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Abstract

We review the literature on the links between inequality, growth and welfare. Three questions are addressed: 1) What is the impact of growth and development on inequality? 2) What is the impact of inequality on growth, development and welfare? 3) What is the impact of proequality public policies upon growth and welfare? As regards the first question, the theoretical and empirical literature that analyses Kuznets hypothesis is firstly reviewed. The answer to the question of the impact of inequality on growth is twofold. Firstly, inequality fosters growth when this is based on capital accumulation, but it hinders growth when growth is based on human capital accumulation and when inequality-related social disturbances are considered. Identically, pro-equality public policies may engender very different effects upon growth depending on their influence on factor accumulation. These mixed impacts may explain the ambiguous findings provided by the empirical literature. If most of the estimates carried out in the 1990s seemed to confirm that inequality was damaging for growth, the 2000s empirical literature reconsiders this diagnosis but remains inconclusive.

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1. Introduction

Since Kuznets' seminal article (1955), the analysis of the links between growth, development, inequality and welfare has generated a large body of economic literature. Three main questions have been addressed:

1) What is the impact of growth and development on inequality?

2) What is the impact of inequality on growth and welfare?

3) What is the impact of pro-equality policies (redistribution, tax regimes, education etc.) upon growth and welfare?

Up to the early eighties, in line with Kuznets hypothesis (henceforth KH) economists had considered the relation between development and inequality as following an inverted-U curve. This was explained by two key mechanisms:

1) In the early stage of economic development, rising inequality essentially results from the income divergence between the traditional sector and the modern sector. Inequality then decreases when the weight of the traditional sector becomes sufficiently small.

2) When the economy reaches a certain level of development, more resources are allocated to education and redistribution, which lowers inequality.

From the early eighties, the belief in an inverted-U relationship has been questioned for several reasons: (i) in the seventies and eighties, East Asian emerging countries experienced a decrease in inequality followed by an increase from the nineties, and (ii) from the eighties, most of the advanced countries have suffered growing inequality. Both these developments seem to contradict KH. Consequently, its verification and explanation have given rise to an extensive literature. Although a number of estimations in cross-sections of countries seem to confirm KH, the results are rather mixed in relation to the turning point and they are often not conclusive when longitudinal analyses are considered and countries taken separately. Finally, the significant increase in inequality in a large majority of advanced countries since the 1980s creates a real challenge to Kuznets hypothesis.

As regards the influence of inequality on growth, the early literature insisted on the positive influence of the former upon the latter. This diagnosis was based on the impact of inequality upon physical capital accumulation within models in which the rich save more than the poor (Kaldor, 1955-56; Bourguignon, 1981). This positive impact has been subsequently questioned, both empirically and theoretically. The empirical works carried out in the 1990s have challenged the common belief that inequality fosters growth. Most of these works show

a negative impact of inequality on growth. In the 2000s, certain new estimates have rehabilitated the diagnosis of a positive relationship between inequality and growth. These works have, however, been criticized for their methods and several of them reveal that the sense of the relation can vary across countries and with time.

Within a theoretical perspective, inequality can firstly hamper growth by encouraging protest (strikes, revolts, revolutions) and criminal activities, which jeopardise production and accumulation. In addition, inequality can hinder social capital and thereby lower growth. Finally, inequality can slow down human capital accumulation or/and generate under education traps (situations in which certain dynasties remain unskilled from generation to generation) through a number of different channels. Galor & Moav (2004) came to the conclusion that inequality is good for growth at the early stage of development when growth is driven by physical capital accumulation, and harmful for growth at the later stage when growth depends on human capital accumulation.

A third question concerns pro-equality public interventions. Such policies, particularly redistribution and education, impact on production and growth (Aghion et al., 1999, and Roed & Strom, 2002, for reviews). In a situation of pure competition, redistribution reduces production and growth because both levies and public transfers reduce labour supply, saving and investment. However, within a political economy framework, this result can be used to show that before tax inequality reduces growth because the higher the inequality, the more redistribution is enforced by the median voter (Alesina & Rodrick, 1994; Persson & Tabellini, 1994). In addition, redistribution and pro-education policies can foster growth when inequality is harmful to growth (Galor & Zeira, 1993; Maoz & Moav, 1999; Galor & Tsiddon, 1997; Glomm & Kaganovich, 2008 etc.; Saint Paul & Verdier, 1996, for a synthesis).

Finally, the inequality-growth literature logically leads to welfare concerns. When all markets are efficient, inegalitarian equilibria can be Pareto-superior. In contrast, with market imperfections, inequality can lower welfare. Then, pro-equality policies (redistribution, education) can foster both growth and welfare.

This paper provides an overview of the inequality-growth-welfare nexus[1]. In Section 2, we examine the impact of growth and development upon inequality, both theoretically and empirically. Section 3 tackles the issue of the influence of inequality on growth. Redistributive policies and their effects on growth and inequality are described in Section 4 and the analyses in terms of welfare in Section 5. We conclude in section 6.

2. The impact of development on inequality: Kuznets revisited

In his seminal article published in 1955 in the *American Economic Review*, Kuznets proposes an early analysis of the impact of development on inequality. Kuznets describes the process of development as the transition from an economy totally dominated by a 'traditional' sector to an economy in which production is fully provided by a 'modern' sector. As the traditional sector is less productive than the modern sector, the income per worker is lower in the former than in the latter. As a result, the process of development firstly raises and subsequently reduces income inequality. This draws an inverted-U curve that binds inequality to the level of development. Several mechanisms can generate a Kuznets curve (henceforth *K-curve*). In addition, a number of empirical works have attempted to verify the inverted-U shape of the development-inequality relationship. Even if a majority of these works seems to support KH, they present several limitations in terms of methods and interpretation. In addition, the reversal of the development-inequality relationship in advanced countries since the eighties may be seen as a move from an inverted-U to a tilde-shaped curve.

2.1. Kuznets inverted-U curve: bases, interpretations and extensions

Kuznets analysis

Kuznets (1955) proposes an analysis in which the development-inequality relationship follows an inverted-U curve. His presentation combines economic, politic and social arguments.

The economy comprises two sectors, a traditional sector with low productivity and a modern sector with high productivity. As a consequence, workers are better paid in the modern than in the traditional sector. This creates income inequality among the working population when both sectors coexist. Development is defined as the transition from a fully traditional economy to a fully modern one. Then, the process of development is characterised by an inverted-U relationship between the income per capita (the measure of the level of development) and global inequality. To demonstrate this, let us denote w_T and $w_M > w_T$ the income per worker in the traditional and modern sector respectively, and let us measure inequality by the variance of income $\sigma^2 = q(\overline{w} - w_M)^2 + (1-q)(\overline{w} - w_T)^2$ with q the proportion of workers in the modern sector and $\overline{w} = qw_M + (1-q)w_T$ the average income. Development consists of an increase in the proportion q that moves from 0 up to 1. Then

$\sigma^2 = q(1-q)(w_M - w_T)^2$ follows an inverted-U curve along the development process with the highest inequality being reached for $q = 1/2$.

