homogeneous region, comparable to the US. It is different for the within country component. The value of the Theil index (in within countries inequality) is circa the double for the world inequality than for the European inequality. On average, inequality is more important in developing countries for two reasons: market income distribution is more unequal and redistribution by the state which reduces a large part of inequality in the European countries is often negligible in developing countries.

It is easy to understand why the Theil index for the between countries component is so low in the European Union. The Union brings together only western European countries which are developed ones. In 1970, there is a significant gap between the less developed countries like Ireland, Greece and Portugal and other members: their average income amounts to 60% of mean income in the Union. However their population represents only 6% of the Union and their GDP is less than 4%. Among other countries the differences of average income are low, so the impact of this gap in 1970 for three small countries could not be important.

Table 4 shows the distribution of the population of each country among the various quantiles of the European distributions. We can say there is a convergence process toward homogeneity in the Union if the share of a country in quintile (decile) is nearer in 1998 to 20% (10%) than in 1970. This happens very frequently. In 1970, the percentage of Spanish, Greek, Portuguese and Irish in the bottom quintile was very high - from 40% to 60%. This percentage has been cut by half in Ireland due to an astonishing growth. While the image of Ireland had been associated with poverty for centuries, the country has now the same percentage of relatively poor people as in the European Union. The percentage of population in the bottom level decreased also in other countries: Spain, Portugal and Greece in a lesser extent. Some important countries with low percentages in 1970 are experiencing the opposite variation. The percentage in Germany increased twofold as a consequence of the reunification: between January and December 1990, the percentage of German citizens in the bottom quintile nearly doubled. This means that the number of relatively poor people in East Germany (16 millions inhabitants) was approximately the same than in West Germany (63 millions). The case of the United Kingdom is different:

the percentage increased by one third because the inequality in this country is higher in 1998 than it was in 1970.

We observe a similar convergence process for the top decile. Ireland again is an exception with a share that has been multiplicated by more than 3 in 30 years. There are increases in Portugal, Spain and in Austria as well. On the contrary the share in Sweden and Germany decreased owing to a low rate of growth in both countries. The share in France has slightly decreased as a result of less internal inequality. If we exclude these latter countries and Luxembourg, we observe that, compared to 1970, the differences in 1998 between the share of a country and the quantile (20% or 10%) are often limited. This reveals a trend toward homogeneity across members of the Union.

Table 5 shows another dimension of the changes in European distribution, with the country composition of the various quantiles in the European distribution. If the domestic distribution and the mean income were the same in all countries, we should find on each line the same figure, which is the share of the country in the total population given by the last column. The positive or negative difference between the share in the quantile and the share in the European population guides the analysis. The changes in that composition result from a complex combination of changes in the countries' respective mean income and in their domestic income distribution. For example in 1995 the shares of Italy and United Kingdom in the top 5% is larger than their share in population because domestic income distribution is relatively unequal, whereas the same difference for Luxembourg and Denmark is explained by higher mean income. As before we will focus the analysis on the bottom quintile and the top quintile. In 1970, there is a clear contrast between a Northern Europe and a Southern one. The population of the two groups are rather equivalent with one third of the Union population each. The former includes the Nordic countries, Benelux and Germany, the latter, Italy, Greece, Spain and Portugal. Nearly 60% of the bottom quintile population lives in the South while the North accounts for only 13% of this relatively poor population. The ratio 4.5/1 describes the large gap between North and South. In 1998 the gap remains but the ratio has decreased to 2.5/1. These figures give proof of the trend toward homogeneity, even if the evolution has yet to be completed. Such changes result from an income growth which is more rapid in the South than in the North and from a significant decrease of domestic inequality in the Southern countries. On the one hand it should be interpreted as an economic mechanism, the convergence of income per capita promoted by the Union, on the other hand it may be a political effect of the redistributive policies in the Southern countries which are now more progressive and have become closer to those followed in the Northern countries (cf. section 3).

The evolution of the top decile composition is more complex. The share of Southern countries such as Spain, Portugal and Italy has increased but not that of Greece, whose domestic inequality has been largely reduced. The share of the United Kingdom has also increased in the same proportion as domestic inequality. These results are linked to the evolution of the domestic distribution. The incidence of a significant variation in inequality may be as important the

effect of different rates of growth.

Table 5 gives a complementary information in showing the distribution of absolute poverty (less than 20$ a day) among countries. The weight of the Nordic countries, of Benelux, France and Ireland has decreased as a result of growth performances and/or of lower domestic inequality. But the share of the southern countries has not changed and we observe even a slight increase. The most important change concerns Germany: with reunification the share of this country has doubled, and has not decreased since 1990. Such a change stands out against the evolution in France: with a higher rate of growth for the GDP per capita, a decrease of domestic inequality (instead of an increase in Germany), the share of this country has been cut nearly by half whereas the German share has doubled.

The dynamics of European income distribution can also be considered with transition matrices (Bourguignon and Morrisson 2002, Quah 1996). Such a matrix shows how Europeans performed between 1970 and 1995 on an income scale defined at the European level. The transition matrix (Table 6) used four income bands defined as less than 0.5Y, between 0.5Y and Y, between Y and 2Y, more than 2Y, where Y stands for the mean European income.

The last line gives the distribution in 1970: the income of 39.8% of the European population ranged between Y and 2Y. The last column gives the distribution in 1995: 42.5 % received an income between 0.5Y and Y. The figures in the diagonal point to people who remain in the same income band. Other figures point to mobility. For example 8.0% (second column) is the percentage of population ranked initially in the 0.5Y-Y band who reach in 1995 the Y-2Y band. This is an upward mobility whereas 3.6% reveals a downward mobility (3.6% of the population ranked in 1970 in the 0.5Y-Y band received less than 0.5Y in 1995). The immobility ratio is the share of european population not changing relative income band. Upward (downward) mobility is the share of the population moving up (down) one income band or more.

Table 6 reveals a very low mobility of individuals. Less than 14% of people changed income band in 25 years. This estimate is not inconsistent with the world mobility since less than 22% of world population changed income band in a longer period (42 years). We must notice a favourable result: the upward mobility exceeds significantly the downward mobility. Such result explains the decrease of the share of the relatively "poor" (less than 0.5Y) in the European population. The upward mobility is due in part to the growth performances of countries like Ireland: less than 30% of the Irish population is ranked in 1995 in the bottom quintile of European distribution instead of 50% in 1970. The performances of Portugal and Spain contribute also to upward mobility. The changes in two countries, Sweden and Germany, explain downward mobility. The share of Sweden in the top European quintile has been cut by half, a result of the bad performances of Sweden. The reunification in Germany entailed an important downward mobility because the majority of East Germans were ranked in the bottom European quintile in 1990. Without this exogenous factor, the difference between upward and downward mobility would have been larger. This means that, in a context of dominant immobility, the upward mobility is

clearly prevailing in the European Union.

3 Evolution of the distribution of market income in the European union since 1970

We can define market income as factors income or as disposable income plus direct taxes and employee social contributions less social monetary transfers. Social monetary transfers are only a fraction of transfers to households. For example nearly all education public expenditures are in kind because a large majority of children are educated in schools which are free of charge. The amount of transfers in kind exceeds usually the monetary transfers. As disposable income concerns only monetary income, we don't take into account these transfers. But the problem of a difference between monetary disposable income and standard of living (which includes transfers in kind) is independent of the estimate of market income.

