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Pro-poor growth and pro-poor convergence across countries

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Abstract
In this paper, we examine the link between the concepts of income convergence and pro-poor growth in a panel of countries. We show that if growth is pro-poor, then the convergence which occurs is a 'pro-poor convergence', because it necessarily implies a fall in income inequality. The empirical analysis uses the data on GDP per capita of 15 European countries for the period 1950-2005. Although the long-run shows pro-poor growth and convergence, the results stress that there are differences in such patterns across periods. Thus, the sub-period 1950-1973 exhibits an unambiguously pro-poor growth and convergence process in the European Union. In contrast, the 1974-2005 sub-period points out two phenomena: neither convergence nor divergence (1974-1992), and a neutral process of growth, i.e., income and inequality converge at the same speed (1993-2005). In the light of these findings, one can question the positive effects of European integration and the effectiveness of the economic and social cohesion policies.

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1. Introduction

The 'pro-poor growth' concept concerns the interrelation between growth, inequality and poverty. How to define and to measure this concept has sustained a wide-ranging debate (see, among others, Kakwani and Pernia 2000; Kakwani and Son, 2003; Kraay, 2006; Klasen, 2008). However, as it is argued by Kakwani and Son (2003), there is no clear consensus yet. Indeed, the growth-inequality-poverty nexus is a complex one, and it lies *per se* in some less than clearly established trade-offs ranging from the historical one growth-inequality trade-off (Kuznets, 1955; Barro, 2000) to the more recent inequality-poverty and growth-poverty trade-offs (see, among others, Dollar and Kraay, 2002; Bourguignon, 2003; Kalwij and Verschoor, 2007). Specifically, the literature agrees on the fact that growth can be qualified as pro-poor if it reduces poverty. But this definition is very simplistic as it neglects improvements in absolute or relative inequality (Ravallion, 2004; Kimenyi, 2006). According to the absolute definition, the growth is pro-poor if the income gain of the poor is larger than the average income gain (Klasen, 2008). In contrast, the relative definition requires that the growth rate of income is higher among the poor than the non-poor.

With regard to the well-established literature on pro-poor growth, the motivation of this paper is two-fold. First, the majority of the studies, notably from the papers cited previously, considers the concept of pro-poor growth by using household data within a country. This paper focuses on the notion of pro-poor growth between countries in a panel data study.[1] In this respect, the experience of the 15 initial Member States of the European Union (EU)[2] provides some useful lessons on their growth during the period 1950-2005. The case of the four 'cohesion countries',[3] namely Greece, Ireland, Portugal and Spain, is particularly illustrative of the countries pro-poor growth notion. Furthermore, this approach removes the 'anonymity axiom' which exists in the pro-poor analyses (see Grimm, 2007, for a discussion on pro-poor growth without the anonymity axiom). Thus, using Ravallion and Chen's (2003) measure of pro-poor growth, we extend their 'growth incidence curve' to countries context.

The second, and by far the principal motivation of this study, is to highlight the close link between the notions of 'pro-poor growth' and 'income convergence' across countries. It is, of course, not in our intention to review here the broad theoretical as well as empirical literature on convergence (e.g., Barro and Sala-i-Martin, 1995; and for reviews De la Fuente, 1997, and Islam, 2003). We will attempt mainly to show how one can adapt the framework developed in

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[1] Of course, we agree that the analysis of poverty within a country is a more relevant issue. However, we will not delve this issue here, but we contribute to the within-country pro-poor growth studies by focusing the analysis on the complementary unexplored topic, i.e., the between-countries pro-poor growth. Notice that the combined analysis is a substantial extension which deserves serious investigations, e.g., one can wonder about the evolution of poverty within the least-developed countries as well as within the wealthy ones during their growth process.

[2] The 'European Union' is the new name of 'European Economic Community' (EEC) as of the Treaty of Maastricht of 1992, come to effect in 1993.

[3] This denomination follows the creation of the EU Cohesion Funds to support the efforts of the four countries towards economic convergence.

the pro-poor growth literature so as to study the income convergence across countries. In particular, on the one hand, we focus our analysis on the relative pro-poor growth, and more precisely, following Kakwani and Son (2003), we use the monotonicity axiom. According to this criterion, the reduction in income inequality is a monotonically increasing function of a specific pro-poor growth measure. On the other hand, we use the two familiar measures of convergence, namely σ and β. The first measure captures the change in income dispersion, and its fall over time means a reduction in income inequality. Whereas there is a β-convergence if poor economies have a tendency to grow faster than the wealthy ones. It is also agreed that β-convergence is a necessary but not a sufficient condition for σ-convergence (Friedman, 1992; Quah, 1993). Furthermore, Furceri (2005) and Wodon and Yitzhaki (2006) examined the reciprocal causality between the two concepts and demonstrated that σ-convergence implies necessarily β-convergence. In this paper, we show that if growth is unambiguously pro-poor, then the convergence (i.e., β-convergence) which occurs is a 'pro-poor convergence' because it necessarily implies a reduction in relative income inequality (i.e., σ-convergence). Accordingly, the countries pro-poor growth evidence provides a sufficient condition for the decrease in income inequality.

The main empirical results of this paper show that a long-run process of convergence towards the EU15[4] income level, which is, a priori, in line with the Neoclassical Growth Theory, is accompanied by many episodes of growth and convergence which are not countries pro-poor. Especially, the sub-period 1950-1973 experienced an unambiguously pro-poor process of growth and convergence in the EU15. In contrast, a slowdown process in growth and in income convergence has been observed during the 1974-2005 period. More finely, the sub-period 1974-1992 exhibited neither convergence nor divergence and persistence in income inequality, while the convergence which occurred in the 1993-2005 period cannot be described as pro-poor. Our results point out a rather neutral process of growth and convergence in view of no improvement of the low-income countries, i.e., *the income and inequality converge at the same speed*. In light of these results, one can draw some policy implications. Indeed, the goal of the European economic and social cohesion aims at reduction of the development gaps between the Member States (Treaty of Maastricht). In fact, the European actions mainly channelled by cohesion and structural funds seek to generate pro-poor convergence. This has become a crucial issue not only for the actual EU (including the twelve New Members), but also in the perspective of the Union's enlargement eastward (i.e., Balkan countries). In this respect, our empirical study shows that only Ireland has moved from the low-income group, however it took more than two decades after its accession. By contrast, Greece, Portugal and Spain performed better before than after their accession. This suggests

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[4] The first six countries of the EU were Belgium, Germany, France, Italy, Luxembourg and Netherlands. In 1973, Denmark, Ireland and United Kingdom joined the EU, following by Greece in 1981, Spain and Portugal in 1986, Austria, Finland and Sweden in 1995.

that the economic integration and European policies have little effect in fostering convergence and economic growth. This is coherent with the findings of Boldrin and Canova (2001; 2003), but not with those of Kutan and Yigit (2007). The latter recognize, however, the beneficial effect of integration from a long term perspective. Furthermore, it comes into view that the pre-accession[5] period is a milestone. This is because it boosts reform policies, improves the working of institutions, and prepares a country to better support the rise of competition (see Farrell, 2004; Oltheten, et al., 2003), whereas the post-accession period is devoted to thwarting constraints accompanying the economic integration and to facing the integration costs. The latter, according to Farrell (2004), can be more apparent in the early stage of integration.

The remainder of the paper is organized as follows. In Section 2, we present a brief overview on pro-poor growth literature. In Section 3, we extend the pro-poor growth approach to the analysis of income convergence. Section 4 is devoted to the empirical analysis. The last section concludes the study and underlines some possible directions for future research.

2. Pro-poor growth : an overview

The question of how to define and to measure pro-poor growth has attracted several approaches including, among others, Kakwani and Pernia (2000), Ravallion and Chen (2003), Son (2004), Essama-Nssah (2005), Kraay (2006), Son and Kakwani (2006), Günther and Grimm, (2007). These studies address various concepts of pro-poor growth which are based on one or more criteria (for reviews, see Kakwani and Son, 2003; Ravallion, 2004; Kimenyi, 2006).