In addition, the increase in the income per capita $\bar{w}$ typically generates higher redistribution. This can be easily modelled by an income tax at rate[2] $\tau < (1-q)(1-w_T / w_M)$ that is paid by the high incomes w_M and redistributed to lower incomes w_T. The development-driven increase in the average income makes it possible (i) to implement higher redistribution for a given rate τ, and (ii) to lower the tax burden (rate τ) for a given after-tax inequality. This shows that development makes redistribution easier, which reinforces the inverted-U shape of the development-inequality relationship. This is all the more likely as higher income per capita entails a demand for redistribution, this demand being easier to grant when income per capita increases.

Finally, drawing on the evidence of higher inequality in urban than in rural areas, Kuznets suggests that the within-sector inequality is higher in the modern than in the traditional sector. Consequently, an increase in the weight of the former induces an increase in inequality[3]. If this reinforces the rise of inequality during the first stage of development, it continues fostering inequality as long as the economy is not fully modern, which can go detrimental to the subsequent decrease in inequality.

Kuznets presented his inverted-U curve as a hypothesis based on observed facts. Anand & Kanbur (1993a) formalised this intuition by studying the impact of development (increase in *q*) on several inequality indicators and by combining both between-sector and within-sector differences in inequality. Their results are rather mixed because the existence of a K-curve depends (i) on the selected inequality indicator and (ii) on the respective weight of the between sector and the within sector inequality. As an example, if we measure inequality by the variance of income, and if we assume that the between-sector and within-sector distributions of incomes are independent of each other, then this variance σ^2 is $\sigma^2 = {\sigma_B}^2 + q{\sigma_M}^2 + (1-q){\sigma_T}^2$, with ${\sigma_B}^2 = q(1-q)(\bar{w}_M - \bar{w}_T)^2$ the between-sector variance, $\bar{w}_i$ the average income in sector $i = M, T$ and ${\sigma_i}^2$ the (assumed constant) within-sector *i* variance. The sign of the derivative $\partial\sigma^2 / \partial q = (1-2q)(\bar{w}_M - \bar{w}_T)^2 + ({\sigma_M}^2 - {\sigma_T}^2)$ depends on the difference of incomes between sectors $w_M - w_T > 0$ and on the difference between within-sector variances ${\sigma_M}^2 - {\sigma_T}^2$. Inequality follows a K-curve if ${\sigma_M}^2 - {\sigma_T}^2 < (\bar{w}_M - \bar{w}_T)^2$, and it increases throughout the development process if ${\sigma_M}^2 - {\sigma_T}^2 > (\bar{w}_M - \bar{w}_T)^2$.

Another limitation in Kuznets' argument is the implicit assumption that productivity does not increase in the traditional sector.

Finally, Kuznets' arguments were presented without modelling the agents' behaviours and the derived mechanisms that create the development dynamics (increase in *q*) and the differences in inequality between sectors and within sectors. In particular, as noted by Anand & Kanbur (1993a), one could expect income to increase in the modern compared to the traditional sector, at least at the beginning of the development process. In addition, stylised facts suggest that inequality has increased within the modern sector during the first stages of economic development.

Modelling Kuznets curve

A simple theoretical explanation of KH can be found in 'Lewis turning point' (Lewis, 1954) with a Harris-Todaro migration process (Harris & Todaro, 1970). Assume (i) that the economy comprises a traditional sector utilising labour only and providing a subsistence income, and a modern industry utilising both labour and an accumulated factor (capital), and (ii) that workers can migrate from the traditional to the modern sector without cost. Then, the wage in the modern industry remains at the subsistence level as long as the traditional sector has not vanished. If the accumulated factor produces an income higher than the subsistence level, this generates savings and capital accumulation, which increases the capital owners' income, resulting in growing inequality. This inegalitarian dynamics comes to an end from the 'turning point' when all the workers have moved from the traditional to the modern sector because there is sufficient capital accumulation to employ all of them in the latter sector. From this point, inequality decreases. Such a development process generates a K-curve.

More recently, several theoretical works have attempted to provide rigorous micro-founded modelling of the Kuznets hypothesis. Glomm (1997) makes a distinction between four categories of general equilibrium models that can generate a Kuznets curve: 1) models based on imperfections on the credit market (Greenwood & Jovanovic, 1990; Aghion & Bolton, 1993); 2) political economy models of redistribution (Perotti, 1993); 3) models based on human capital accumulation (Galor & Tsiddon, 1996, 1997; Glomm & Ravikumar, 1998; etc.); 4) models based on migrations from the traditional to the modern sector and on occupational choices by workers (Glomm, 1992; Rauch, 1993; Banerjee & Newman, 1993). Most of these approaches lead to the same diagnosis, i.e., that the development process can generate or not generate a K-curve depending on the model parameters and on the initial

distribution of human or physical capital. We focus here on the mechanisms with which development can create or not a K-curve in the particular case of human capital accumulation,

Figures 1 and 2 depict two possible links between the parents' human capital h_{t-1} and their child's human capital h_t depending on the education function and the education conditions and constraints. In both cases, parents' human capital has a positive impact on their children's human capital h_t because of intra-family human capital externalities, transmissions of skill and ability etc. (Chusseau & Hellier, 2012, for an extensive description of parent-child human capital transfers). There is thus a function $h_t = H(h_{t-1})$ that binds the individual's human capital h_t to her/his parents' human capital h_{t-1}.

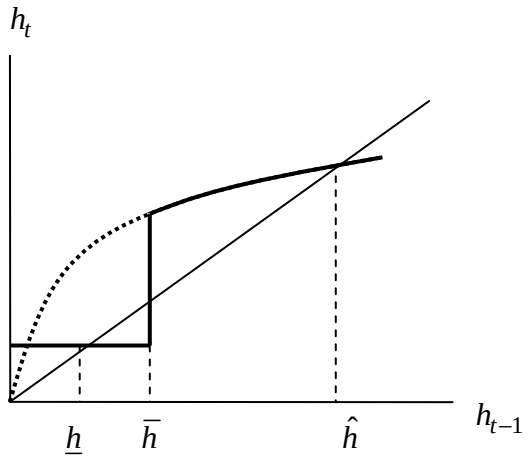

Fig. 1: Fixed education cost and credit constraint.