In fact it is difficult to find statistics which are consistent in a panel of countries on a long period. From one country to another, some sources of income are included or excluded. For example, child allowances are or are not taken into account. Fortunately we have at our disposal consistent estimates of market income and disposable income distributions in a set of 10 countries in 1985 and 1995 (by Forster 2000). But it is more difficult to find estimate for previous years. We found five estimates (for Denmark, Finland, Germany, Spain and Sweden) in Sawyer (1976) plus specific case studies on France and United Kingdom in 1970-73 (cf.Annex). This set of 7 countries is not large but it represents circa 70% of the European Union GDP. Table 7 gives market income distribution in 1970 for 7 countries, in 1985 and 1995 for 10 countries.

We can choose the most recent year for which estimates are available, that is to say 1995, to appraise the redistribution effect in European countries. This effect is clearly important: the Gini coefficient is reduced from 0.408 to 0.294 and the Theil index is decreasing by half because this inequality measure is more sensitive to variations of high incomes. The share of the top decile is reduced by 20%, and redistribution allows a doubling of the share of the first quintile, whereas the share of the bottom 40% is increased by 50%. The distribution of the market income is rather unequal: the ratio of the top decile/bottom quintile (for mean income) amounts to circa 13/1. After redistribution, the ratio is reduced to 6/1. As the share of the top decile decreased by 5.1 points and that of the bottom 40% increased by 7.3 points, we can conclude that the cost of redistribution is paid mainly by 10% of the population. The estimates of poverty before and after redistribution confirm the favourable impact of transfers: the percentage of relatively poor is cut by half and the absolute poverty index (less than 20$ a day) decreases even more. If we refer to the absolute poverty index for less than 10$ a day, such poverty disappears through redistribution: 0.5% instead of 12%. Such figures prove that direct taxes and monetary transfers explain for a large part these two characteristics of the European Union: a

distribution of disposable income which is not unequal and a low percentage of poor: 10% if we refer to a threshold which is ten times higher than the 2$ a day limit chosen by the World Bank.

The evolution of market income distribution and of redistribution can be followed since 1970. A sample of 7 countries shows this evolution of market income distribution: a decrease of inequality between 1970 and 1985, and an increase between 1985 and 1995. On Table 7 the sample of 10 countries confirms an undebatable increase of inequality between 1985 and 1995. It can be explained by the German reunification, the rise of unemployment which has a direct incidence on market income distribution because more and more people have no income at all. Others factors of inequality could be quoted: wages widening in some countries like the United Kingdom due to trade competition and globalization, and a shift in technology that has been strongly biased in favour of higher-skilled people (cf. Lindert and Williamson 2001 who note that some authors think that globalization drives technological change).

The most interesting point is the role of automatic stabilizers. The increase of inequality (of market income) between 1985 and 1995 has been partially blunted by redistribution. When market income inequality increases, the redistribution becomes more important so that the disposable income inequality increases less or not at all. The tax and transfers system explains this result. The decrease of the earnings of unskilled people or the effect of unemployment are partially offset by transfers and the increase of income of high skilled people is reduced by higher taxes. As a result of more taxes and more transfers, the coefficient of Gini for disposable income has increased twofold less than the same coefficient for market income, and the safety net has reduced by 50% the decrease of the share of the bottom 40%. The redistribution system has not avoided an increase of disposable income inequality, but it has reduced it by half. We cannot forecast what could happen if the rate of unemployment would increase dramatically. But until now, the safety nets in European countries have not been undermined.

It is pertinent to draw a comparison with the US income distribution in 1995 which is given by the same source (Forster 2000). The inequality of market income is lower in the European Union: the coefficients of Gini are respectively 0.408 and 0.421, the Theil index 0.276 and 0.297. Moreover, the redistribution is larger than in the US: -0.114 instead of -0.079 for the Gini coefficient. Concerning the European Union, if market income inequality has increased between 1985 and 1995, the redistribution is also larger in 1995 : -0.114 instead of -0.102 for the Gini coefficient. As a result, the income share for the bottom 40% is lower in the US in 1995, in spite of shares in the market income distribution which are close. The difference between the US and the European Union for the distribution of disposable income results mainly of a political choice: the fiscal policies of Europeans countries are more redistributive. But the difference must not be overestimated, with the enlargement to 12 countries the inequality of disposable income in the European Union would be significantly higher than in the US.

4 The growth convergence process

The latter sections suggests that the income distributions of the fifteen European countries likely converged to a common pattern. One major contribution of this article is to clearly test this hypothesis and quantify the dynamics of convergence. We study both the convergence of GDP per capita and that of within inequality.

In this section we use a dynamic panel data to study growth convergence among the 15 countries over the period 1960-2000. Classically, a growth convergence equation is derived from the Solow model. The following differential equation is provided by a linearization near the steady-state

$$\frac{d \ln \hat{y}_t}{dt} = \lambda(\ln \hat{y}^* - \ln \hat{y}_t) \tag{2}$$

where $\hat{y}_t = Y_t/A_t L_t$ is the income per effective worker at time t, and $\hat{y}^*$ the long-term output. This equation can be rewritten as

$$\ln \hat{y}_t - \ln \hat{y}_{t-T} = (1 - e^{-\lambda T})(\ln \hat{y}^* - \ln \hat{y}_{t-T}) \tag{3}$$

from which the dynamics of the output per capita $y_t = Y_t/L_t$ is deduced. Given that $A_t = A_0\ e^{gt}$, equation (3) leads to

$$\ln y_t = a + b\ t + \rho \ln y_{t-T} \tag{4}$$

for any date t and any period of length T, where

$$\begin{cases} a = (1 - e^{-\lambda T})(\ln \hat{y}^* + \ln A_0) + g\ T\ e^{-\lambda T} \\ b = g(1 - e^{-\lambda T}) \\ \rho = e^{-\lambda T} \end{cases} \tag{5}$$

This equation has been tested empirically in different ways. Empirical studies using cross-section data have focused on the influence of initial per capita GDP on the growth rate for any specific period, after controlling for the differences of countries characteristics like educational attaintment, investment ratio, quality of institutions. For any period $[t_1,\ t_2]$, they typically consider a pseudo-panel equation

$$\ln y_{i,t_2} - \ln y_{i,t_1} = \alpha + \beta \ln y_{i,t_1} + \sum_{j=1}^{N} \gamma_j\ x_{i,j} + u_i \tag{6}$$

where u_i is an error term with a mean equal to zero, α a constant term, β the coefficient that reflects the magnitude of the convergence effect, and $x_{i,j}$ some explanatory variables. Focusing on the convergence of a panel of countries or regions, Barro and Sala-I-Martin (1995) infer a convergence rate comprised between 2 and 3%. Some drawbacks of this approach have been pointed out: some of the regressors may be endogenous, and no fixed-effects are allowed between countries. In particular, fixed-effects represent initial level of technology that may be positively correlated with a regressor, the initial level of output, which leads to an omitted variable bias and an underestimation of β.

Another approach based on panel data consists in estimating the following equation

$$\ln y_{i,t} = \alpha_i + \xi_t + \rho \ln y_{i,t-1} + \sum_{j=1}^{N} \gamma_j x_{i,j} + u_{it} \tag{7}$$

that introduces country-specific effects α_i with zero mean and time-specific effects ξ_t. The procedure consists in writing all the variables as differences from period means to make the time-specific constant ξ_t disappear, in taking then first-differences to remove the unobserved country-specific effects α_i, and finally in instrumenting by the levels of the series lagged two periods or more. First introduced by Arellano-Bond (1991), this two-steps GMM estimator (hereafter DIF-GMM) corrected both the omitted variable and the endogeneity biases of simple cross-section regressions. As a consequence, Caselli-Esquivel-Lefort (1996) infered much higher convergence rates (between 6% and 14%) than former studies over the same panel data[4]. However, their estimator could suffer from a weak instruments problem, which means that the instruments are often weakly correlated to the regressors.