The reduction of poverty is the simplest criterion of the World Bank's definition (Ravallion, 2004; Kraay, 2006). According to this criterion, a positive income growth rate of the lower incomes is an indicator of the pro-poorness of growth (OECD, 2006). Nevertheless, this definition is rather weak since the poor may receive very little from the benefits of growth (Kakwani and Son, 2003). Accordingly, a stronger definition of pro-poor growth incorporates the reduction in relative or absolute inequality that accompanies the reduction of poverty (McCulloch and Baulch, 1999; Kakwani and Pernia, 2000). As it is argued by Klasen (2008), the criterion of the absolute definition is a stronger requirement than that of the relative definition. Indeed, White and Anderson (2000) showed that the absolute criterion used to define pro-poor growth is very restrictive as it requires that the growth rate of the poor must be much larger than that of the non-poor.[6] To conclude the debate on how to define pro-poor growth, Klasen (2008) shows that the relative definition has the merit of 'defining the state of pro-poor growth', while the absolute definition is more adapted for measuring the rate of pro-poor growth. Klasen (2008) also notes that the two concepts are useful and that they prove to

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[5] The pre-accession period refers to the 'candidate country status' period.
[6] In particular, the growth rate of the poor income must be at least equal to the growth rate of the non-poor income times the incomes ratio non-poor/poor.

be important for policies warding off poverty. In this paper, we mostly address the relative concept of pro-poor growth.

The various definitions of pro-poor growth gave rise to a number of measures using a class of additively decomposable poverty measures such as the Foster-Greer-Thorbecke (i.e., headcount, poverty gap and squared poverty gap) and Watts measures (see Kakwani and Pernia, 2000; Ravallion and Chen, 2003; Son, 2004; Kraay, 2006; Son and Kakwani, 2006). Moreover, the various measures introduced two important criteria for measuring either absolute or relative pro-poor growth, namely, the poverty line and the monotonicity axiom. By specifying a poverty line, this allows one to quantify the rate of pro-poor growth as the average growth rate of the percentiles below the poverty line. Given such line, the simplest measure is the headcount index. However, the principal disadvantage of this index lies in the fact that it does not inform us about the situation of the poor located below the poverty line. Thus, the same indexes can express various degrees of poverty severeness. An alternative measure considers the poverty gap or its square to take into account the changes in average levels of the poor incomes. But these indexes do not reflect the changes in the distribution among the poor (see Kraay, 2006). According to Ravallion (2004), the Watts index appears as a better measure of pro-poor growth. Indeed, the index has the most adequate properties of any poverty measure and it is equally sensitive to growth in all percentile incomes below the poverty line (Kraay, 2006).

The approaches that specify a poverty line make it possible to measure the rate of pro-poor growth. Nevertheless, the disadvantage of the poverty line rests on the degree of uncertainty about the location of such a line (see Ravallion, 2004). Moreover, poverty and inequality could move in the same, as well as in the opposite, direction (see Fields, 2007 for a discussion). Hence, there may be a situation where a high and positive growth rate of incomes below the poverty line results in increasing inequality. Thus, we need a criterion which guarantees without ambiguity the pro-poorness of growth. It follows that the monotonicity axiom proves to be fundamental for measuring pro-poor growth (Kakwani and Son, 2003). According to this requirement, a reduction of poverty is a monotonically increasing function of a pro-poor growth measure.[7]

In view of the degree of uncertainty about the location of the poverty line, other tracks were considered, with the aim to base the measure of pro-poor growth on the first (Pareto improvement) or the second (Pigou-Dalton improvement) order dominance conditions (see Ravallion and Chen, 2003; Son, 2004; Essama-Nsaah, 2005; Son and Kakwani, 2006). This means that economic growth generates a new income distribution which dominates the

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[7] One can quote in this line of research, which we do not develop here, McCulloch and Baulch's (1999) measure of pro-poor growth known as the 'poverty bias of growth' (PBG). Kakwani and Pernia (2000) defined the 'pro-poor growth index' (PPGI) as the ratio of the total poverty elasticity of growth to the elasticity of poverty with respect on inequality. Kakwani and Son (2003) proposed a 'poverty equivalent growth rate' (PEGR) which satisfies the monotonocity axiom. All these measures arise from Kakwani's (2000) decomposition of a change in poverty as the combined effect of growth and inequality.

original one. Hence, the situation of the individuals is improved with the new distribution. Ravallion and Chen (2003) proposed the 'growth incidence curve' (GIC) which implies the Pareto improvement criterion. This measure shows the rates of income growth by percentiles of the income distribution. In the same line, Son (2004) presented the 'poverty growth curve' (PGC) which implies the Pigou-Dalton improvement. Compared to the Ravallion-Chen's measure, the PGC exhibits the growth rates in mean income up to the different percentiles of income distribution. In an unified framework, Nessama-Nssah (2005) derived the 'equally distributed equivalent growth rate' (EDEGR) as a measure of the rate of pro-poor growth. The EDEGR is a weighted sum of points on the GIC. However, this measure depends largely on the choice of the degree of inequality aversion. Our paper can be incorporated into this latter current literature, which we discuss more deeply in the next section.

3. The link between income convergence and pro-poor growth

In this section, we attempt to establish a connexion between the notion of pro-poor growth and the traditional approach of income convergence. To do this, we focus the analysis on the 'growth incidence curve' (GIC) developed by Ravallion and Chen (2003) as a measure of pro-poor growth. Let $l_{it} = \frac{1}{n} \frac{y_{it}}{\mu_t}$ denote the slope of the Lorenz curve where y_{it} is the income of the individual i ($i = 1, \ldots, n$) at time t ($t = 1, \ldots, T$) and μ_t is the mean income of the population. We can express the growth rate of individual income g_{it} as follows:

$$g_{it} = \eta_t + \Delta \ln l_{it} \quad , \tag{1}$$

where η_t is the growth rate in mean income. Assuming that individuals are ranked by their per capita income and letting $g_t(p)$ denote the growth rate in income at the pth percentile ($p = 1, \ldots, 100$), we derive the GIC as $g_t(p) = \eta_t + \Delta \ln l_t(p)$. A Pareto-improvement criterion implies that $g_t(p) \geq 0$ for all p; then the first-order dominance condition leads to a reduction of poverty (Ravallion and Chen, 2003). Furthermore, if $g_t(p)$ is a decreasing function of p, then inequality falls over time for all inequality measures satisfying the Pigou-Dalton transfer principle (Essama-Nssah, 2005). In this case, growth is qualified pro-poor.

We now assume that the individuals are ranked according to the level of their income at some initial time $t = t_0$. This supposes that the same individuals are observed during a given period $[t_0, t_1]$ where $t_1 > t_0$, and the GIC can be reformulated as $g_t(p_{t_0}) = \eta_t + \Delta \ln l_t(p_{t_0})$.[8] Moreover, the mean growth rate of incomes y_{it} up to the p_{t_0}th percentile can be written as follows :

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[8] This is what Grimm (2007) considered as 'removing anonymity'. He called the GIC under this assumption 'Individuals growth incidence curve' (IGIC).

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$$\overline{g}_t(p_{t_0}) = \eta_t + \overline{\Delta} \ln l_t(p_{t_0}) \quad . \tag{2}$$

$\overline{g}_t(p_{t_0})$ shows the rates of pro-poor growth for all poverty lines. Thus, for $p_{t_0} = H$, where H is the headcount index, $\overline{g}_t(H)$ is the rate of pro-poor growth proposed by Ravallion and Chen (2003), i.e., the area under the GIC up to H. Accordingly, $\overline{g}_t(p_{t_0})$ may be called *the pro-poor growth curve* (PPGC). Notice that $\overline{g}_t(1) = g_t(1)$, and $\overline{g}_t(100) = \overline{g}_t$ is the mean growth rate in income of all individuals in the sample.