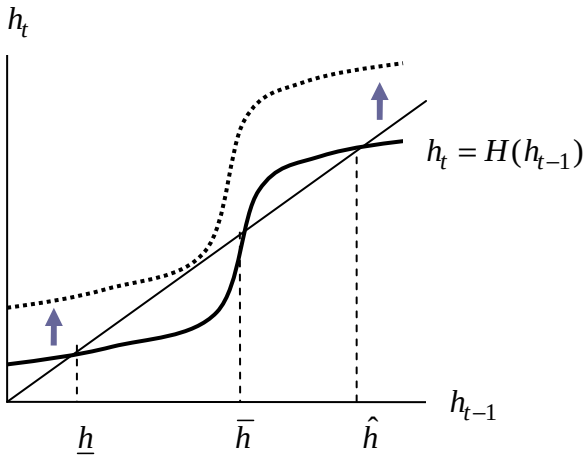

Fig. 2: S-shaped education function

Figure 1 depicts a situation in which there is a fixed cost of education paid for by individuals and no access to the credit market for the young. All the parents with a human capital below $\overline{h}$ are assumed to have an income that is too low to give or to lend the fixed schooling fee to their children. There is a minimal human capital level $\underline{h}$ that is attained by all those who do not get educated (this can portray the level at the end of compulsory and free basic education, the fee being for further education only). Finally, the (further) education function is concave. Phase diagram 1 depicts the individual's human capital h_t depending on her/his parents' human capital h_{t-1} when $\underline{h} < \overline{h}$. This dynamics can generate a multiplicity of two-segment steady states in which all the dynasties originally located in the interval $[0, \tilde{h}[$ possess the human capital $\underline{h}$, and all those with an initial human capital higher than $\tilde{h}$ the human capital $\hat{h}$. The number of dynasties in each group thus depends on the distribution of

dynasties over the human capital spectrum at initial time. In addition, the transition towards the steady state can take several very different shapes in terms of inequality, depending (i) on the initial distribution of human capital across dynasties, and (ii) on the selected measure of inequality (variance, Gini, Atkinson, Theil, inter-decile ratio, percentile shares, etc.). The K-curve is just one particular shape in this set of transitions.

Figure 2 depicts the case of an S-shaped education function as modelled by Galor & Tsiddon (1997). In the short term, all the individuals whose parents' human capital is lower than $\bar{h}$ tend towards human capital $\underline{h}$ whereas al those with parents' human capital higher than $\bar{h}$ tend towards $\hat{h}$. In the longer term, the education function moves upwards. This can result (i) from human capital externality in the education function as the average education level of the population increases (the same educational expense is more efficient in a more educated than in a less educated population), (ii) from the fact that a higher educational level of the population increases the income and thus the levies allowed for education, and (iii) from technical progress linked to the impact of increasing education on R&D, which in turn augments income and levies for education. If the increase in human capital is high enough to move the convex part of the S-shaped curve above the 45° line (dotted curve in Figure 2), then the dynamics results in one steady state with all dynasties having the same human capital in the long term. The development process described above can generate a K-curve because (i) inequality firstly increases when human capital dynamics results in a two-group stratification that widens the differences in income and (ii) inequality subsequently decreases when all dynasties tend towards the same human capital.

2.2. Empirical evidence

One could argue that plotting inequality on time or on the real income per capita, i.e. throughout the countries' development processes, provides a simple and relevant way to check Kuznets' hypothesis. This has been done for advanced countries from the early 19th century onwards (Lindert, 2000; Morrisson, 2000). This simple method can, however, be misleading if certain perturbing factors or shocks occur during the development process. These possible perturbing factors are many: wars, revolutions, strikes, coming into power of conservative anti-equality or progressive egalitarian governments, oil shocks, migrations, openness etc. As a matter of fact, Kuznets hypothesis is clearly based on a closed economy scenario and it is centred on the passage from a traditional to a modern economy. When development is openness-driven, this can modify the process because of the specialisation in

trade and the Stolper-Samuelson effect. In addition, even if political and social shocks impact on the income per capita (measure of the development level), these shocks may also modify the structure of the economy and thereby the level of inequality corresponding to each development level.

So, an appropriate way to check the existence of Kuznets hypothesis is to estimate the following equation for each country:

$$i_t = \alpha y_t + \beta {y_t}^2 + AX_t + b \qquad (1)$$

where i_t and y_t are respectively the value of the inequality index and the real income (or GDP) per capita at time *t* and $X_t = \{x_{jt}\}$ a vector of variables *j* that impact on i_t. The x_{jt} can be dummies when they represent a shock the impact of which is either limited to one period or lasting and constant during several periods (e.g., institutional differences and changes, wars, strikes etc.). They can also be variables that change over time (e.g., the weight of trade in GDP, the weight of inward FDI in GDP etc.). For a panel of countries (depicted by subscript *c*), equation (1) becomes:

$$i_{ct} = \alpha y_{ct} + \beta {y_{ct}}^2 + AX_{ct} + b_c$$

Finally, to circumvent the absence of longitudinal data on inequality, a number of studies have checked KH from a cross section of countries (see Table 1).

In the preceding equations, Kuznets hypothesis is confirmed if the estimated values α and β are such that $\alpha > 0$ and $\beta < 0$.[4] The estimation also makes it possible to calculate the turning point, i.e., the moment of the development process when inequality attains its highest value and begins to decrease. If the estimation starts at time $t = 0$ with the income per capital y_0, then the turning point corresponds to the period θ such that $y_\theta = y_0 - \alpha / 2\beta$.

Table 1 provides the results of the estimations based on a cross-section of countries and Table 2 the results of panel data estimations.

Most of the early estimations in cross section seem to validate Kuznets hypothesis (Table 1). However, these works suffer from several shortcomings. For the early works using data from Jain (1975), the poor quality of the dataset has been underlined (Deninger & Squire, 1998). In addition, the cross-section method is questionable because it implicitly assumes that the K-curve turning point occurs at the same level of development for all countries, which has been proved to be false by a number of empirical works. Moreover, Anand & Kanbur (1993a) calculations have shown that the results depended on the selected inequality measure. For the

Kuznets hypothesis to be accepted, it should be verified for a wide range of inequality indicators, which does not seem to be the case. Finally, certain estimations clearly reject KH (Ravallion, 1995).

Even if a number of estimations using panel data also confirm Kuznets hypothesis (see Table 2), their results are questionable because (i) these are sensitive to the introduction of new variables (Deninger & Squire, 1998), (ii) the impact of the development indicator(s) upon inequality is weak (Tsakloglou, 1988) or not significant (Frazer, 2006), and (iii) KH is often rejected at the country level (Deninger & Squire, 1998).

2.3. From an inverted-U to a tilde-shaped curve?

During the last thirty years, almost all advanced countries have experienced an increase in inequality (Chusseau et al., 2008). This increase has even been dramatic in countries like the US and the UK. Since this growing inequality primarily concerns the most developed countries, this new tendency is clearly at variance with Kuznets hypothesis. Even if we consider that the inverted-U shape had been confirmed for advanced countries from the early 19^{th} century to the early 1980s, one must diagnose the advent of a new inequality-oriented stage of development since then. Three main factors have been put forward to explain this new orientation, i.e., globalisation (North-South trade), skill biased technical progress and institutional changes. This shows that the initial inverted-U Kuznets curve should at least be replaced by a tilde-shaped curve. Finally, the sectoral transformation hypothesis proposed by Kuznets, with however the ‘modern vs. traditional’ replaced by a ‘service vs. goods’ division, has been utilized to explain the U-shape (i.e., not inverted-U) curve observed in the shares of the top percentiles in the US (Mollick, 2012).