Bond, Hoefler and Temple (2001) showed that the DIF-GMM estimate of the autoregressive coefficient ρ could on the contrary suffer from a downward bias, that translates to an overestimation of the implied convergence rate. To correct this problem, they use an improved version of the latter estimator, introduced by Arellano-Bover (1995) and Blundell-Bond (1998), hereafter SYS-GMM. Under some weak conditions, they combine the Arellano and Bond's equations in first-differences, using lagged variables in levels as instruments, with additional equations in levels and lagged first-differenced variables as instruments. Importantly, they find the same convergence rate than cross-countries regressions, around 2 or 3%[5].

In this paper we test three estimators, the classical Within Groups estimator (hereafter WG), DIF-GMM and SYS-GMM, and retain the growth convergence rate given by the latest, SYS-GMM, for further simulations. After substracting each period mean to the logarithm of output, the panel data equation is given by

$$\ln y_{it} = a_i + \rho \ln y_{i,t-1} + u_{it} \qquad t = 1...4 \tag{8}$$

where u_{it} represents an uncorrelated white noise across countries and time dimensions, and a_i zero-mean fixed-effects uncorrelated with perturbations. In Table 8 we compare the results of the procedures. It is well known that Within Group estimator is seriously biased since the elimination of fixed-effects introduces some correlations between the regressors and the perturbation. Moreover, for a pure autoregressive model as in equation (8) this estimator is biased downward, which entails an upward bias in the convergence rate. We should then refer to the WG estimate as an upper bound for acceptable values.

[4] Using other estimators than DIF-GMM, Islam (1995) was the first to infer high convergence rates around 7 or 9%.

[5] More recently Arellano (2003), using optimal instruments on the same data as the latter, has estimated a convergence rate of 4.3%, which however lacked of some precision.

Our results confirm qualitatively the former studies, and SYS-GMM provides a value of 2.3% in tune with most of the former empirical litterature. Sargan tests indicate that the moment conditions underlying the GMM estimators are valid one. Everything else being equal, a convergence rate of 2.3% means that a country displaying initially 60% of the GDP of another one may reach 72% 20 years latter.

Now we turn to the computation of others parameters. A simple average over time[6] on equation (8) provides

$$\hat{a}_i = \ln y_{i.} - \hat{\rho}\ \ln y_{i.-1} \tag{9}$$

where $\ln y_{i.} = \frac{1}{3}\sum_{t=1}^{3} \ln y_{it}$, $\ln y_{i.-1} = \frac{1}{3}\sum_{t=0}^{2} \ln y_{it}$, and $\hat{\rho} = 0.793$ using SYS-GMM estimate. Moreover, equation (9) also derives a standard error for $\hat{a}_i$ that is deduced from that of $\hat{\rho}$. Equation (4) suggests to infer linear time-specific effects $\xi_t = \mu + bt$. Returning to variables written in levels, equation (8) becomes

$$\ln\ y_{i,t} = a_i + \mu + bt + \rho\ \ln\ y_{i,t-1} + u_{it} \tag{10}$$

Taking first-differences of the latter, and computing the mean over countries and time, we get the coefficient of variation of the linear long-term trend $\hat{b} = 0.0426$, then the intercept $\mu = 2.057$. The coefficient $\hat{b}$ is then translated into a stationnary annual growth rate, equal to 2.06%, by taking into account the time period $T = 10$ and the autoregressive coefficient $\hat{\rho}$ (see equations (5)). Then we tested our model backward on the period 1970-2000 by simulating the GDP per capita of each country at each date, comparing the simulated values to the real ones. The mean error of prediction over the period is close to 0 (– 0.7% of countries GDP per capita), which indicates that our set of parameters is unbiased, and its standard deviation is reasonnable (10%).

5 Convergence of income inequalities

In the latter section we showed that the first moments of the European countries income distributions, GDP per capita, were converging to the same growth path, and we quantified the speed of this convergence process. We now turn to further moments: do the distribution themselves tend to converge to a unique pattern, in other words, does *within* inequality of the European countries converge to a common level? This question has not been raised many times, mainly due to the difficulty to find consistent data over long periods, and to the erratic frequencies of surveys that complicate statistical inference. However, some studies suggest that, at the world level, inequality within countries reverts to a mean level[7] - in particular Ravallion (2001) estimates this level at a Gini index around 0.40,

[6] We compute the fixed-effects and the long-term trend on the period 1970-2000 rather than 1960-2000 because we believe that low mean GDP per capita in 1960 entails a serious downward bias on the estimates. One should indeed not forget that the linear specification of growth convergence is justified only for economies close to the steady-state.

[7] see Benabou (1996), Li, Squire and Zou (1998), and Ravallion (2001)

with a speed of convergence comprised between 3 and 4%. Our intention is to estimate the within inequality convergence process inside the European Union for the 1970-1995 period. We use for the first time - to our knowledge - the estimators presented above on a panel data. We consider different indexes, in order to compare the speed of convergence of different parts of the distribution: Gini and Theil indexes, the income shares of the two bottom quintiles and of the top decile of the Lorenz curve. Formally we set G_{it} for the Gini index of country i at date t. Typically, existing studies have tested inequality convergence with the following equation:

$$G_{it} = (1 - \rho_G)\, G^0 + \rho_G\, G_{i,t-1} + v_{it} \ldots\ldots\ldots\ldots t = 1, \ldots 4 \tag{11}$$

with G^0 the long-term level of inequality, ρ_G the autoregressive coefficients, v a white noise. To apply the same methodology, we have to overcome a problem of data coherence. Our observations consist in income distributions in 1970, 1980, 1990 and 1995, so that the last one could introduce a temporal bias resulting probably in an underestimation of convergence (an overestimation of ρ_G). To solve this problem, we make the autoregressive coefficient depend on time t by setting $\rho_{G,t} = 1 + \lambda T_t$ where T_t indicates the length of time between observations t and $t-1$. This is justified by a first-order approximation of the autoregressive coefficient in equation (3), so that in what follows $-\lambda$ stands for the annual rate of change in inequality. As a first step, we use OLS estimator and regress the change in inequality on past inequality weighted by the time variable:

$$\Delta G_{it} = \mu + \lambda T_t\, G_{i,t-1} + v_{it} \ldots\ldots\ldots\ldots t = 1, \ldots 4 \tag{12}$$

In this regression we exclude Luxembourg for which we only have one observation over the period. The results are described in the first column of Table 9. The convergence rate of the Gini index is about 2%, that of Theil index about 3%, and the top of the distribution converges at a rate equal to 2%. On the contrary we do not observe convergence for the bottom of the distribution. These results suggest that the upper half of the income distribution converges whereas the dynamics of the lower half is more ambigous. These values are coherent with Ravallion (2001), but we cast doubt on the statistical robustness of these estimates. As described in the GDP per capita convergence econometric controversy, the lack of heterogeneity in the model due to the absence of fixed-effects could bias the estimates if these fixed-effects are in reality correlated with the regressor. Introducing fixed-effects means that, in equation (11), the common long-term level G^0 now depends on the country and is written G_i^0. It seems plausible to believe that country-specific determinants as the importance of the welfare state or the structure of the labour market, have an impact on inequality at any date, thus on the long-term as well. Therefore, as for the growth convergence problem, we believe that introducing fixed-effects could raise the statistical quality of estimates, and avoid a downward bias on the rate of convergence since these fixed-effects G_i^0 are plausibly positively correlated with the regressor $G_{i,t-1}$. Moreover we introduce time-dummies δ_t, to take into account the fact that the stationnary level of inequality could vary across periods because of economic factors. Intuitively, it is certainly easier to lessen inequalities

with a growth rate of 3% - like during the seventies - rather than with a growth rate of 1.5%. Indeed, the mean across countries of the Gini index $\frac{1}{N}\sum_i G_{it}$ has a downward trend between 1970 and 1980 and an upward trend afterward - so does the Theil index. In practice, the statistical improvement of estimates that a time-dummy enabled is also very interesting. As a result, we assume that the stationnary inequality level could vary accross countries and time, but that both effects are independent. Thus equation (8) becomes

$$\Delta G_{it} = a_i + \delta_t + \lambda\ T_t G_{i,t-1} + v_{it} \ldots\ldots\ldots\ldots t = 1, \ldots 4 \tag{13}$$