In order to highlight the link between the concepts of pro-poor growth and income convergence, we consider the equation of convergence (e.g., Barro and Sala-i-Martin, 1995) defined relative to the average income level:[9]

$$\ln(y_{it} / \mu_t) = \beta \ln(y_{it-1} / \mu_{t-1}) + X'_{it}\gamma \quad , \tag{3}$$

where the parameter of convergence is $\beta = \exp(-\lambda)$, and λ is the speed of income convergence. X_{it} is a vector of controlling variables which captures other determinants of the relative incomes. Pre-multiplying equation (3) by l_{it}, we obtain :

$$l_{it} \ln(y_{it} / \mu_t) = \beta l_{it} \ln(y_{it-1} / \mu_{t-1}) + l_{it} X'_{it}\gamma \quad . \tag{4}$$

Let $C_{it} = l_{it} \ln(y_{it} / \mu_t)$. Assuming now that i refers to a country, and y_{it} is the income per capita, C_{it} is the Theil entropy measure which captures the contribution of country i to international inequality at time t. Thus, C_{it} is positive (respectively negative) for the countries whose income is above (respectively below) the average income μ_t. The sum of C_{it} over all countries gives the global inequality level at each point of time t (i.e., the Theil index). Since the first term on the right hand side can be written as $(l_{it} / l_{it-1}) C_{it-1}$, we rewrite (4) as follows:

$$C_{it} = \rho_{it} C_{it-1} + l_{it} X'_{it}\gamma \quad , \quad \text{where } \rho_{it} = \beta(l_{it} / l_{it-1}) \quad . \tag{5}$$

As a result, equation (5) is a specification of convergence of contributions to income inequality. Let $\delta_{it} = -\ln(\rho_{it})$ be the speed of inequality convergence. Then, we can express δ_{it} as follows :

$$\delta_{it} = \lambda - \Delta \ln l_{it} \quad . \tag{6}$$

The parallel between the pro-poor growth concept and the income convergence across countries is immediate. Indeed, if the countries are ranked according to their per capita income at time t_0, equation (6) can also be rewritten as follows:

$$\overline{\delta}_t(p_{t_0}) = \lambda - \overline{\Delta} \ln l_t(p_{t_0}) = \lambda - [\overline{g}_t(p_{t_0}) - \eta_t] \quad . \tag{7}$$

Equation (7) shows the link between the PPGC and the convergence speeds of income and inequality. Therefore, $\overline{\Delta}\ln l_t(p_{t_0}) > 0$ for all p_{t_0} means that the Lorenz curve shifts upward (i.e., $\overline{g}_t(p_{t_0}) > \eta_t$ for all p_{t_0}), and if $\overline{\Delta}\ln l_t(p_{t_0})$ is a decreasing function, then growth is unambiguously pro-poor because it is accompanied by a decrease in income inequality. Starting from equation (7), if $\overline{\delta}_t(p_{t_0}) > 0$ for all p_{t_0}, then $\lambda > \overline{\Delta}\ln l_t(p_{t_0})$ for all p_{t_0}. Hence, $\overline{\Delta}\ln l_t(p_{t_0}) > 0$ necessarily implies $\lambda > 0$ (i.e., $\beta-$convergence). Moreover, if $\overline{\Delta}\ln l_t(p_{t_0})$ is a decreasing function (i.e., $0 < \overline{\Delta}\ln l_t(p_{t_0}) < \lambda$), then the monotonicity axiom implies that $\overline{\delta}_t(p_{t_0})$ is an increasing function (i.e., $0 < \overline{\delta}_t(p_{t_0}) < \lambda$). As a result, if growth is unambiguously pro-poor then the $\beta-$convergence which occurs is a 'pro-poor convergence' because it implies necessarily a decrease in income inequality (i.e., $\sigma-$convergence). Furthermore, one may note that income convergence ($\lambda > 0$) does not necessarily imply $\overline{\Delta}\ln l_t(p_{t_0})$ positive. This situation corresponds to the dominant view that $\beta-$convergence is a necessary but not sufficient condition for $\sigma-$convergence.

In contrast, if $\overline{\Delta}\ln l_t(p_{t_0}) < 0$ for all p_{t_0}, income inequality (and also poverty) increases (i.e., $\overline{g}_t(p_{t_0}) < \eta_t$ for all p_{t_0}). We can note that poverty falls only if $0 < \overline{g}_t(p_{t_0}) < \eta_t$. Correlatively, if $\overline{\delta}_t(p_{t_0}) < 0$ for all p_{t_0}, then $\lambda < \overline{\Delta}\ln l_t(p_{t_0})$ for all p_{t_0}. On the one hand, $\overline{\Delta}\ln l_t(p_{t_0}) < 0$ implies necessarily $\lambda < 0$ (i.e., $\lambda < \overline{\delta}_t(p_{t_0}) < 0$). This case corresponds to the view that $\beta-$divergence implies $\sigma-$divergence. On the other hand, if $\overline{\delta}_t(p_{t_0}) > 0$ for all p_{t_0}, then $\overline{\delta}_t(p_{t_0}) > \lambda$. In this case, $\beta-$convergence is accompanied by an increase in inequality as long as $\overline{\Delta}\ln l_t(p_{t_0})$ is negative.

Finally, the case when $\overline{\Delta}\ln l_t(p_{t_0}) = 0$ corresponds to a situation of persistence in income inequality. Therefore, on the one hand, the case by $\overline{\delta}_t(p_{t_0}) = \lambda \cong 0$ reflects a situation of stagnation characterized by neither convergence nor divergence of both β and σ. On the other hand, when $\overline{\delta}_t(p_{t_0}) = \lambda > 0$ (this condition holds when $\overline{g}_t(p_{t_0}) \cong \eta_t > 0$) means that $\beta-$convergence is associated with no change in income inequality. One may qualify this case as neutral processes of growth and convergence. This situation may reflect a steady-state where income convergence simply conveys the oscillatory movements which follow the successive rocking of the countries. The world in this case, according to Quah (1996), has countries 'criss-crossing' and 'leapfrogging'.[10] De la Fuente (1997) argued that this state may occur in the long-run in which the relative positions of the different economies switch rapidly, but the level of inequality remains unchanged.

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[10] See in particular the Fig.3, page 1366, of Quah's (1996) paper.

To sum up, the above exercise leads to some interesting observations. First, the analysis shows that if growth is unambiguously countries pro-poor, then the convergence which occurs is a 'pro-poor convergence' because it necessarily implies a fall in income inequality. Formally, the two processes β and σ coexist as long as the speed of income inequality convergence is significantly lower than the income convergence speed (i.e., $\delta < \lambda$). In contrast, the other situations may lead to an increase in income inequality (i.e., when $\delta > \lambda$) or at best a stagnation or a neutral process of income convergence when δ does not deviate significantly from λ.

Second, the notion of inequality convergence is related to convergence in the whole income distribution, whose empirical investigation was initiated by Bénabou (1996). Especially, the test of inequality convergence stands on the correlation between the change in inequality over time (i.e., variation of the Gini index) and the initial level of the Gini index. Bénabou (1996) found evidence of convergence in income distribution in the period 1960-1990 for seven main regions in the world. By using new data, Ravallion (2003) has reconsidered Bénabou's test, and concluded the same during the 1980s and the 1990s. One can underline two points. Firstly, Bénabou's findings showed also that the relative stability in world distribution hides the important relative mobility. In our approach, the movements of contributions to inequality (i.e., C_{it}), used in our model, could express this mobility between countries. Secondly, our analysis clearly shows that the coefficient of inequality convergence cannot be assumed constant (as it is usually considered in the test of inequality convergence using the Gini index). Rather it varies according to the income convergence coefficient and to the relative growth.

Finally, our analysis can also be related to the framework developed by O'Neill and Van Kerm (2008). In particular, by using the Jenkins and Van Kerm (2006) exact additive decomposition of the change in Gini index, O'Neill and Van Kerm (2008) exploited the links between income convergence and progressivity of the tax system. Thus, they decomposed the change in the Gini index as the combined effect of re-ranking and progressive growth. The former captures the positional mobility and has an offsetting effect, while the latter expresses the income convergence process. In the line of O'Neill and Van Kerm (2008), our approach highlights the differences in the income dynamics masked by the income convergence process. More accurately, we have showed that the income inequality convergence is a combined effect of income convergence and relative growth.

4. Empirical analysis

The empirical investigations address the growth and convergence of income per capita of 15 countries of the European Union (EU) during the 1950-2005 period: this is long enough to be considered as long-term. First, we examine the situation in the two sub-periods 1950-1973 and 1974-2005. The post-World War II period (here, 1950-1973) was characterized by a return to economic and political stability (referred to 'European Golden Age'), while the second period experienced more instability (i.e., oil crises, Golf War, etc.), and with regard to

the EU, the enlargement from 6 countries to 15 countries.[11] Secondly, the sub-period 1974-2005 is divided into two shorter intervals: 1974-1992, which corresponds to the often discussed period of 'productivity slowdown', and 1993-2005. The long-term data on income per capita come from the Groningen Growth and Development Centre database (GGDC, 2007). The income per capita is measured by the ratio GDP to population where GDP is expressed in PPP (Purchasing Power Parities) in US dollars with constant 1990 prices.