Table 1: Estimations of Kuznets Hypothesis (KH) based on Cross-Section of countries

Authors	Dataset, countries, years	Variables & Methods	Main results
Ahluwalia (1976)	- Jain (1975) - 60 countries - 1955-72	-Different percentile share - y and y^2 (in log)*	- Clear confirmation of KH, for all countries as well as for developing countries only. - Different turning points during the development process according to the income groups.
Saith (1983)	- Jain (1975) - 41 countries - 1955-72	- Share of bottom 20%; y and y^2 (in log)* - Re-estimation of Ahluwalia's equation, socialist and developed countries being excluded.	– Compared with Ahluwalia (1976), substantial drop in value of the estimated coefficients and R^2 – When outlying observations are excluded, KH disappears.
Campano & Salvatore (1988)	- Various sources - 95 countries	-Different percentile shares. - y and y^2 (in log)*	- KH confirmed for all income groups except bottom 20% - Thus, the poorest may lose out with development - KH applies for both developed and developing countries
Bourguignon & Morrisson (1990)	-Various sources - 36 developing countries - 1970	- Share of bottom 40% and 60%, top 20%, Gini. - y and y^2 * - Formal model of income distribution - Emphasis on external trade factors	The effect of GDP on level of inequality is indirect since it passes through the correlation of GDP with other factors (e.g. presence of exportable mineral resources) - Trade is a main determinant of inequality
Anand & Kanbur (1993b)	- Jain (1975) - 60 countries - 1955-72	- Check the validity of Ahluwalia´s estimates (1976) by using different functional forms. - In addition, estimations from a higher quality database are implemented, using both Ahluwalia's equation and an alternative equation.	- Result highly sensitive to the estimated equation. - With new dataset and Ahluwalia´s equation, KH supported but not significant. - Using y and y^2 (not in log), the relation is reversed.
Ravallion (1995)	-IMF - 1 observation for 36 countries making up 78% of the developing economies population; 2 observations for 16 countries accounting for 66%. - 1980s	- Gini index G_{it}; level of development measured by consumption per capita μ_{it}; - Cross section curve (Gini against consumption per capita) for the 52 observations (20 countries with 1 and 16 countries with 2 observations). - Estimation of Anand & Kanbur (1993a) model: $G_{it} - G_{it} = A(\mu_{it} - \mu_{it}) + B(1/\mu_{it} - 1/\mu_{it}) + C$	-Rejection of KH found for both the cross section curve (Gini against consumption per capita) and the estimated model.
Ogwang (1995)	-Different sources -32 countries -1970s	- Gini, share of bottom 20% and 40% - HDI** and PQLI*** used together with GDP/capita - Quadratic Box-Cox model - Maximum likelihood procedure	- KH is supported when inequality is measured by the shares of bottom 20 and 40%, but the support is weak for the Gini. - Same result when developing countries are considered alone. - Other factors (social, political and demographic) impact upon inequality.

Ram (1995)	-Dataset Lecaillon & al. -36 developing countries	- y and y^2 * - Inequality–development relationship estimated constraining the constant term to 0.	- KH is supported - The results are better when the constant term is constrained
Jha (1996)	-World Bank Social Indicators of Development -76 countries -1960-92	- Different quintile income shares - y and y^2 (in log)* - Pooled cross-sections and time series	- support for KH even when developing countries are considered separately. - bottom 20% also benefit from development.
Eusufzai (1997)	- Jain (1975) - 54 countries - 1955-72	- The 6 inequality indicators used by Anand & Kanbur (1993b). - Quandt log-likelihood ratio test is used to check a break in the relation, i.e., a turning point	- 4 out of 6 indicators reveal a break in the relationship, which supports KH. - These breaks occur at similar level of GDP/capita.
Mbaku (1997)		- Several measures of the development level used to estimate the development-inequality relation-ship: y and y^2 (in log)*$_2$; HDI, HDI^2; PQLI, PQLI^2.	- KH is confirmed - HDI and PQLI are better explanations for the variation in inequality than GNP per capita.
Bulíř (2001)	– Various sources – 75 countries – 1970-91	- Gini - y and y^2 * - Inflation is added to the usual Kuznets equation as a determinant of inequality.	- KH is confirmed - Inflation has non-linear negative impact on income inequality - The effect most apparent in the case of hyperinflation.
Huang (2004)	- Same data as Bulíř (2001) - 75 countries - 1970-91	- Gini - Flexible non-linear inference method used to test whether the relationship between inequality and development is non-linear and how this can be described.	- The development-inequality relationship is nonlinear - The variables y and y^2 provide a good approach for this non-linearity. - Thus, KH is confirmed.

* y = real GDP per capita. ** Human Development Index (World bank).***Physical Quality of Life Index (World Bank).

Table 2: Estimations of Kuznets Hypothesis (KH) based on Panel data analyses

Authors	**Dataset, countries, years**	**Variables & method**	**Main results**
Tsakloglou (1988)	- various sources - 31 countries - 1950-75	- Shares of bottom 40% and top 20% - y and y^2 (in log)* - Cross-section data analysis and fixed effects model	- Evidence for KC in cross-section but little variation in inequality is explained - In fixed effects models, KH supported and country-specific effects are significant. - The coefficients on y and y^2 are not significant for bottom 40% when other variables are added. - Institutional factors have greater impact on the middle class than on the top and bottom of income distribution.

Deininger & Squire (1998)	- Deininger & Squire (D&S) database - 54 countries - Post-war period	- Gini - y and $1/y$ - Pooled time-series/cross-section data analysis - Estimations in level and in differences - Fixed effects dummy-variables model	- Support for KH in cross-section for decadal country averages, but this result is sensitive to the inclusion of regional dummies and other robustness test. - No support for KH found from the model in differences. - With country-specific effects, the relationship is no longer statistically significant and signs can reverse. - Hypothesis of equal coefficients rejected: no universal K-curve. - When countries are considered separately, no statistically significant KH for a majority of countries
Barro (2000)	- D&S - 84 countries - 1960s-1990s	- Gini - y and y^2 (in log)* - Panel model with fixed effects - Stability of KH tested	- KH is a stable empirical regularity. - However, much of the variation in time and across countries remain unexplained - KH applies also in fixed effect estimation but the coefficients on y and y^2 (in log) are substantially smaller.
Thornton (2001)	- D&S - 96 countries - Post-war period	- Gini, income share of bottom 40% – y and y^2 (in log)* - Pooled cross-section/time-series data analysis	- KH is confirmed - The turning point occurs at a relatively low level of income per capita
Frazer (2006)	- WIID (UNU/WIDER) - Post-war period	- Gini, shares of top 20% and 40% - Overlapping nonparametric regression to estimate pooled relationship as well as within and between countries relationship in the course of development - This method allows visual comparisons	- In pooled regression a variant of KH found but the result is not statistically significant. - When within-country inequality considered substantial heterogeneity found even between countries with very similar level of development - In summary, little evidence found to support KH.
Zhou and Li (2011)	- WIID (UNU/WIDER) - 75 developed and developing countries - 1962-2003	- Gini - y and y^2 (in log) (+ y^3 and y^4) - Nonparametric and semi-parametric unbalanced panel data models with fixed effects	- KH is confirmed only when development reaches a certain threshold → KH does not apply at low stage of development. -Policy instruments and economic performance play a larger role in reducing inequality in more developed than in less developed economies

* y = real GDP per capita.