Under the assumption that the mean of the fixed-effects is zero, we can rewrite this equation without the time dummy δ_t if all variables are written as differences with the period mean. Exactely as before, we estimate this dynamical panel model with the same three estimators: WG, DIF-GMM and SYS-GMM. Results are described in columns 2, 3 and 4 of Table 9. As expected, OLS estimates are always smaller that the others, and WG estimates always greater. If we already knew that WG estimator was biased upward for pure autoregressive panel models, we have the confirmation that OLS estimates are probably biased downward because of omitted fixed-effects. It is worth noticing that for Gini and Theil indexes, two-steps GMM estimates are significant and very close to each other; the dynamics of the income share of the two bottom quintiles is ambigous since only one estimate on four is significant[8]. We therefore confirm a global convergence of the income distribution that for a large part rests upon the top decile convergence process.

Another question we raise concerns the stationnary inequality levels of the European countries. It is quite a difficult point to consider, because if we can easily compute the fixed-effects of the countries on the basis of the SYS-GMM estimates for instance, we have to decide about the value of the time-dummy on the long range. As the mean European inequality has only slightly increased over the last twenty years, we set it at its 1995 value. Otherwise we would have to sketch scenari about the time trend of inequality and compute the stationnary inequality levels on this basis. In our benchmark example, if the mean of within inequality inside the European Union is constant in the future, then inequality convergence is already almost completed. Indeed, the standard error of the inequality distribution across countries in 1970 was 0.057 if we refer to the Gini index, 0.044 in 1995, and 0.037 at its stationnary level[9]. Statistically this is explained by quite large fixed-effects expressing much heterogeneity at the steady-state. In the future, changes in inequality may only imply marginal changes of the distributions, except for a few countries: Finland (+0.009 for the Gini index), Greece (-0.015), Italy (-0.020), United Kingdom (+0.019), Portugal (-0.012) , Sweeden (+0.013). The overall impact on the European distribution might be negligeable since these modifications could somehow compensate each

[8] for the first bottom quintile SYS-GMM indicates a relatively quick convergence.

[9] Once again under the assumption that the time trend of inequality remains at its 1995's value. The incoming of at least twelve countries inside the European Union should not change the stationnary level of inequality, since the within inequality of the incoming countries is very similar to that of the current European Union. See Table 11 for more details.

other. At last, income distributions do converge, but towards levels that can be quite different to each other[10], and that are close to the observed distributions today.

6 The short-term impact of the enlargement

The European Union has only one experience of enlargement to a relatively poor country with German reunification and this country, East Germany, was small (less than 5% of the European Union population). The impact of enlarging the Union with several relatively poor countries, would be very different. Table 10 presents four simulations based on the following hypotheses :

1. enlargement with 10 countries in 2000.
2. enlargement with 12 countries in 2000.
3. enlargement to Turkey only, with the data on population, average income, and income distribution in this country in 2000.
4. enlargement with 12 countries plus Turkey.

In every case, the enlargement entails a large increase of inequality and of poverty, which rise beyond the US level. The coefficient of Gini index increases by 0.034 and 0.059 points with 10 countries and 12 countries, the Theil by 0.036 and 0.066 points. With Turkey alone (third simulation), the Gini and the Theil increase respectively by 0.051 and 0.057 points, which means that the incoming of Turkey alone would have almost the same impact of the 12 countries. These results are unexpected because the mean income of the 12 countries and of Turkey are nearly the same, but the population of the 12 countries exceeds largely the Turkish population. But the income distribution in Turkey is much more unequal than in the 12 countries or in the European Union countries. With 12 countries plus Turkey, the Gini coefficient amounts to 0.397, the Theil index to 0.262, instead of 0.342 and 0.190 respectively in the US. The share of the bottom 20% is almost divided by two, that of the bottom 40% to is reduced of on third. This increase of inequality combined with a lower mean income explains the progress of poverty: the absolute poverty index (less than 20$ a day) is increased threefold, the relative poverty index is doubled. If we compare these figures to the same indexes in the US it is clear that poverty would reach a level which would be much higher than in the US and of course in the European Union before enlargement. Such large increases of inequality and poverty could entail tensions and social problems that the European Union has never known in the past. Even if the entry of Turkey is postponed, we must notice the impact of the enlargement to 12 countries. The share of the bottom 20% decreases significantly, the absolute poverty index doubles, the increase of the relative poverty index exceeds 50%. These few figures suffices to prove that such an enlargement could entail consequences that the Union has never experienced.

Table 10 gives also the decomposition of the Theil index and of the MLD for the European Union plus 12 countries. It is remarquable that the within

[10] The extremes of the income distributions should be represented by Sweden and Portugal with Gini coefficients of respectively 0.212 and 0.343.

component of the Theil index does not increase but that the between component is multiplicated by six or ten with the incoming of 10 or 12 countries. With the entry of 12 countries plus Turkey, the decomposition of income inequality comes closer to the decomposition of the world income inequality. The share of the between countries component remains lower: a third instead of more than 50%, but it increases from 4% to 37%. This means that the European Union with 12 countries plus Turkey becomes an heterogenous region with developed and developing countries where the inequality between countries is an important component of total inequality.

7 The simulated European income distribution after the enlargement

To compute the European income distribution for the next forty years, we need to forecast the GDP per capita, the population, and the national income distribution of each country. The first one is computed through simulations with the help of the estimated growth convergence equation, the second is issued from a demographic projections database, while the latter is simply the income distribution of 1998 since, as it was showed before, statistically the national income distributions should not change a lot in the future. In particular we assume that growth and income distributions are independant processes and do not influence each other. Indeed, on this topic both empirical and theoretical litterature seems controversy and deprived of clear evidence - as noted in Bourguignon (2002), case-studies may suggest different conclusions that cross-countries analysis concerning the mutual influence of growth and income distributions. For the sake of simplicity, we therefore choose to make both concepts independant.