Table 1 summarizes the average growth rates of income per capita and income inequality. For the entire period 1950-2005, the average growth rates in income $\bar{g}_\bullet$ and in mean income $\eta_\bullet$ are at 2.91% and 2.79% per year, respectively. Income inequality declined on average by -1.32% per annum, which shows a $\sigma-$convergence process. Especially, we reject the null hypothesis that the starting and end values of σ are equal.[12] The first sub-period 1950-1973 records the highest average annual increase in income ($\bar{g}_\bullet = 4.02\%$) and in mean income ($\eta_\bullet = 3.74\%$). The evolution in income inequality reveals a higher downward trend with -2.47% per year on average during the 1950-1973 period. This clearly suggests a significant $\sigma-$convergence process. In contrast, one observes a slight slowdown in growth in the second sub-period 1974-2005. In particular, the average growth rate in income is 2.12% and it closes at an average growth rate in mean income of 2.10%. The slowdown in growth is more noticeable in the 1974-1992 period than in the 1993-2005 period, as shown in the last two columns of Table 1. Therefore, the decline in income inequality is very weak, and does not support any $\sigma-$convergence process (i.e., the *F*-tests conclude to a persistence in income inequality during the 1974-2005 period).

It emerges from this analysis that a positive relative growth rate (i.e., $\bar{g}_\bullet - \eta_\bullet > 0$) leads to a fall in income inequality. Indeed, the relative growth rates are at 0.28% in the first sub-period 1950-1973, and only about 0.02% in the second sub-period 1974-2005. Correlatively, the change in income inequality is higher in the first period than in the second one. More specifically, the regression analysis strengthens this result, and shows that, all things being equal, a 1% relative growth rate is associated to a decrease in income inequality of 9%.[13]

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[11] One can also note some milestones of the European integration process such as the Single Market Act in 1987, the Maastricht Treaty in 1993 and the Economic and Monetary Union in 1999.

[12] In particular, the test is conducted by calculating the Fisher-ratio $= \sigma_1^2 / \sigma_2^2$ where σ_1^2 and σ_2^2 are the variances of the logarithm of per capita income at two different periods.

[13] The regression results of changes in income inequality (i.e., $\Delta \ln(\sigma_t)$) on changes in relative growth rate (i.e., $g_{\bullet t} - \eta_t$) during the period 1950-2005 indicates a strong and highly significant negative coefficient of -8.98, with standard error 0.19, $\bar{R}^2 = 0.73$. Notice that it is a simple correlation analysis, and not any attempt to causality study. Furthermore, we do not delve here more deeply on the effect of growth (in income and/or in mean income) on income inequality, which has received more attention in the past few years (see, among others, Lopez, 2006; and for a related discussion, Ravallion, 2001).

Table 1 : Income per capita in the EU15, 1950-2005

	1950-2005	1950-1973	1974-2005	1974-1992	1993-2005
Income growth rate *in %*	2.91	4.02	2.12	1.98	2.33
Growth in mean income *in %*	2.79	3.74	2.10	1.94	2.33
Income inequality (a) : *starting value*	0.452	0.452	0.259	0.259	0.227
end value	0.218	0.256	0.218	0.221	0.218
F-test (b)	0.23**	0.32**	0.71	0.73	0.92
Change in income inequality *in %* (c)	-1.32	-2.47	-0.50	-0.78	-0.10

Notes : GDP in PPP (Purchasing Power Parities) in US dollars at 1990 prices. (a) Standard deviation of the logarithm of income per capita. (b) Ratio 'end value squared'/'starting value squared', and (**) means that the ratio is significantly lower than 1 at the 1% level. (c) average variation per year of the Standard deviation.
Source : Author's own calculations.

4.1. Countries pro-poor growth

In order to derive the 'pro-poor growth curve' (PPGC), we first proceed by examining the levels of per capita GDP of the countries in the sample in the three reference years 1950, 1974 and 1993. Table 2 presents the countries ranked by ascending levels of per capita GDP, as shown in column 1. At the start of the 1950s, Luxembourg has a relative income per capita at least 3.8 times higher than those of the countries at the bottom, namely Greece (40%), Portugal (44%) and Spain (46%) (see column 1). The income gap narrowed considerably at the start of the 1970s (see column 2). Thus, the average relative per capita GDP of the top four countries decreased from 153% of 1950 to 123% of 1974, while the average relative income per capita of the lowest four countries increased from 51% to 65% between 1950 and 1974. However, since the late 1970s, the gap between the top and bottom four countries (which was at 102% in 1950 and 58% in 1974) has remained stable, and even showed a slight narrowing, 53% in 1993 and 49% in 2005. Furthermore, one can point out the strong reduction of the gap between the mid-income countries.

The ranking of countries according to their per capita income level in 1950 was found to be more correlated with the subsequent rankings observed between 1951 and 2005. Indeed, Spearman's rank correlation coefficients are 0.90 in 1974, 0.84 in 1993 and 0.75 in 2005. However, the re-ranking remains insignificant as Spearman's rank correlation coefficients are less than the critical values for the 1% significance level.[14] Thereby, only Ireland shows a significant leapfrogging while leaving the bottom group, and by taking place among the top countries at the beginning of the 2000s.

Columns 5 to 8 of Table 2 show the contributions to international income inequality. As we can see, Luxembourg distinguishes itself clearly with the highest positive contributions. These experienced a strong fall in the first sub-period 1950-1973, and a big rise in the second period

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[14] For a number of observations about 15, the critical values of Spearman rank test are 0.443 and 0.604 at the 5% and 1% levels of significance, respectively.

1974-2005. Ireland, which initially presented negative contributions to international income inequality until the late of the 1990s, is characterized by a significant progression of its contributions, which are positive in the beginning of the 2000s. The contributions of Greece, Portugal and Spain are negative throughout the entire period 1950-2005, and show a slightly fall (more prominent for Spain), which took place especially in the first sub-period 1950-1973. Furthermore, we observe that the contributions of the middle-countries tend towards zero-equalization (see column 8).

Table 2 : GDP per capita: ratio to the EU15 average, and countries contributions to inequality

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	GDP per capita, EU15 = 100 (a)				Contributions to GDP per capita inequality (b)			
Country	1950	1974	1993	2005	1950	1974	1993	2005
Greece (GR)	40	64	62	68	-0.024	-0.019	-0.020	-0.018
Portugal (PT)	44	62	69	64	-0.024	-0.020	-0.017	-0.019
Spain (ES)	46	71	76	83	-0.024	-0.016	-0.014	-0.010
Ireland (IE)	73	62	78	124	-0.015	-0.020	-0.013	0.018
Italy (IT)	74	97	102	88	-0.015	-0.002	0.001	-0.008
Austria (AT)	78	102	108	100	-0.013	0.001	0.005	0.000
Finland (FI)	90	100	92	101	-0.006	-0.000	-0.005	0.001
Germany (DE)	90	115	103	89	-0.006	0.011	0.002	-0.007
France (FR)	111	117	112	101	0.008	0.013	0.009	0.001
Belgium (BE)	115	111	108	100	0.011	0.008	0.005	0.000
Netherlands (NL)	126	118	110	103	0.019	0.013	0.007	0.002
Sweden (SE)	142	122	103	104	0.033	0.016	0.002	0.003
Denmark (DK)	146	120	117	110	0.037	0.015	0.012	0.007
United Kingdom (UK)	146	104	102	102	0.037	0.003	0.002	0.001
Luxembourg (LU)	177	134	158	163	0.067	0.027	0.048	0.053

Notes : (a) GDP in PPP (Purchasing Power Parities) in US dollars at 1990 prices. (b) The sum of columns 5 to 8 gives the Theil indexes, which are equal to 0.085, 0.029, 0.025 and 0.024 respectively in 1950, 1974, 1993 and 2005.
Source : Author's own calculations.

Table 3 presents the average growth rates $\overline{g}_{\bullet}(p_{t_0})$ at each percentile of the income distribution for the entire period 1950-2005, and for two sub-periods 1950-1973 and 1974-2005 (see columns 1, 3 and 5). Columns 2, 4 and 6 report the average relative growth rate, i.e., $\overline{g}_{\bullet}(p_{t_0}) - \eta_{\bullet} = \overline{\Delta} \ln l_{\bullet}(p_{t_0})$. The average growth rates $\overline{g}_{\bullet}(p_{t_0})$ are positive for all percentiles for a given period which means that the first-order dominance condition holds, i.e., a reduction of poverty among the European countries. Moreover, in the long run and in the first sub-period, the growth rates are decreasing over all percentile groups, and $\overline{g}_{\bullet}(p_{t_0})$ is found to be

significantly different from $\eta_\bullet$ for the majority of low-income percentiles.[15] This means that the growth for the entire period 1950-2005 and in the sub-period 1950-1973 is associated with a decline in income inequality. Therefore, these results sustain the hypothesis according to which growth in the EU15 is unambiguously countries pro-poor during the long period 1950-2005 and in the first sub-period 1950-1973.