3. The impact of inequality on growth

3.1. Physical capital: inequality is good for growth

Inequality fosters growth when growth is based on physical capital accumulation. As shown hereafter, this is caused by differences in savings between the rich and the poor. A consequence of this positive impact of inequality on growth is that, when capital and technologies are immobile across countries, the catching-up of advanced by less developed countries is easier when inequality is higher in the latter than in the former. In certain approaches, this difference in inequality is even a condition for convergence. This provides a justification for the Kuznets hypothesis, and also an explanation if the public planner pursues a catching-up target and if her/his policy can influence income distribution.

Kaldor (1955-56) developed a model in which growth is driven by capital accumulation based on savings. Factors (labour and capital) are complementary and the coefficient of capital (i.e., the efficient capital/output ratio) is constant. In addition, Kaldor assumes two social groups, the capitalists and the workers, the former having a (constant) marginal propensity to save which is higher than the latter. Thus, the economy saving rate is a weighted average of the capitalist and the workers' saving rates, and the higher (lower) the share of total income received by the capitalists, the higher (lower) the saving rate. The model determines a unique saving rate and a related unique income distribution (between the capitalists who receive profits and the workers who earn wages) consistent with full employment in the long term, and the economy naturally moves to these full employment values. These values depend positively on the growth rate of labour productivity. Labour productivity growth depends on technical progress, the latter being incorporated into capital. The model then determines a steady state growth rate of labour productivity, which defines the distribution of income between capitalist and workers. For a less developed economy to catch an advanced economy up, it is thus necessary that the former increases its labour productivity more rapidly that the latter, i.e., that its saving rate be higher than that of the advanced economy. This shows that income distribution must be more uneven in developing than in advanced countries.

From a dynamic model based on Stiglitz' framework (1969), Bourguignon (1981) shows that non egalitarian distributions of wealth among households result in equilibria that are Pareto superior to the egalitarian equilibrium resulting from an equal distribution. This result

stems from the assumption of a convex saving function $s(y_i)$, $0 < \partial s / \partial y_i < 1$, $\partial^2 s / \partial y_i^2 > 0$, with y_i being individual *i*' s income.

More generally, it is easy to show that, if the rate of growth depends positively on savings through capital accumulation and if the household's marginal saving rate is an increasing function of income, then higher inequality, defined as a transfer of income from low income to higher income households, raises growth. The growth rate of capital *K* is $\gamma_K = (I - \delta K) / K$ with *I* being investment and δ the capital depreciation rate. As investment equals savings, we can write $\gamma_K = K^{-1} \sum_h s(y_h) \times y_h - \delta$, with y_h household *h*'s income and $s(y_h)$ its saving rate that increases with income ($\partial s / \partial y_h > 0$). As the marginal saving rate is an increasing function of y_h, we have $\partial^2 s / \partial y_h^2 > 0$. A change in income distribution is a vector of variations $\{dy_h\}$ with $\sum_h dy_h = 0$. Suppose now an increase in inequality that takes the form of a transfer of income $dy > 0$ from a low income household *i* to a higher income household *j* ($y_j > y_i$ before and after the transfer): $dy = dy_j = -dy_i$ The resulting change in growth is after re-arranging $d\gamma_K = \Big(\big(s(y_j) - s(y_i) \big) + \big(s'(y_j) y_j - s'(y_i) y_i \big) \Big) K^{-1} dy$. As $s(y_j) > s(y_i)$ because $\partial s / \partial y_h > 0$ and $s'(y_j) y_j > s'(y_i) y_i$ because $\partial^2 s / \partial y_h^2 > 0$, the transfer $dy > 0$ increases growth. The reason is simply that the richer household saves a higher proportion of the transferred income than the poorer one.

3.2. Human and social capital: inequality can be harmful to growth

Human capital accumulation

Human capital accumulation generates endogenous growth because of human capital externalities (Lucas, 1988). Thus, agents do not account for all the benefits from investing in education in their private calculations, which proves to be suboptimal. Consequently, public intervention through subsidies for education is welfare-improving. In addition, any factor that slows down or prevents human capital accumulation has a negative effect on production and growth. The literature has put forward a number of such factors that are linked to inequality.

Firstly, when the young people cannot borrow on the credit market, the funding of education depends on the parents, either through loans or through bequests. Children from poor families can then be constrained in their educational choices. This typically slows down human capital accumulation and growth (Becker & Tomes, 1986; Loury, 1981). In addition, if

there is a fixed cost of education, credit constraints can generate under-education traps (situations in which certain dynasties remain low skilled from generation to generation; see Chusseau & Hellier, 2012) when the parents' saving and/or bequest are not sufficient to pay the fixed fees (Galor & Zeira, 1993; Barham et al., 1995).

Secondly, the human capital dynamics generates under-education traps when the education function is S-shaped (Galor & Tsiddon, 1997)[5].

Thirdly, local human capital externalities and higher local public expenditure for education, linked to the gathering of households in different districts according to their income and skill, produce the same decelerating impact upon human capital accumulation and growth (Benabou, 1993, 1996b, 1996c; Durlauf 1994, 1996; Chusseau & Hellier, 2012).

Finally, the educational system itself can generate social stratification with under-educated groups through its division into different cycles with selection procedures (Bertocchi & Spagat, 2004; Chusseau & Hellier, 2011 and 2012).

In summary, when considering human capital formation, there are a number of channels through which inequality may hamper growth, either by slowing down the rhythm of skill accumulation, or by generating social stratifications with under-education traps.

Appropriative strategies

Within a socio-political perspective, inequality can shift the poor from productive to appropriative strategies (Grossman, 1991, 1994). These can range from union militancy and strikes as far as revolts, revolutions and criminal activities (Benabou, 1996a, for a survey). These activities firstly remove resources from production and accumulation. They also increase social violence and reduce safety and property rights enforcement, which makes it necessary to allocate new resources to combat and control these disturbances. All these effects jeopardise growth (Alesina & Perotti, 1996; Sala-i-Martin, 1997). Finally, the level of mass violence resulting from high inequality is likely to change the individuals' attitude towards the future, leading them to discount it more heavily. Borissov & Lambrecht (2009) study the distribution and growth implications of this hypothesis.