In order to simulate the evolution of the incoming countries' GDP within the next forty years, we have to make assumptions about their growth convergence process. Concerning the 15 countries, we assume that the incoming of new members inside European Union will not affect their growth path. Then we have to make assumptions about the incoming countries. The first and most important one is that their convergence rate is similar to that of the fifteen countries studied over the last forty years. The other hypotheses concern the fixed-effects and the long term trend of the incoming countries. The incoming countries display approximatively from one third to two thirds of the European mean income in 2000, a situation that could only be compared with that of Portugal, Greece, Irlande and Spain forty years ago. Therefore we choose to allocate the mean of the latter four countries fixed-effects to the incoming countries[11]. The last hypothesis concerns the long-term trend; the annual growth rate is assumed to be the same across countries and equal to that estimated above (2.1%). Given the GDP per capita in 2000 of the twenty-seven countries,

[11] Of course, some differences could be made inside the incoming group, in order to test different scenari of convergence. For instance, if the fixed-effects of Poland and Romania were close to zero, the way the other countries converge will have less impact on the European distribution because of their weak demographic weight

we construct recursively their GDP per capita in 2010, 2020, 2030 and 2040. We use the structural equation of convergence (equation 10) estimated in section 4 to simulate the levels of logarithms of output:

$$\ln y_{it} = a_i + 2.057 + 0.0426\ t + 0.793 \ln y_{i,t-1} \qquad t \geq 5 \qquad (14)$$

where coefficients a_i are the estimated fixed-effects for the fifteen countries, and $a_i = -0.016$ for the incoming countries[12].

Population projections are provided by the United Nations Population Division (2000). They are based on assumptions on life expectancy, fecondity and mortality rates, migration rate and others. According to standard hypothesis, Northern Europe, which is composed of the Baltic countries, United Kingdom, Denmark and the Nordic countries, should be the only one part of Europe to gain in population. For instance, in 2040 Italy may have lost 10 millions of inhabitants, Germany 7 millions, Spain and Poland 5 millions. As a whole, the European Union might loose 35 millions of inhabitants within 40 years. Table 11 presents the evolution of the European income distribution, under the assumption of the integration of the 12 countries in 2000.

The simulation forecasts a low decrease of inequality all over the period, correlated to the low GDP convergence rate of the incoming countries. Not surprisingly, all the inequality levels until 2040 are the highest the European Union ever experienced. The Gini index reaches its historical level of 1970 (the highest over the past 30 years) only between 2030 and 2040, and remains at this date higher than it is now. In 2010, the Gini is about 0.350 whereas it is now close to 0.310; absolute poverty is at its 1990 level, that is to say 50% higher than now, whereas relative poverty is 70% higher. Absolute poverty should only reach its current level in 2020, the share of the first quintile, only in 2040. The European Union will thus have to face very high levels of inequality and poverty that should persist, above all for inequality, on the long range.

However, we should demonstrate some prudence with theses results. An important issue is to know whether the catch up process is well described by the linear equations we estimated. In fact, the latter are based on a linearization of the Solow model near the steady-state. Countries that display a third or half of the European mean are not meant to be close to their steady-state, so that the convergence dynamics might be more complex, in particular not linear at the beginning of the process. The simulations are also conditional on the demographic forecasts, which variance increases substancially with time. Any modification of fertility in any direction in Eastern Europe, due to the economic development for instance, could alter the long-term predictions which are based in particular on the assumption of a dramatic decline of Eastern Europe population. However this demographic bias should not be very much important until at least 2020.

[12] Note that any bias on the time-dummy estimate $2.057 + 0.0426\ t$ has no impact on the resulting European distribution and inequality indexes, because it affects the GDP of all the country with the same scale. It only changes the simulated mean income of the European Union and absolute poverty indexes. Thus the evolution of inequality depends mainly on the estimated rate of growth convergence, and marginally on the fixed-effects.

8 Concluding Remarks

The distribution of disposable income in the European Union among its present 380 millions inhabitants and its 480 millions in a few years (with 12 countries, but excluding Turkey) depends of many opposite factors. Some factors increase inequality (and poverty), others reduce it ; some factors are controlled by governments or the European Union, but others are exogenous. It matters obviously very much for policy makers as well as politicians.

If we look at inequality factors, any world recession which increases unemployment in Europe during several years is in some respect an exogenous factor (present hopes of growth recovery rest upon the situation in the US and not on that in Europe). The shift in technology in favour of higher-skilled people and the globalization which widens wages scale or increase unemployment of unskilled people are long-term and exogenous factors of inequality and cannot be avoided. In this respect, the situation of the European Union was a lot more favourable in the 1960's and the 1970's than it is now.

Other inequality factors depend on the governments and the Union. Deciding on a less redistributive policy, as the United Kingdom did after 1980, is a national choice. The choice of enlargement with new countries which are relatively poor depends on the Union. Attention must be drawn to the contrast between past enlargement and future enlargement (excluding countries like Austria, Finland and Sweden whose average income was the same that the mean income of the Union). In the past there was a lapse of time between each enlargement: Ireland in 1971, Greece in 1981, Portugal in 1986 and East Germany in 1990 and each of these countries was small. The next enlargement (10 countries in 2004 plus 2 a short time after) entails an increase of inequality much higher than that entailed by the entry of any country in the past.

Fortunately some factors have the opposite effect. The process of integration has reduced the mean income disparities between European countries. The structural funds have the same effect. The evolutions of market income and disposable income distributions show the role of automatic stabilizers. When recession increases market income inequality, redistribution becomes more important and partially offsets the effect of recession. The fiscal competition can also reduce inequality, as the Irish example proves. If a relatively poor country attracts investments and highly-skilled people by low taxes on corporate benefits and households income, the convergence process accelerates.

It is difficult to forecast the final result of all these opposite factors in 2010 or 2020, considering a new European Union with 27 members. It will be necessary to compensate a large increase of inequality and poverty by more structural funds, more fiscal competition, more redistribution by governments. But such policies could raise political tensions because these policies will affect the living standards of the relatively rich households (quintiles 4 and 5) in the European Union. Such measures are more easily accepted if the rate of growth of GDP per capita is high. But this rate has been cut by half betwen the 70s and the 90s. The European Union cannot avoid trading off between the improvement of the living standards of the population in new member states (and in countries

such as Greece and Portugal) and the situation of the relatively rich households of the European population, because the living standards of these households will be reduced by increasing taxes and decreasing factor income in consequence of more unemployment and of capital out-going.

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Data sources are available on request from the authors

Table 1 - The European Distribution of Disposable Income (EU 15)

	1970		1980		1990[1]		1990[2]		1995		1998	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Income shares (percents)												
Bottom 20 percent	7.1	0.09	7.8	0.09	7.8	0.11	7.7	0.09	7.9	0.09	7.9	0.13
Bottom 40 percent	19.7	0.17	21.1	0.18	20.9	0.18	20.7	0.18	20.9	0.16	21.0	0.20
Bottom 60 percent	37.3	0.25	38.9	0.23	38.6	0.23	38.2	0.23	38.4	0.21	38.2	0.24
Bottom 80 percent	60.8	0.26	62.1	0.24	62.0	0.23	61.6	0.23	61.7	0.2	60.9	0.22
Top 10 percent	23.8	0.22	22.7	0.20	22.9	0.18	23.1	0.19	23.2	0.16	24.2	0.17
Top 5 percent	14.3	0.17	13.5	0.15	13.8	0.13	14.0	0.14	13.7	0.10	14.7	0.12
Summary Inequality measures												
Coefficient of Gini	0.320	0.003	0.299	0.003	0.301	0.003	0.306	0.003	0.303	0.003	0.309	0.003
Theil Index	0.169	0.004	0.146	0.003	0.150	0.003	0.154	0.003	0.150	0.003	0.160	0.004
within country groups	0.152		0.130		0.138		0.145		0.142		0.152	
between country groups	0.017		0.016		0.012		0.009		0.008		0.008	
Mean Logarithmic Deviation	0.179	0.004	0.153	0.003	0.154	0.004	0.158	0.004	0.154	0.003	0.162	0.004
within country groups	0.160		0.136		0.141		0.148		0.145		0.154	
between country groups	0.019		0.017		0.013		0.010		0.009		0.008	
Standard deviation of logarithm	0.410	0.009	0.341	0.008	0.343	0.009	0.350	0.009	0.341	0.008	0.355	0.012
Mean European Income (PPP $ 1990)	10 375	100	13 442	130	16 371	148	15 870	149	16 792	162	17 816	165
European population (millions)	323.3		338.6		348.4		364.5		372.0		374.9	
Absolute Poverty Index (< 10 $ a day)	10.4	1.0	2.2	0.7	1.0	0.9	1.0	0.8	1.1	0.8	1.1	0.7
Absolute Poverty Index (< 20 $ a day)	34.9	1.1	20.1	0.8	13.8	1.1	14.3	0.6	12.4	0.8	9.2	0.4
Relative Poverty Index ($< \frac{1}{2}$ median income)	14.6	0.7	12.1	0.9	13.3	1.1	12.7	1.0	12.1	1.0	12.1	0.9