Table 3 : Per capita income growth rates of the European countries, *in %*

	(1)	(2)	(3)	(4)	(5)	(6)
	1950-2005		1950-1973		1974-2005	
*p*th groups	Growth rate	Relative growth rate	Growth rate	Relative growth rate	Growth rate	Relative growth rate
G3= GR, PT and ES	3.68	0.89**	5.59	1.85**	2.30	0.20
G4= G3 and IE	3.70	0.91**	4.94	1.20**	2.80	0.70*
G5= G4 and IT	3.58	0.79**	4.92	1.18**	2.61	0.51
G6= G5 and AT	3.52	0.73**	4.90	1.16**	2.53	0.43
G7= G6 and FI	3.45	0.66*	4.80	1.06**	2.48	0.38
G8= G7 and DE	3.36	0.57*	4.81	1.07**	2.32	0.22
G9= G8 and FR	3.28	0.49	4.71	0.97**	2.25	0.15
G10= G9 and BE	3.20	0.41	4.59	0.85**	2.21	0.11
G11= G10 and NL	3.13	0.34	4.48	0.74*	2.16	0.06
G12= G11 and SE	3.06	0.27	4.36	0.62*	2.12	0.02
G13= G12 and UK	2.98	0.19	4.21	0.47	2.10	0.00
G14= G13 and DK	2.93	0.14	4.13	0.39	2.08	-0.02
G15= G14 and LU	2.91	0.12	4.02	0.28	2.12	0.02

Notes : The countries are ranked according to the 1950 level of income per capita. Columns 1, 3 and 5 show the 'Pro-poor growth curve' (PPGC), i.e., $\bar{g}_\bullet(p_{t_0})$. Columns 2, 4 and 6 show $\bar{g}_\bullet(p_{t_0})-\eta_\bullet$ where $\eta_\bullet$ is the average growth rate in mean income per capita: $\eta_\bullet$ = 2.79% for 1950-2005, 3.74% for 1950-1973 and 2.10% for 1974-2005. (**) and (*) : significant at 1% and 5% levels, respectively.
Source : Author's own calculations.

In the second sub-period 1974-2005, the results indicate a weak pro-poor growth process compared to the 1950-1973 period. Indeed, as Figure 1 shows, the PPGC for the period 1950-1973 evolves far in excess of the 1974-2005 PPGC. More specifically, the growth rates in

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[15] To the best of our knowledge, the pro-poor growth literature does not give weight to the significance of the difference between the growth rate in income and the growth rate in the mean income. As Son (2004) argued, it is a substantial extension to test the significance of the relative growth rate. To do this, we develop a simple 'comparative test' to check if $\bar{g}_\bullet(.)$ at each percentile deviates significantly from $\eta_\bullet$. Thus, we define the test statistic as $z = \bar{d}/\sigma_{\bar{d}}$ where $\bar{d} = \bar{g}_\bullet(.)-\eta_\bullet$, $\sigma_{\bar{d}} = ([\sigma^2(\bar{g}_\bullet(.))+\sigma^2(\eta_\bullet)]/T-1)^{1/2}$, $\sigma^2(\bar{g}_\bullet(.))$ and $\sigma^2(\eta_\bullet)$ are the observed of $\bar{g}_\bullet(.)$ and $\eta_\bullet$, respectively. Hence, for *T* large, we assume that $z \sim N(0,1)$, and for a significance level $\alpha\%$, we reject the null hypothesis, i.e., $\bar{d} = 0$ (against the alternative hypothesis that $\bar{d} > 0$), if $z > z_{1-\alpha}$ where $z_{1-\alpha}$ is the $1-\alpha$ quantile of $N(0,1)$. For *T* small, one should use the Student distribution.

income $\overline{g}_\bullet(p_{t_0})$ deviate significantly from the growth rate in mean income $\eta_\bullet$ only for the Ireland group (i.e., G4-percentile group, see Table 3, column 6), while the average growth rate (2.3%) of the lowest income percentile (i.e., Greece, Portugal and Spain) closes to the growth rate in mean income (2.1%). Accordingly, despite the fact that $\overline{g}_\bullet(p_{t_0}) \geq \eta_\bullet$ for all percentiles, one cannot conclude that growth is countries pro-poor. The results show rather a neutral process of growth in the EU15 during the period 1974-2005, and the significant relative growth rate of the G4-percentile is attributable mainly to the high-growth country, Ireland. Finally, notice that if we consider the Cohesion Fund criterion[16] according to which the countries whose GDP per capita are below 90% of the EU average are eligible for funds, we can assess the rate of pro-poor growth at 3.52% in the long run (percentile G6, Table 3, column 1). The pro-poor growth rate is 4.9% for the sub-period 1950-1993 (percentile G6, Table 3, column 3), and falls to 2.8% for the 1974-2005 period (percentile G4, Table 3, column 5).
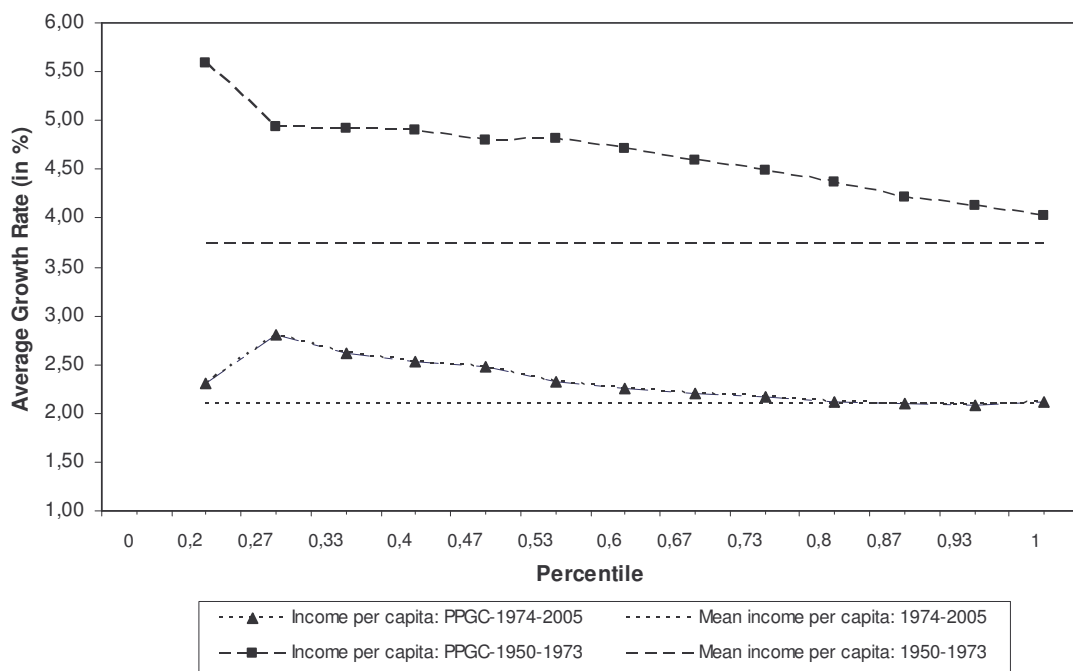

Fig. 1. Pro-poor Growth Curve (PPGC), 1950-1973 and 1974-2005, EU15

In order to get a more refined picture of pro-poor growth during the 1974-2005 period, we have examined the situation in 1974-1992 and 1993-2005. Moreover, to take account of the possible sensitivity of the results to a re-ranking, Table 4 reports the PPGC according to 1974

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[16] The Cohesion funds are intended to finance particular projects for Member States, and were established in 1993 (Maastricht Treaty).

and 1993 rankings. During the 1974-1992 period, the growth rates in income $\overline{g}_{\bullet}(p_{t_0})$ do not deviate significantly from the growth rate in mean income ($\eta_{\bullet}$=1.94%) for all percentiles (see columns 1 and 2). These results suggest that the growth is not pro-poor during the first sub-period 1974-1992. In contrast, the pace of growth is higher in the 1993-2005 sub-period, as shown in columns 3 and 4, and in Figure 2. Even so, the situation is similar to that of 1974-2005 which exhibits a neutral growth process, aside from the G4 percentile which shows a significant relative growth rate. This is particularly attributed to the high-growth country, namely, Ireland.