Social capital

The economic literature on social capital has undergone a significant expansion since the mid-nineties. Imported from sociology[6], the concept of social capital refers to 'the existence of a certain set of informal rules or norms shared among members of a group that permits cooperation among them' (Fukuyama, 1995). These informal norms and rules generate trust,

reciprocity and solidarity inside the group, and finally positive externalities for its members (Durlauf & Fafchamps, 2004). Higher social capital typically comes with more equality. If, on top of that, social capital has a positive impact on growth, this creates a new connexion between equality and growth.

Several works have investigated the relationship between social capital, production and growth, either empirically or theoretically (Temple, 1998; Knack, 1999; Routledge & Amsberg, 2002; Chou, 2006; Akçomak & Weel, 2008; Bartolini & Bonatti, 2008; Dinda, 2008; Beugelsdijk & Smulders, 2009; Antoci et al., 2011)

From an empirical point of view, Temple (1998) studies the role of initial conditions in explaining slow growth in African countries. He looks at three dimensions to these conditions, namely social arrangements, income inequality and ethnic diversity. The quality of social arrangements and ethnic homogeneity are indicators of social capital. Temple finds that the quality of social arrangements bears a positive influence on growth through government policy outcomes. In contrast, income inequality measured by the low middle class income share does not seem to slow down growth in African countries. The influence of ethnic diversity (a source of low social capital) is non linear: there is an intermediate range of ethnic diversity within which the effect on growth is the worst.

Beugelsdijk & Smulders (2009) and Antoci et al. (2011) utilise similar individual micro-foundations to analyse the social capital-growth relationship, albeit within different production frameworks. We propose here a simplified exposition of the impact on growth within such approaches. Individuals spend time both in the production of a consumer good and in a social activity. The latter produces a non-market ‘social good’ that generates personal utility. The individual’s social good depends on her/his time allocated to the social activity, on the average time the members of the society spend in this activity, and on the existing social capital. The accumulation of social capital depends on the average time allocated to the social activity and on the already accumulated social capital, with a constant depreciation rate. Finally, social capital enters the consumer good production function. This makes production (of the consumer good) an increasing function of social capital. Consequently, the impact of social capital upon the production of the consumer good and growth is twofold. On the one hand, time is removed from the production to the social activity, thereby lowering production. On the other hand, by increasing social capital, the time allocated to social activities fosters growth (Beugelsdijk & Smulders, 2009).

3.3. Empirical evidence

From the early nineties, a number of empirical works have suggested that, as opposed to common belief, equality could be beneficial for growth. However, new empirical works carried out from the early 2000s seem to question this diagnosis. In fact, the ambiguous impact of inequality on growth is not really surprising since (i) several opposite mechanisms simultaneously operate, and (ii) the weight of each mechanism may significantly vary between countries and over time.

The early 90s turnabout: equality is good for growth

Perotti (1992) shows that higher credit availability (measured by loan-to-value ratio for domestic mortgages) has a positive and significant effect on the growth rate, and that this impact is greater when the income share of the lowest 2 quintile decreases, i.e. higher inequality. Easterly & Rebelo (1993) examine the impact of taxation policy (marginal and average tax rates) and of different types of social spending on the growth rate for a wide cross-section of developed and developing countries. They find that redistribution has, if anything, a positive effect on growth. Both these works suggest that equality could be good for growth.

The positive impact of equality on growth has subsequently be confirmed by Persson & Tabellini (1994), Alesina & Rodrik (1994) and Deininger & Squire (1998).

For a cross-section of developed and developing countries over the period 1960-1985, Persson & Tabellini (1994) regress the GDP average growth rate on the share in income distribution of the 3rd quintile that represents the weight of the middle class considered as being a measure of equality. They find a positive and significant impact. This result is subsequently confirmed for a panel of 9 advanced countries over the period 1830-1985. Similarly, Alesina & Rodrik (1994), find that greater inequality reduces growth by regressing the average growth rate over 1960-1985 on the Gini coefficient of income and of land around 1960, controlling for the initial per capita income and primary school enrolment rate in 1960. Both inequality indexes have a negative impact on growth.

Perotti (1996) finds that both higher equality and higher redistribution increase the rate of growth. The average rate of growth of per capita GDP over 1960-85 is regressed, either on the combined income share of the 3rd and 4th quintiles (measuring the size of the middle class and thus equality), or on the average marginal tax rate over 1970-85, controlling for per capita GDP in 1960, average years of secondary schooling in the male and female populations and the value of investment deflator (representing market distortions). Both the size of the middle

class (without controlling for redistribution) and redistribution (without controlling for the size of the middle class) have a positive impact on growth.

Using cross-country data on income and asset distribution, Deininger & Squire (1998) find that (i) there is a strong negative relationship between initial inequality in the asset distribution and long-term growth and (ii) inequality reduces income growth for the poor, but not for the rich. Consequently, policies that increase aggregate investment and facilitate the acquisition of assets by the poor could be beneficial for both growth and poverty reduction.

In the late 1990s, it was thus commonly admitted that, in contrast with early beliefs, inequality was rather bad for growth.

The early 2000's new turnabout: inequality could be good for growth

Albeit not really conclusive, Barro's estimation (2000) seems to question the main result of the preceding decade, i.e., a negative impact of inequality on growth. From a broad panel of countries, Barro finds little overall relation between income inequality and the rates of growth and investment. Higher inequality slows down growth in poor countries, but this fosters growth in richer countries. Finally, the considerable variations in inequality across countries remains unexplained over time.

Forbes (2000) turns clearly back to the diagnosis that inequality is good for growth. His panel estimations suggest that an increase in income inequality has a significant positive impact on subsequent economic growth in the short and medium term. The result appears highly robust across samples, variable definitions and model specifications. Forbes' methodology has however been criticised by Aghion et al. (1999).

Finally, Lopez (2006) concludes that, unlike the pre-1990 growth process, a positive and significant correlation appears between growth and inequality after 1990, and that this finding survives a number of robustness checks.

However, considering human capital inequality instead of earnings inequality, Castello & Domenech (2002) find that the former has a significant negative influence on growth rates.

4. Redistribution, educational policy and growth

4.1. The negative impact of redistribution

From a simple neoclassical framework in perfect competition, it is easy to show that redistribution has a negative impact upon production and growth. This is because both the levies paid by the rich and the transfers to the poor reduce labour supply and savings.

To demonstrate this, let us assume that households live two periods of time, successively working and being retired. They maximise the utility function $u_i = u(c_i, c_i', \lambda_i)$ under the usual income constraint $w_i l_i \geq c_i + \rho c_i'$, with c_i and c_i' being respectively household *i*'s consumption when working and retired, $\lambda_i = 1 - l_i$ and l_i its leisure and working time (disposable time is normalised to 1), w_i its real wage (we allow for household heterogeneity) and ρ the real discount factor. The utility function being well behaved (increasing in both arguments with decreasing marginal utilities), the maximisation programme determines household *i*'s optimal labour supply $l_i = l(w_i, \rho),\ \partial l / \partial w_i > 0,\ \partial l / \partial \rho < 0$ and saving $s_i = w_i l_i - c_i = s(w_i, \rho),\ \partial s / \partial w_i > 0,\ \partial s / \partial \rho < 0$.