[1]before German reunification

[2]after German reunification

Table 2 - The Disposable Income Distribution of the Historical Union

	1970[1]		1980[2]		1990[3]		1990[4]		1995[5]		1998[5]	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Income shares (percents)												
Bottom 20 percent	7.6	0.09	8.4	0.08	7.7	0.10	7.7	0.10	7.9	0.09	7.9	0.13
Bottom 40 percent	20.6	0.16	22.0	0.16	20.7	0.18	20.5	0.19	20.9	0.16	21.0	0.20
Bottom 60 percent	38.1	0.21	39.8	0.21	38.3	0.22	37.8	0.24	38.4	0.21	38.2	0.24
Bottom 80 percent	61.1	0.22	62.8	0.22	61.7	0.23	61.2	0.24	61.7	0.2	60.9	0.22
Top 10 percent	23.9	0.24	22.5	0.16	23.1	0.18	23.4	0.21	23.2	0.16	24.2	0.17
Top 5 percent	14.7	0.26	13.5	0.13	14.0	0.13	14.2	0.15	13.7	0.10	14.7	0.12
Summary Inequality measures												
Coefficient of Gini	0.311	0.003	0.287	0.003	0.306	0.003	0.310	0.003	0.303	0.003	0.309	0.003
Theil Index	0.162	0.004	0.135	0.003	0.154	0.004	0.159	0.004	0.150	0.003	0.160	0.004
Mean Logarithmic Deviation	0.165	0.004	0.138	0.003	0.159	0.004	0.162	0.004	0.154	0.003	0.162	0.004
Standard deviation of logarithm	0.365	0.008	0.298	0.008	0.352	0.009	0.358	0.009	0.341	0.008	0.355	0.012
Mean European Income (PPP $ 1990)	11 177	113	14 345	143	16 316	166	15 789	156	16 792	162	17 816	165
European population (millions)	188.4		261.1		327.1		343.2		372.0		374.9	
Absolute Poverty Index (< 10 $ a day)	7.9	1.1	0.6	0.6	1.0	0.8	1.1	0.8	1.1	0.8	1.1	0.7
Absolute Poverty Index (< 20 $ a day)	29.4	1.4	15.7	1.0	14.1	1.2	14.6	0.8	12.4	0.8	9.2	0.4
Relative Poverty Index	12.3	1.2	9.9	1.2	13.6	1.2	13.0	1.2	12.1	1.0	12.1	0.9

[1]EU 6 = Belgium, Germany, France, Italy, Luxembourg, Netherlands

[2]EU 9 = EU 6 + Denmark, Irland, United Kingdom

[3]EU 12 (January 1990) = EU 9 + Greece, Spain, Portugal

[4]EU 12 (December 1990)

[5]EU 15 = EU 12 + Austria, Finland, Sweden

Table 3 - The World Income Distribution (1970, 1980, 1990) and the American Income Distribution (1980, 1986, 1995)

	United States of America		World	
	1986	1995	1970	1992
Income shares (percents)				
Bottom 20 percent	6.0	6.1	2.2	2.2
Bottom 40 percent	18.2	18.0	6.1	6.4
Bottom 60 percent	35.8	35.4	12.8	13.5
Bottom 80 percent	60.0	59.4	30.4	28.2
Top 10 percent	24.1	24.6	50.8	53.4
Top 5 percent	14.5	14.8	34.2	36.0
Summary Inequality measures				
Coefficient of Gini	0.337	0.342	0.650	0.657
Theil Index	0.185	0.190	0.808	0.855
within country groups	n.a.	n.a.	0.315	0.342
between country groups	n.a.	n.a.	0.492	0.513
Mean Logarithmic Deviation	0.207	0.211	0.823	0.827
within country groups	n.a.	n.a.	0.305	0.332
between country groups	n.a.	n.a.	0.518	0.495
Standard deviation of logarithm	0.497	0.501	1.210	1.184
Mean Income (PPP $ 1990)	20 717	24 879	3 773	4 962
Population (millions)	238.5	263.0	3 664.5	5 459.1
Absolute Poverty Index[1] (percents)	4.4	3.2	35.6	23.7
Absolute Poverty Index[2] (percents)	12.9	9.3	60.1	51.3
Relative Poverty Index ($< \frac{1}{2}$ median income)	22.3	22.6	n.a.	n.a.

[1]Extreme Poverty line equals 10 $ a day for the United-States and 1 $ a day for the world poverty estimate

[2]Poverty line equals 20 $ a day for the United-States and 2 $ a day for the world poverty estimate

Table 4 - Distribution of Country Population by European Quantile and Percentage of Population under the Absolute Poverty Threshold ($20 per day$) – 1970

	Absolute Poverty Index	Bottom 20 %	Decile 3-4	Decile 5-6	Decile 7-8	Decile 9	Top 10 %	Top 5 %	Deciles total
Belgium	27.3	11.6	24.7	21.3	23.9	10.7	7.8	4.8	100
Denmark	15.1	5.6	12.8	18.9	31.5	17.1	14.1	6.0	100
West Germany	18.9	7.0	16.1	22.0	29.5	14.1	11.3	5.7	100
Greece	60.3	55.2	21.5	9.7	6.0	1.9	5.7	2.9	100
Spain	52.7	41.9	25.2	14.5	10.1	2.6	5.7	2.5	100
France	27.4	14.8	22.9	16.8	21.1	10.6	13.8	7.2	100
Ireland	60.7	48.6	27.0	12.6	5.8	2.5	3.5	0.1	100
Italy	36.6	24.9	22.2	21.4	13.5	8.6	9.4	6.1	100
Luxembourg	12.3	4.5	9.6	19.6	28.8	17.1	20.4	7.3	100
Netherlands	21.9	8.8	18.0	25.1	23.1	10.3	14.7	6.5	100
Austria	28.6	11.6	26.3	27.1	22.6	6.4	6.0	0.9	100
Portugal	67.2	62.5	17.2	10.0	4.4	2.5	3.4	0.1	100
Finland	33.4	15.6	28.1	22.5	19.9	5.8	8.1	2.1	100
Sweden	17.7	11.9	9.3	15.4	30.0	19.6	13.8	6.0	100
United-Kingdom	26.5	15.3	16.5	24.5	22.0	12.2	9.5	4.6	100

Table 4 (continued) - Distribution of Country Population by European Quantile and Percentage of Population under the Absolute Poverty Threshold ($20 per day$) – 1998