Table 4 : Per capita income growth rates of the European countries, *in %*

*p*th groups, 1974 ranking	(1) Growth rate	(2) Relative growth rate	*p*th groups, 1993 ranking	(3) Growth rate	(4) Relative growth rate
	1974-1992			1993-2005	
G3=IE, PT and GR	2.37	0.43	G3=GR, PT and ES	2.46	0.13
G4=G3 and ES	2.41	0.47	G4=G3 and IE	3.38	1.05*
G5=G4 and IT	2.40	0.46	G5=G4 and FI	3.30	0.97
G6=G5 and FI	2.27	0.33	G6=G5 and IT	2.93	0.60
G7=G6 and AT	2.28	0.34	G7=G6 and UK	2.87	0.54
G8=G7 and UK	2.19	0.25	G8=G7 and SE	2.80	0.47
G9=G8 and BE	2.16	0.22	G9=G8 and DE	2.62	0.29
G10=G9 and DE	2.07	0.13	G10=G9 and AT	2.53	0.20
G11=G10 and FR	2.05	0.11	G11=G10 and BE	2.45	0.12
G12=G11 and NL	2.01	0.07	G12=G11 and NL	2.40	0.07
G13=G12 and DK	1.98	0.04	G13=G12 and FR	2.33	0.00
G14=G13 and SE	1.93	-0.01	G14=G13 and DK	2.30	-0.03
G15=G14 and LU	1.98	0.04	G15=G14 and LU	2.33	0.00

Notes : Columns 1 and 3 show the 'Pro-poor growth curve' (PPGC), i.e., $\overline{g}_{\bullet}(p_{t_0})$. Columns 2 and 4 report $\overline{g}_{\bullet}(p_{t_0})-\eta_{\bullet}$ where $\eta_{\bullet}$ is the average growth rate in mean income per capita: $\eta_{\bullet}$=1.94% in 1974-1992 and 2.33% in 1993-2005. (**) and (*) : significant at 1% and 5% levels, respectively.
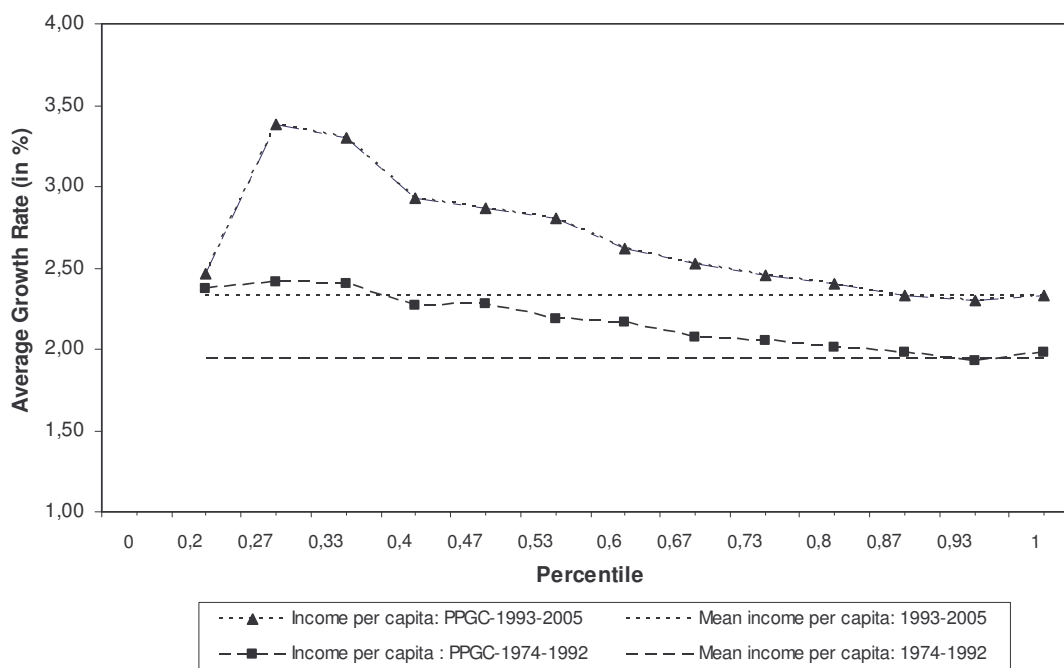*Source :* Author's own calculations.

Fig. 2. Pro-poor Growth Curve (PPGC), 1974-1992 and 1993-2005, EU15

To summarize, the analysis in this subsection stresses some facts which deserves to be underlined. Indeed, during the long run period 1950-2005, the growth in per capita income in the EU15 was higher among the poor economies, and it was accompanied by a reduction in income inequality. By considering the pace and pattern of growth in two shorter intervals, our results point out an unambiguous pro-poor growth process in the sub-period 1950-1973 accompanied by a strong fall in income inequality among the EU Member States. In contrast, the European growth experience is rather neutral in the 1974-2005 period, which exhibits a persistence in income inequality. Moreover, a thorough analysis of the situation of the cohesion countries, namely Greece, Ireland, Portugal and Spain, shows that the relative growth rate for the four countries is higher in the first sub-period 1950-1973 than in the 1974-2005 sub-period: 1.2% per year against 0.7% per annum on average (see Table 3). More accurately, the relative growth rate in per capita income of the four countries is about 0.47% in the sub-period 1973-1992, namely during its accession to the EU,[17] and about 1.05% during the 1993-2005 period (see Table 4). The rising of the relative growth rate in the last period is ascribed mainly to the strong growth in income per capita of Ireland. Indeed, the relative growth rates in income of Greece, Portugal and Spain are on average at 1.85% in the period 1950-1973 (i.e., before they joined the EU), at 0.25% in the period 1974-1992 (i.e., during their accession), and at 0.13% in the 1993-2005 period.

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[17] Recall that Ireland has joined the EU in 1973, Greece in 1981, Portugal and Spain in 1986.

In addition, the results in this subsection suggest that the effect of the integration is unevenly disseminated among the lagging countries. In fact, the enhancing growth appears to rely more on the national specificities than on the expected benefits from European integration. Indeed, Farrell (2004) argued that the benefits from integration are a long-term issue, whereas the costs appear in the early stages of integration. Although the author points out the positive redistributive and growth effects of the EU Structural Funds, he puts emphasis on the role of national, institutional and political configurations in the interpretation of the outcome of economic integration.[18] According to Martin and Sanz (2003), the promoting growth depends largely on the growth strategy implemented by countries themselves. As Oltheten et al. (2003) recommended, it is important to tackle the structural deficiencies of the lagging economies before entry into the EU. This enables to attenuate the outcomes of increased competition after the removal of trade protection, and to set up the appropriate national policies. In short, it becomes apparent that the pre-accession period is a milestone in the growth process, since it prepares the countries to better counteract the expected difficulties and disadvantages of economic integration. Hence, the empirical evidence of the slowdown in the performance of the low-income countries after their accession appears as a useful signal and an interesting lesson for the countries eager to join the UE.

4.2. Countries pro-poor convergence

The inequality convergence equation (5) can be re-written as follows:

$$C_{it} = \beta Z_{it} + \tilde{X}'_{it} \gamma + \varepsilon_{it} \ , \tag{8}$$

where $Z_{it} = (l_{it}/l_{it-1})C_{it-1}$ and $\tilde{X}'_{it} = l_{it} X'_{it}$. The error term ε_{it} is assumed to be composed of a country-specific effect v_i and of an independently identically distributed random term u_{it}, with mean zero and variance σ_u^2. Before looking at the results, some preliminary observations related to the explanatory variables and to the method of estimation must be mentioned. Indeed, the choice of explanatory variables X_{it} represents a crucial issue which was extensively discussed in the growth and convergence literature (see, among others, Dowrick and Nguyen 1989; Levine and Renelt, 1992; Mankiw, et al., 1992; Barro and Sala-i-Martin 1992; Sala-i-Martin 1994, 1996). However, it is beyond the scope of this paper to discuss and to assess the relevant determinants of the economic growth used in the majority of studies on the conditional convergence (see De La Fuente (1997) and Islam (2003) for a discussion). We rather focus our analysis on the close link between income convergence and pro-poor growth. Thus, we consider in the list of the explanatory variables 'European Union dummies' to take account of the EU successive enlargements effects from 6 to 15 countries. In particular, we introduce six 'times series dummies' which take value 1 as from the year of the constitution of the Union to the year before the new one : 1951 for the EU6, 1973 for the EU9, 1981 for the

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[18] Giannetti (2002) also pointed out that a greater interaction across countries leads to a higher intensification of international knowledge spillovers which impedes the dynamics of convergence across countries.

EU10, 1986 for the EU12 and 1995 for the EU15. Furthermore, we also include a dummy variable which takes value 1 as from 1990 to capture the effect of German reunification.