Let us now assume a redistributive pattern such that all the households above the mean wage $\overline{w}$ (the '*rich*') pay a tax $\tau(w_i l_i - \overline{w})$ and all those below $\overline{w}$ (the '*poor*') receive a transfer $f_i = \tau(\overline{w} - w_i l_i)$. The rich reduce both their working time l_i and their savings s_i because the levies correspond to a decrease in their real wage per unit of working time that moves from w_i down to $(1-\tau)w_i$. The poor do the same because their income moves up to $w_i l_i + f_i = (1-\tau)w_i l_i + \tau\overline{w}$ which shows that, quite surprisingly, their wage per unit of working time $(1-\tau)w_i$ also decreases. Finally, the decrease in labour supply reduces production and total income, and the squeeze in savings reduces investment and growth.

The result that redistribution jeopardizes both production and growth is obviously linked to the analytical framework. In particular, if levies are utilised to increase or maintain certain accumulated factors (human capital, public infrastructures, social capital, health etc.), their impact on growth can be reversed. In addition, when markets are not purely competitive, public expenditures funded by taxes may foster accumulation and growth as well as equality. This is particularly the case when human capital accumulation is handicapped by credit market imperfections.

4.2. The political economy of redistribution

In the nineties, a series of papers studied the link between inequality and growth from a political-economy point of view. The central idea of these works was that inequality induces more redistribution from the political system and that this redistribution may have a cost in terms of growth opportunities to be balanced with potential growth-enhancing properties. These models rely on the theory of voting and on the effect of taxation on accumulation. They

endogenize the level of taxation and study its costs and benefits for growth and income distribution.

Bertola (1993) uses an infinite-horizon endogenous growth model with heterogeneity in the sources of income, i.e. individuals differ in the shares of income they get from an accumulated factor (like capital) and from a non-accumulated factor (like labour or land). When this heterogeneity is accounted for, individuals display heterogeneous saving propensities. As a result, growth-oriented policies have distributional consequences. Lump sum redistribution transfers, like those brought about by a land reform or by plans to diffuse stock ownership, are in general needed for growth-oriented policies to be Pareto-improving. If lump sum redistribution is ruled out, the model yields positive result which may help explaining growth differentials across countries with similar technologies. First, the political weight is a key variable: faster growth rates should be observed in economies where the political power lies in the hands of those with a higher share of accumulated factor. Second, the menu of policy instruments matters. If policy is based on redistribution between accumulated and non-accumulated factors Bertola's (1993) predicts slower growth rates. If policy is based on investment subsidy, the reverse is predicted: growth rates will be larger than the socially optimal one.

In a similar vein, Persson & Tabellini (1994) and Alesina & Rodrik (1994) present models whose common point is that the poor median voter faces a lower 'tax price' for the corresponding policy: a productive public good for Alesina & Rodrik (1994) or a redistributive subsidy for Persson & Tabellini (1994). Hence inequality that results in a poorer median voter typically induces higher tax rate, which creates a disincentive for investment.

However, taxation can also have positive effects, especially on human capital accumulation in unequal societies (Perotti, 1993; Saint-Paul & Verdier, 1993). Perotti (1993) models a non-overlapping economy in which only part of the population can afford the cost of investing in human capital while all the population benefits from the externality associated with human capital accumulation. Individuals vote on the degree of redistribution in the economy. Redistribution affects the post-tax income of various income groups and hence determines who can invest in education, which in turn impacts growth and the distribution of income. Perotti distinguishes poor (low per capita income) from rich (high per capita income) economies. In the former, only a very unequal income distribution, favouring the upper class, is compatible with high growth rate and conversely the median voter (middle class) should not be too different from the upper class in its tax choices. In the latter, the reverse is true: redistribution in favour of the lower class should prevail for growth to be fostered and middle

and lower classes should not differ much in their tax choices. The same type of result can be attained in the case of an S-shaped education function with human capital externalities (Galor & Tsiddon, 1997).

What is the empirical relevance of these contributions? As explained in subsection 3.3 Persson & Tabellini (1994) and Alesina & Rodrik (1994) both present empirical results showing that inequality is negatively related to growth. However in the chain of causality "inequality-redistribution-growth", they do not firstly test the link between inequality and redistribution, but rather directly the link between inequality and growth. From an empirical point of view, this test in 'reduced form' does not elucidate the mechanism of transmission between the two variables. The three elements of the relation must be disentangled: inequality-redistribution-growth. Other studies (Perotti, 1993; Clarke, 1995; Benabou, 1996a) find either no significant effect or a negative effect of inequality on transfers. In addition, several empirical studies reveal a positive and significant effect of transfers on growth (Esaterly & Rebelo, 1993; Perotti, 1996)

Saint-Paul & Verdier (1996) question the results of these models. Firstly, they provide several arguments according to which unequal societies are not always those with the highest degree of redistribution. In fact, the latter depends on the position of the median income (and hence voter) with respect to the average income and not all mean-preserving change in income distribution lower the position of median income. Secondly, the poor typically have a lower political participation than the rich. Thirdly taxes are often progressive. Benabou (1996a) shows that the relation between inequality and the level of transfers can be U-shaped if the political system is biased towards the rich and if financial markets are imperfect (so that redistribution is efficient). Relatively equal societies will unanimously support efficient redistribution (transfers will decrease) but as inequality widens an additional element of contention arises and we go back to the positive relation between inequality and transfers.

Saint-Paul & Verdier also advocate that redistributive transfers can be growth-promoting. In fact, redistribution via public education (Saint-Paul & Verdier, 1993) and redistribution alleviating credit constraints (Galor & Zeira, 1993; Aghion & Bolton, 1993; Banerjee & Newman, 1993) are growth-promoting. Furthermore, redistribution could be useful to create a large middle class able to buy a broad range of manufactured products in economies where there are increasing returns to scale in technologies. This is a demand composition effect. Finally, redistribution is a means for public authorities to compete with illegal, criminal or violent activities that might attract poor individuals.

To summarize (see Benabou, 1996a), when the political system is biased towards the rich and when credit markets are imperfect, the link between inequality and redistribution can be U-shaped. It is then possible that an increase in initial inequalities has a negative effect on growth through a decrease of growth-promoting redistributive transfers.

4.3. Redistribution, education and human capital accumulation

Public educational policies have redistributive features. In growth models with human capital it is therefore useful to study how the inequality-redistribution-growth nexus operates.