	Absolute Poverty Index	Bottom 20 %	Decile 3-4	Decile 5-6	Decile 7-8	Decile 9	Top 10 %	Top 5 %	Deciles total
Belgium	3.2	9.3	13.5	25.6	30.0	12.2	9.4	4.2	100
Denmark	0.5	2.7	8.6	25.9	33.3	15.0	14.5	6.6	100
Germany	8.9	14.9	22.5	20.3	22.1	12.6	7.6	4.3	100
Greece	27.2	50.7	21.2	13.7	7.8	2.5	4.1	0.1	100
Spain	17.5	34.4	23.5	16.5	14.5	4.6	6.5	2.7	100
France	5.0	12.3	18.9	23.3	22.9	10.4	12.2	6.1	100
Ireland	11.7	24.1	23.6	15.1	15.3	9.2	12.7	6.7	100
Italy	13.4	25.8	17.1	17.9	19.1	8.8	11.3	6.3	100
Luxembourg	0.8	1.9	4.3	10.8	20.9	20.8	41.3	18.3	100
Netherlands	2.8	8.0	14.6	31.7	18.5	13.7	13.5	5.7	100
Austria	3.6	11.0	22.2	23.8	22.0	9.9	11.1	5.4	100
Portugal	27.2	47.6	18.6	13.1	10.3	3.4	7.0	3.4	100
Finland	0.4	3.6	26.4	28.9	25.1	7.1	8.9	2.8	100
Sweden	1.8	7.2	21.3	23.9	30.5	7.4	9.7	4.0	100
United-Kingdom	10.2	20.9	20.0	16.9	18.0	11.9	12.3	6.0	100

Table 5 - Distributions of European Quantiles and Absolute Poverty by Country - 1970

	Absolute Poverty Index	Bottom 20 %	Decile 3-4	Decile 5-6	Decile 7-8	Decile 9	Top 10 %	Top 5 %	Total[1]
Belgium	2.6	1.7	3.7	3.2	3.6	3.2	2.3	2.8	3.0
Denmark	0.8	0.5	1.0	1.4	2.4	2.6	2.1	1.8	1.5
West Germany	11.2	6.5	15.1	20.7	27.7	26.5	21.2	21.1	18.8
Greece	5.2	7.5	2.9	1.3	0.8	0.5	1.5	1.6	2.7
Spain	17.5	21.9	13.2	7.6	5.3	2.8	5.9	5.0	10.5
France	13.5	11.6	18.0	13.2	16.6	16.6	21.7	22.4	15.8
Ireland	1.8	2.2	1.2	0.6	0.3	0.2	0.3	0.1	0.9
Italy	19.3	20.7	18.5	17.8	11.2	14.4	15.7	20.1	16.6
Luxembourg	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.1
Netherlands	2.8	1.8	3.6	5.0	4.7	4.1	5.9	5.2	4.0
Austria	2.1	1.3	3.0	3.1	2.6	1.5	1.4	0.4	2.3
Portugal	5.7	8.4	2.3	1.3	0.6	0.7	0.9	0.1	2.7
Finland	1.5	1.1	2.0	1.6	1.4	0.8	1.1	0.6	1.4
Sweden	1.4	1.5	1.2	1.9	3.7	4.9	3.4	3.0	2.5
United-Kingdom	14.5	13.2	14.2	21.2	18.9	21.0	16.4	15.6	17.2
Total	100	100	100	100	100	100	100	100	100

[1]share in european population

Table 5 (continued) - Distribution of European Quantiles and Absolute Poverty by Country - 1998

	Absolute Poverty Index	Bottom 20 %	Decile 3-4	Decile 5-6	Decile 7-8	Decile 9	Top 10 %	Top 5 %	Total[1]
Belgium	0.9	1.2	1.8	3.5	4.1	3.3	2.5	2.3	2.7
Denmark	0.1	0.2	0.8	1.8	2.4	2.1	2.1	1.9	1.4
Germany	19.0	16.2	24.6	22.2	24.2	27.7	16.4	19.0	21.9
Greece	7.5	7.0	3.0	1.9	1.1	0.7	1.1	0.1	2.8
Spain	18.1	18.1	12.3	8.7	7.6	4.9	6.8	5.7	10.5
France	7.6	9.7	14.8	18.3	18.0	16.3	19.1	19.3	15.7
Ireland	1.2	1.2	1.2	0.7	0.8	0.9	1.3	1.3	1.0
Italy	20.2	19.7	13.1	13.7	14.6	13.6	13.3	19.4	15.4
Luxembourg	0.1	0.1	0	0.1	0.1	0.2	0.5	0.4	0.1
Netherlands	1.2	1.7	3.1	6.6	3.9	5.7	5.7	4.8	4.2
Austria	0.8	1.2	2.4	2.6	2.4	2.1	2.4	2.3	2.1
Portugal	7.1	6.2	2.5	1.7	1.4	0.9	1.9	1.8	2.7
Finland	0.1	0.3	2.1	2.0	1.7	1.0	1.2	0.8	1.4
Sweden	0.4	0.8	2.5	2.8	3.6	1.8	2.3	1.9	2.4
United-Kingdom	15.7	16.4	15.8	13.4	14.1	18.8	19.4	19.0	15.8
Total	100	100	100	100	100	100	100	100	100

Table 6 - European Relative Income Mobility, Matrix and Mobility Ratios: 1950 / 1995

Income in final year relative to european mean income (emi)	Income in initial year: Less than 1/2 emi	From 1/2 to 1 emi	From 1 to 2 emi	More than 2 emi	Total[1]	Mobility ratios
Less than 1/2 emi	79.1	3.6	0.0	0.0	17.0	
From 1/2 to 1 emi	20.9	88.4	9.1	0.0	42.5	
From 1 to 2 emi	0.0	8.0	88.5	8.5	33.7	
More than 2 emi	0.0	0.0	2.4	91.5	6.8	
Total[1]	19.7	39.8	33.8	6.7	100	
Immobility ratio[2]						86.8
Upward mobility[2]						8.1
Downward mobility[2]						5.1

The entries are initial year's population in each income band by income in the final year (percentage)

[1]share in total population

[2]the immobility ratio is the share of total population not changing relative income band. Upward (downward) mobility is the share of total population moving up (down) one income band or more

Table 7 - Market and Disposable Income Distributions

	1970[1]		1985[2]		1995[2]		United States 1995	
	Pre-Tax	Post-Tax	Pre-Tax	Post-Tax	Pre-Tax	Post-Tax	Pre-Tax	Post-Tax
Income shares (percents)								
Bottom 20 percent	2.5	7.2	4.5	8.6	4.2	8.2	3.5	6.1
Bottom 40 percent	12.4	20.0	15.6	22.3	14.2	21.5	13.2	18.0
Bottom 60 percent	29.2	37.7	32.9	40.3	30.7	39.2	29.4	35.4
Bottom 80 percent	53.9	61.3	57.3	63.4	55.3	62.3	53.9	59.4
Top 10 percent	29.2	23.4	26.1	22.0	28.0	22.9	28.6	24.6
Top 5 percent	17.6	14.0	15.7	13.0	17.4	13.6	17.4	14.8
Summary Inequality measures								
Coefficient of Gini	0.435	0.314	0.381	0.279	0.408	0.294	0.421	0.342
Theil Index	0.325	0.161	0.240	0.127	0.276	0.142	0.297	0.190
Mean Logarithmic Deviation	0.506	0.168	0.287	0.130	0.323	0.145	0.361	0.211
Standard deviation of logarithm	1.962	0.375	0.770	0.280	0.855	0.317	0.999	0.501
Mean European Income (PPP $ 1990)	10 864		15 385		17 619		24 879	
European population (millions)	218.6		277.6		304.1		263.0	
Absolute Poverty Index (< 10 $ a day)	22.1	8.6	12.6	0.2	11.9	0.5	8.1	3.2
Absolute Poverty Index (< 20 $ a day)	38.9	31.8	23.7	13.8	24.3	10.1	17.7	9.3
Relative Poverty Index ($< \frac{1}{2}$ median income)	26.2	14.4	21.6	9.8	24.2	12.0	30.9	22.6