In order to provide estimators with the best properties, the estimation method should take into account the possible endogeneity occurring through Z_{it}. Because of the presence of endogenous lagged variables, i.e. C_{it-1}, the within-estimator[19] and the Generalized Least Squares (GLS) methods do not lead to consistent estimates as long as the dimension (individual or temporal) is finite (see Baltagi, 2001, pp. 129-131). One of the solutions is to use the Instrumental Variables (IV) method. In particular, in presence of country-specific effects v_i, it is possible to obtain more efficient estimators using the Generalized Instrumental Variables (GIV) method (see Sevestre and Trognon, 1995, pp.133-136). At the first stage, the procedure consists in deducting an estimation of variances σ_v^2 and σ_u^2. In the second stage, we apply OLS on the transformed data $D_{it} - \hat{\phi} D_{i\bullet}$, where $D_{it} = \{C_{it}, Z_{it}, \tilde{X}'_{it}\}$, $\hat{\phi} = 1 - \sqrt{\hat{\theta}^2}$, $\hat{\theta}^2 = \hat{\sigma}_u^2 [\hat{\sigma}_u^2 + T\hat{\sigma}_v^2]^{-1}$, and using the lagged of the variables in the right side (Z_{it} and $\tilde{X}'_{it}$) transformed in the same way as the instruments.

Table 5 summarizes the main estimation results for specification (8) for the entire period and for two sub-periods (see the Appendix for more detailed results). In the long run, the speed of convergence is 2.47% (see column 1). The speed of inequality convergence, $\overline{\hat{\delta}}_\bullet(p_{t_0}) = \hat{\lambda} - \overline{\Delta} \ln l_\bullet(p_{t_0})$, is positive and increasing function at all percentiles. Moreover, for the majority of low-income countries, the inequality convergence speed deviates significantly from the income convergence speed, and $\overline{\hat{\delta}}_\bullet(p_{t_0}) < \hat{\lambda}$ for all percentiles. This is evidence of dynamic change in the income distribution during the long run. Hence, the income convergence which occurs in the entire period 1950-2005 can be qualified as a pro-poor convergence. A similar situation occurs in the first sub-period 1950-1973, but this time the speed of income convergence (4.13%) is much higher, and the speed of inequality convergence deviates significantly from $\hat{\lambda}$ for almost all percentiles (see column 2). Likewise, $\overline{\hat{\delta}}_\bullet(p_{t_0})$ is a positive increasing function for all p_{t_0}, which clearly suggests that convergence is unambiguously pro-poor in the first sub-period 1950-1973. In contrast, the results show a slowdown process of income convergence in the second sub-period 1974-2005 (see column 3). The speed of convergence is not significantly different from 0. This finding is in accordance with the empirical studies (notably among those quoted above) which have emphasized the slowdown in convergence process during the 1980s and the 1990s. Accordingly, the speeds of inequality convergence are closer to the income convergence speed which means no significant change in income distribution during this period.

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[19] This consists of applying Ordinary Least Squares (OLS) to the specification in terms of deviations from individuals means.

Table 5 : Speeds of income and inequality convergence, European countries, *in %*

	(1) 1950-2005	(2) 1950-1973	(3) 1974-2005
Income convergence : $\hat{\lambda}$ (a)	2.47**	4.13**	0.68
Inequality convergence : $\bar{\hat{\delta}}_{\bullet}(p_{t_0})$ at *p*th: (b)			
G3= Greece, Portugal and Spain	1.58**	2.28**	0.48
G4= G3 and Ireland	1.56**	2.93**	-0.02*
G5= G4 and Italy	1.68**	2.95**	0.17
G6= G5 and Austria	1.74**	2.97**	0.25
G7= G6 and Finland	1.81*	3.07**	0.31
G8= G7 and Germany	1.90*	3.06**	0.46
G9= G8 and France	1.98	3.15**	0.54
G10= G9 and Belgium	2.06	3.27**	0.58
G11= G10 and Netherlands	2.13	3.39*	0.62
G12= G11 and Sweden	2.20	3.51*	0.66
G13= G12 and United Kingdom	2.27	3.66	0.68
G14= G13 and Denmark	2.33	3.74	0.71
G15= G14 and Luxembourg	2.35	3.85	0.66

Notes : The countries are ranked according to the 1950 level of income per capita. $\bar{\hat{\delta}}_{\bullet}(p_{t_0}) = \hat{\lambda} - \overline{\Delta}\ln l_{\bullet}(p_{t_0})$ where $\overline{\Delta}\ln l_{\bullet}(p_{t_0}) = \overline{g}_{\bullet}(p_{t_0}) - \eta_{\bullet}$ are shown in Table 3. (**) and (*) significant at 1% and 5% respectively: (a) $\hat{\lambda}$ is significantly different from zero, (b) $\bar{\hat{\delta}}_{\bullet}(p_{t_0})$ is significantly different from $\hat{\lambda}$.
Source : Author's own calculations.

To shed light on the process of convergence during the 1974-2005 period, we have estimated the model in two shorter intervals, 1974-1992 and 1993-2005. Table 6 shows the convergence process in the two sub-periods. The results stress that there are differences in the patterns of convergence across sub-periods. Indeed, there was no evidence of either convergence or divergence during the first sub-period 1974-1992 (see column 1). In the second sub-period 1993-2005, even if the results indicate a clear process of income convergence (2.32%), the speeds of inequality convergence $\bar{\hat{\delta}}_{\bullet}(p_{t_0})$ deviate significantly from the speed of income convergence only for the G4 percentile (see column 2). This is explained mainly by the strong convergence of the income per capita of Ireland. On the whole, the results suggest that the convergence which occurred during the last decade of the study is not pro-poor.

Table 6 : Speeds of income and inequality convergence, European countries, *in %*

*p*th groups, 1974 ranking	(1) 1974-1992	*p*th groups, 1993 ranking	(2) 1993-2005
Income convergence: $\hat{\lambda}$ (a)	1.22		2.32**
Inequality convergence: $\overline{\hat{\delta}}_\bullet(p_{t_0})$ at *p*th: (b)			
G3=IE, PT and GR	0.80	G3=GR, PT and ES	2.19
G4=G3 and ES	0.75	G4=G3 and IE	1.27*
G5=G4 and IT	0.76	G5=G4 and FI	1.35
G6=G5 and FI	0.89	G6=G5 and IT	1.71
G7=G6 and AT	0.89	G7=G6 and UK	1.77
G8=G7 and UK	0.98	G8=G7 and SE	1.84
G9=G8 and BE	1.00	G9=G8 and DE	2.03
G10=G9 and DE	1.09	G10=G9 and AT	2.11
G11=G10 and FR	1.11	G11=G10 and BE	2.19
G12=G11 and NL	1.15	G12=G11 and NL	2.24
G13=G12 and DK	1.18	G13=G12 and FR	2.32
G14=G13 and SE	1.24	G14=G13 and DK	2.35
G15=G14 and LU	1.19	G15=G14 and LU	2.32

Notes : $\overline{\hat{\delta}}_\bullet(p_{t_0}) = \hat{\lambda} - \overline{\Delta}\ln l_\bullet(p_{t_0})$ where $\overline{\Delta}\ln l_\bullet(p_{t_0}) = \overline{g}_\bullet(p_{t_0}) - \eta_\bullet$ are shown in Table 3. (**) and (*) significant at 1% and 5% respectively: (a) $\hat{\lambda}$ is significantly different from zero, (b) $\overline{\hat{\delta}}_\bullet(p_{t_0})$ is significantly different from $\hat{\lambda}$.
Source : Author's own calculations.

To close this section, some main preliminary conclusions can be drawn from the results of the convergence analysis in the EU15. First, the estimation results show a clear-cut process of income convergence during the 1950-1973 period, and a slowdown process afterwards. These results remain in accordance with the findings of the majority of the studies on convergence in Europe, which have emphasized the differences in the patterns of convergence across sub-periods and across subsets of countries (see among others, Armstrong, 1995; Neven and Gouyette, 1995; Sala-i-Martin, 1996; Boldrin and Canova, 2001, 2003; Barry, 2003).[20]

Second, with respect to our approach, the estimation results strengthen the findings of the previous sub-section 4.1. Indeed, we have seen that the first sub-period 1950-1973 witnessed a strong pro-poor growth process accompanied by a drastic decline in income inequality (on average, -2.23% per annum). Correlatively, we have observed a higher income convergence process, and a significant dynamic change in the income distribution, i.e., the speed of inequality convergence deviates significantly from the income convergence speed. In contrast,

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[20] Note that we refer only to the results at the level of countries not at regional level as one can find different conclusions between the two approaches (for a related discussion, see Neven and Gouyette, 1995; Boldrin and Canova, 2003).

the second sub-period 1974-2005 recorded a slowdown of the income growth in the EU15. Accordingly, the income convergence is very weak, and our results point out the phenomena of neither convergence nor divergence and of persistence in income inequality. More accurately, these phenomena were more noticeable in the first sub-period 1974-1992, whereas the 1993-2005 period experienced a convergence process. But this latter does not lead either to a close income gap with the EU15 average of the lagging economies or to a decrease in income disparities between the European countries. Hence, the convergence which occurred in the period 1993-2005 is rather a neutral process, i.e., the per capita income and inequality converged at the same speeds.