[1]Denmark, Germany, Spain, France, Finland, Sweden, United-Kingdom (70% of EU 15 GDP)

[2]Belgium, Denmark, Germany, France, Ireland, Italy, Netherlands, Finland, Sweden, United Kingdom (86% of EU 15 GDP)

Table 8 - WG, Arellano-Bond and Blundell-Bond GMM Estimators of Growth Convergence Equation

	WG	DIF-GMM	SYS-GMM
ρ	0.389** (0.093)	0.303* (0.157)	0.793** (0.011)
Implied λ (in percents)	9.4** (2.4)	11.9* (5.5)	2.3** (0.1)
Sargan Test	-	3.63 (0.60)	9.17 (0.33)

Note: implied $\lambda = -\frac{1}{T}\ln\rho$; standard errors are shown in parentheses:* indicates that the coefficient is significant at 10%, ** at 5%; for Sargan statistics p-values are in parenthesis

Table 9 - The Convergence Rate of Inequality Indexes

		OLS	WG	DIF-GMM	SYS-GMM
Gini	λ	-0.018^{**}	-0.098^{**}	-0.062^{*}	-0.070^{**}
		(0.005)	(0.012)	(0.033)	(0.029)
	Sargan statistics	-	-	3.67	4.47
				(0.16)	(0.48)
Theil	λ	-0.0323^{**}	-0.078^{**}	-0.070^{**}	-0.051^{**}
		(0.007)	(0.015)	(0.014)	(0.008)
	Sargan statistics	-	-	3.12	3.90
				(0.21)	(0.56)
Bottom 40	λ	0.003	-0.102^{**}	-0.052	-0.022
		(0.005)	(0.011)	(0.034)	(0.018)
	Sargan statistics	-	-	3.28	3.46
				(0.19)	(0.62)
Top 10	λ	-0.018^{**}	-0.096^{**}	-0.067^{**}	-0.034^{**}
		(0.004)	(0.013)	(0.025)	(0.010)
	Sargan statistics	-	-	2.68	3.60
				(0.26)	(0.61)

Note: -λ stands for the annual convergence rate; standard errors are shown in parentheses:* indicates that the coefficient is significant at 10%, ** at 5%; for Sargan statistics p-values are in parenthesis

Table 10 - The Distribution of Disposable Income in 2000

	EU 15		Enlarged EU[1]		Enlarged EU[2]		EU 15 + Turkey		Enlarged EU[2] + Turkey	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Income shares (percents)										
Bottom 20 percent	7.9	0.13	6.5	0.11	5.3	0.11	5.2	0.15	4.3	0.14
Bottom 40 percent	21.0	0.19	18.7	0.19	16.9	0.22	17.4	0.19	14.8	0.20
Bottom 60 percent	38.2	0.23	35.8	0.25	34.1	0.30	34.8	0.24	31.7	0.26
Bottom 80 percent	60.9	0.22	59.2	0.25	57.9	0.31	58.6	0.24	56.2	0.28
Top 10 percent	24.2	0.17	25.3	0.21	26.1	0.25	25.5	0.20	27.1	0.24
Top 5 percent	14.7	0.12	15.5	0.15	16.0	0.18	15.6	0.15	16.7	0.19
Summary Inequality measures										
Coefficient of Gini	0.308	0.003	0.342	0.003	0.367	0.004	0.359	0.004	0.397	0.004
Theil Index	0.159	0.003	0.195	0.004	0.225	0.005	0.216	0.004	0.262	0.005
within country groups	0.152		0.152		0.152		0.168		0.166	
between country groups	0.007		0.043		0.073		0.048		0.096	
Mean Logarithmic Deviation	0.161	0.004	0.207	0.004	0.255	0.005	0.252	0.008	0.306	0.008
within country groups	0.153		0.154		0.155		0.191		0.184	
between country groups	0.008		0.053		0.100		0.061		0.122	
Standard deviation of logarithm	0.354	0.011	0.488	0.014	0.647	0.017	0.665	0.034	0.808	0.034
Mean Income (PPP $ 1990)	18 743	174	16 922	148	16 081	138	16 913	152	14 917	120
Population (millions)	377.1		452.2		482.6		443.4		548.9	
Absolute Poverty Index (< 10 $ a day)	0.7	0.6	3.2	0.6	7.5	0.6	7.0	0.8	11.6	0.7
Absolute Poverty Index (< 20 $ a day)	8.5	0.6	16.4	0.6	21.1	0.6	18.9	0.8	27.9	0.7
Relative Poverty Index ($< \frac{1}{2}$ median income)	10.1	1.0	16.2	0.7	19.6	0.9	18.8	0.9	23.7	0.4

[1] Enlarged Europe in 2004: 25 countries

[2] Enlarged Europe: 27 countries

Table 11 - The Prospects of the Enlarged European Income Distribution - SYS-GMM estimates

	EU 15 in 2000		Enlarged EU[1] in 2000		2010		2020		2030		2040	
	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE	Estimate	SE
Income shares (percents)												
Bottom 20 percent	7.9	0.13	5.3	0.11	6.1	0.11	6.8	0.11	7.3	0.12	7.6	0.12
Bottom 40 percent	21.0	0.19	16.9	0.22	18.3	0.20	19.2	0.18	20.0	0.19	20.4	0.20
Bottom 60 percent	38.2	0.23	34.1	0.30	35.3	0.26	36.3	0.23	37.1	0.24	37.6	0.24
Bottom 80 percent	60.9	0.22	57.9	0.31	58.8	0.27	59.5	0.23	60.1	0.23	60.4	0.23
Top 10 percent	24.2	0.17	26.1	0.25	25.4	0.22	25.0	0.18	24.7	0.19	24.4	0.19
Top 5 percent	14.7	0.12	16.0	0.18	15.7	0.16	15.4	0.14	15.1	0.14	14.9	0.14
Summary Inequality measures												
Coefficient of Gini	0.308	0.003	0.367	0.004	0.348	0.003	0.334	0.003	0.324	0.003	0.317	0.003
Theil Index	0.159	0.003	0.225	0.005	0.203	0.004	0.187	0.004	0.176	0.004	0.169	0.004
Mean Logarithmic Deviation	0.161	0.004	0.255	0.005	0.218	0.005	0.195	0.004	0.180	0.004	0.171	0.004
Standard deviation of logarithm	0.354	0.011	0.647	0.017	0.523	0.014	0.448	0.012	0.403	0.012	0.377	0.012
Mean Income (PPP $ 1990)	18 743	174	16 081	138	20 364	169	25 717	201	32 375	259	40 617	362
Population (millions)	377.1		482.6		480.6		473.8		462.4		445.2	
Absolute Poverty Index ($<$ 10 $ a day)	0.7	0.6	7.5	0.6	2.7	0.3	0.5	0.4	0.1	0.1	0.0	0.1
Absolute Poverty Index ($<$ 20 $ a day)	8.5	0.6	21.1	0.6	13.2	1.0	6.7	0.8	2.2	0.3	0.4	0.4
Relative Poverty Index	10.1	1.0	19.6	0.9	17.0	0.6	15.2	0.4	12.8	0.6	11.7	0.9

[1] Enlarged Europe: 27 countries