In the light of these results, convergence in the EU15 appears as a long-run process which has been characterized by three stages: a pro-poor convergence in *terms of income level* in the 1950-1973 period, a slowdown process during the 1974-1993 period, and a convergence in *terms of mean growth rate* since the late 1990s. Accordingly, our results do not support the predictions of the New Growth Theory model, that the increasing returns associated to the trade openness would have produced divergence and increase in inequality. In contrast, they are in line with Boldrin and Canova (2001, 2003) findings. It is true that the disparities did not completely disappear, however, one may regard the level of inequality reached at the start of the 1970s (i.e., 0.256, see Table 1) as a steady-state level, because it does not deviate significantly from the 2005 level (i.e., 0.218).

Furthermore, it seems that the effect of the European cohesion policies is mixed in view of the weak process in convergence of the four countries of cohesion.[21] Indeed, alone in the group, Ireland stood out largely. But the catching-up with the EU15 income per capita has taken place in the end of the 1990s, namely more than two decades after its accession. However, for Greece, Portugal, and to a lesser extent Spain, it is still a challenge to narrow the income gap. Barry's (2003) historical analysis of economic integration and convergence of the cohesion countries pointed up certain hindrances for convergence generated by labour-market failures[22] and poor public administration systems.[23] However, Barry (2003) argued that structural funds and innovative foreign direct investments (FDI) inflows have promoted convergence. This is especially sustainable in the case of Irish strategy. In opposition to Barry's analysis, Boldrin and Canova (2001, 2003) showed that the structural funds in general operate as 'pure income transfers' and have little long term effect.

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[21] Of course, we are conscious that one must be careful when drawing conclusions on the impact of the EU integration, as we are unaware of the effects in the absence of integration. We want merely to underline some facts suggested by our findings.

[22] According to Barry (2003), this also explains the slowdown in convergence process of the cohesion countries during the 1960-1973 period.

[23] In the same line of research, according to Fischer (1993), poor macroeconomic policies appear as a serious inhibitor for convergence. In this context, and when the economic policies and institutions are inappropriate, Hallet (2002) argued that the EU structural funds have little impact.

5. Conclusion

This paper provided a new methodology as well as some useful lessons about the European convergence process. Thus, we have established a connexion between the concepts of pro-poor growth and income convergence. This approach emphasized that an analysis of pro-poor growth across countries would shed further light on the convergence process. Specifically, in the context of a panel of countries, if growth is unambiguously pro-poor, then the convergence which occurs is a pro-poor convergence, because it necessarily implies a fall in income inequality. Hence, the evidence of countries pro-poor growth provided a sufficient condition for inequality reduction. By contrast, if growth is not countries pro-poor, the convergence which occurs is either an anti-poor convergence (in the case of anti-poor growth) or a neutral process of convergence (i.e., if growth is neutral). Correlatively, the income inequality worsens in the former case, and it persists in the latter one.

The empirical results show that there is a long-run process of convergence towards the EU15 income level, since the countries converge at a speed of approximately 2.5% per year during the period 1950-2005. The period 1950-2005 was further divided into two phases. The speed of convergence was much higher in the first phase 1950-1973, and it was assessed at around 4.1%. In contrast, we have observed a slowdown in the convergence process during the 1974-2005 period. Especially, neither convergence nor divergence occurred during the sub-period 1974-1992. In spite of a rise in the speed in the second sub-period 1993-2005 (2.3% per annum), the convergence which occurred in this period appears as a neutral process. Indeed, we did not observe a significant change in the income distribution of the low-income countries or a fall in income inequality between the countries of the EU15. Accurately, the results show the same convergence speeds of per capita income and inequality.

In the light of these findings, and especially when we focus our attention on the cohesion countries (i.e., Greece, Ireland, Portugal and Spain), we can ask ourselves about the beneficial effects of the European integration and the effectiveness of the European policies. Indeed, as we have seen, growth and convergence have been unambiguously pro-poor during the period before accession of the four countries, and they were neutral afterwards. Only Ireland left the cohesion group almost 25 years after its accession. As it was underlined in the literature, the role of FDI has proven considerable in the Irish performance. In relative terms, Greece, Portugal, and to a lesser extent, Spain, performed better before their accession than after their integration in the EU. Hence, it comes into view that the pre-membership period is a crucial one to resolve the various structural blockages and to suit national policies and institutions, and the beneficial effects of economic integration are a long-term issue.

Finally, some limitations of this study, which are as much track for future research, must be mentioned. First, one can wonder about the sensitivity of the results if we control for additional variables in the convergence equation, which means some caution is needed when drawing conclusions from the magnitude of the estimated speeds of convergence. Notice, however, that the homogeneous countries of the EU15 can mitigate the influence of such

variables. In contrast, it is worthwhile to deal with a more heterogeneous group of countries, and the EU27 offers a good sample and a new challenge for convergence. Second, a related question deserving serious investigations concerns the homogeneity of the parameter of convergence (i.e., β). In fact, as it was shown by the neoclassical model, the parameter depends on the return to scale coefficient (i.e., capital coefficient, and spillover effects), the capital depreciation rate, the technical progress rate and the population growth rate. The hypothesis according to which the economies' behavior is homogeneous supposes that the aforesaid factors are constant over time and/or they are assumed to be the same for all countries. Taking into account the heterogeneity of the parameter of convergence is a track which deserves more attention.

Appendix

Table A1 : Estimation results of the convergence model

	(1)	(2)	(3)	(4)	(5)
Dependent variable C_{it} [a]	1950-2005	1950-1973	1974-2005	1974-1992	1993-2005
Z_{it} ($\hat{\beta}$-convergence)	0.976** (0.004)	0.960** (0.006)	0.993** (0.007)	0.988** (0.007)	0.977** (0.011)
$l_{it} \times EU6$	0.004* (0.002)	0.006* (0.003)			
$l_{it} \times EU9$	0.000 (0.003)		-0.000 (0.003)		
$l_{it} \times EU10$	0.003 (0.004)		0.003 (0.003)	0.002 (0.004)	
$l_{it} \times EU12$	0.005* (0.002)		0.004 (0.003)	0.003 (0.003)	
$l_{it} \times EU15$	0.002 (0.002)		0.001 (0.002)		-0.000 (0.002)
$l_{it} \times UNIF$	-0.013* (0.006)		-0.005 (0.007)	0.006 (0.015)	
SEE [b]	0.0013	0.0013	0.0012	0.0014	0.0008
SSR [b]	0.0013	0.0006	0.0007	0.0005	0.0001
$\overline{R}^2$	0.990	0.990	0.981	0.988	0.979
Observations	810	330	480	285	195

Notes : Numbers in parentheses are standard errors. (*) and (**) represent statistical significance at 5% and 1%, respectively.

[a] $C_{it} = \beta Z_{it} + \tilde{X}'_{it}\gamma + \varepsilon_{it}$, $i = 1,\ldots,n$, $t = 1,\ldots,T$, where $Z_{it} = (l_{it} / l_{it-1})C_{it-1}$ and $\tilde{X}'_{it} = l_{it} X'_{it}$. The error term ε_{it} is assumed to be composed of a country-specific effect v_i and of an independently identically distributed random term u_{it} , with mean zero and variance σ_u^2 . l_{it} denotes the slope of the Lorenz curve, $l_{it} = y_{it} / n\mu_t$, where y_{it} is the per capita income of the country i at time t , and μ_t is the mean income of all countries in the sample. $C_{it} = l_{it} \ln(y_{it} / \mu_t)$ is the Theil entropy measure which captures the contribution of country i to international inequality at time t . X'_{it} is the vector of the explanatory variables: six 'European Union dummies' (*EU*6, *EU*9, *EU*10, *EU*12, *UE*15) and 'German reunification dummy' (*UNIF*). Estimation method: GIV (Generalized Instrumental variables). Instruments: Z_{it-1} and $\tilde{X}'_{it-1}$.

[b] SEE: Standard Error of Estimate; SSR: Sum of Squared Residual.

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