To analyze this issue, Glomm & Ravikumar (1992) use an overlapping-generation model with heterogeneous agents in which the engine of growth is the human capital investment in formal schooling. They compare the economies with public education and those with private education. An agent's human capital depends on his parents' human capital, on time spent in school and on the quality of schools. Each parent has a bequest motive in the form of the quality of schools which is passed on the next generation. In the private system, the quality of schools depends on the parents' private decision and is a source of intergenerational persistence in inequality. In the public system, this depends on the government tax revenues and thus the quality of school is the same for all. Glomm & Ravikumar (1992) firstly examine an economy with homogenous agents. They find that sustained growth is possible if the parents' human capital and the school quality have non-decreasing returns. Moreover, average income is higher in the private system at all periods. They then turn to the heterogeneous-agent versions of the model. Inequality declines faster in the public education system. In the latter system again, among two economies differing only in their initial income distribution (i.e. having the same *per capita* income) the one with lower inequality has higher *per capita* income at every period. On the other hand private education yields higher income per capita except when inequality is very large. Finally Glomm and Ravikumar endogenize the choice of the education system and find that if a majority of voters obtain income below the average (i.e. the median income is lower than the average), then public education wins the vote.

Das (2007) endogenizes parental bequest motive to analyse the same issue as Glomm and Ravikumar. Das commences with the supposition that parents' perception about the utility of their children's education varies according to their income status. He then assumes that parental altruism (a 'warm-glow' type of altruism on educational expenditure) is an increasing function of the parents' own consumption. As a consequence poor parents put less weight on their offspring's education than rich parents. Therefore, not only lower income makes poor

parents unable to finance education but they are also less willing to do so. This contributes significantly to the persistence of earnings inequality over the generations. Apart from this, his economy is standard in the sense that preferences and technology are convex. The implication of endogenizing altruism is that savings and bequests represent an increasing proportion of lifetime income. This feature is known to produce inequality persistence in the long run.

Within this framework, Das then examines the conditions in which a public education system performs better than a private one in relation to run growth. Given the fact that poor households are less willing to invest in education, a growth-promoting public education system must reduce the cost of the educational investment for those households, at the expense of the richer households. This policy will be the outcome of a voting equilibrium if poor households comprise the majority of the population, i.e. if the median income is lower than the average income.

Redistribution among the rich and the poor does not only take place through the public education budget. Direct redistribution can also be attained by social security transfers. Glomm & Kaganovitch (2008) develop a general equilibrium model with both these types of redistributive policies. Human capital in their model is produced both with parents ’time and with public spending. They study the comparative dynamics effects of increased social security funding within the context of two policy scenarios. The first scenario is a permanent marginal increase of the social security program financed by an increase in the overall tax burden and keeping the public education budget unchanged. In the second scenario, the overall tax burden is constant, which implies that the expansion of social security funding occurs at the expense of public education expenditures. Under both experiments Glomm & Kaganovitch demonstrate that increasing social security funding has a non monotonic effect on the growth–inequality relationship. Such an increase unambiguously reduces inequality, but the effect on growth is firstly positive, if the initial social security funding level is low, and subsequently negative. The fact that public and parental inputs are complement is a key feature of their model. Glomm & Kaganovich (2003) have shown that when public and private inputs in education are complements a reallocation of funds from public education to social security budget can also yield an increased private input in education because of a positive effect on the altruist’s income. This effect is particularly sizeable in low income families. Through this mechanism, such a reallocation of public funds is progressively redistributive.

The main conclusion of Glomm & Kaganovitch's (2008) approach is that the impact of public education funding on economic growth can be non-monotonic. If parental inputs into education are sensitive to social security transfers, a global analysis encompassing both means of redistribution is recommended. An increase in public education funding, especially if it occurs at the expense of social security funding, can lead to a net retirement income loss of the relatively poor individuals over their life-cycle. This result depends crucially on the importance attached to consumption during old age and to the time spent on the children's education. High preference on old-age consumption will drive the altruist's choice towards labour supply rather than children's education. The combination of these two types of redistributive policies makes the analysis of the growth–inequality nexus more complex and rich than unidimensional-policy models of income redistribution.

It can finally be noted that social policies other than redistribution can encourage growth in R&D-driven models. Chusseau & Hellier (2007, 2008) have shown that the setting of a minimum wage that reduces the relative wage of skilled workers fosters growth and income per capita by lowering the cost of the R&D activity (that utilises skilled workers) in relation to the cost of producing goods (which utilises both skilled and unskilled workers). Similarly, the combination of R&D subsidies with generous redistribution (the 'Scandinavian model') makes it possible to accelerate growth without increasing inequality (Chusseau & Hellier, 2008).

5. Welfare, Growth and inequality

The previous sections have underlined the complexity of the analysis of the growth-inequality nexus. Simultaneously, distribution issues about wealth, tastes and skills matter for the dynamics of per capita output, income and consumption. In turn, the dynamics of per capita variables (average income, wealth, consumption) shape the cross-sectional distribution of well-being and its evolution over time.

In terms of welfare, an additional criterion is market efficiency. The question is whether we tackle the inequality-growth relationship from an efficient markets hypothesis, i.e., competitive and complete markets, or if we assume some inefficiency such as credit constraints. The literature based on the efficient credit market hypothesis considers both the Pareto criterion and a social welfare criterion. It is firstly possible to study the social welfare improvements of a redistribution of wealth while keeping aggregate growth unchanged (see below Chatterjee, 1994). While the two states of the economy (before and after redistribution)

are both Pareto optimal, they may differ in terms of social welfare. On the other hand, if aggregate growth is higher in one of two states of the economy, the Pareto criterion and many social welfare criteria will coincide. However, it might appear under certain conditions that the higher-growth path of the economy is more unequal than the other (see below Bourguignon, 1981). Under the hypothesis of inefficient credit market, there is even more room for welfare improvements (see below Galor & Zeira, 1993).

Paradoxically the analysis of welfare issues in growing economies with heterogeneous agents first has to ascertain whether we should rely on the convenient and tractable fiction of the representative consumer or if we should use models in which heterogeneity is explicitly introduced, be it in wealth, tastes or skills. The analytical convenience of the representative consumer is easy to stress. In fact, it is much less complicated to follow the evolution of average quantities, such as per capita output or consumption, along an equilibrium growth path than to keep track of distribution functions of the same variables across time or generations.

The literature on the welfare properties of growing heterogeneous economies has thus sought to identify the conditions under which distributive cross-sectional heterogeneity bears no impact on the macroeconomic dynamics of aggregate output and consumption. Conversely, the literature has also studied how the evolution of macroeconomic aggregates affects the distribution of wealth, consumptions and well-being both from a cross-sectional point of view (within-generation inequality) and across time (social mobility).

This section firstly reviews the literature on the first-best, Pareto-efficient markets models of growth with heterogeneous agents. We subsequently examine the second-best, Pareto-inefficient markets models.

5.1. Efficient markets

The tendency towards equality or towards inequality along an equilibrium growth path in efficient-markets economies depends crucially on the shape of the saving function.

Stiglitz (1969) and Bourguignon (1981) analyze the role played by the convexity of the saving function in producing a trade-off between income or wealth inequality and growth or aggregate welfare. Bourguignon shows that inegalitarian locally stable equilibria coexist with egalitarian equilibria, and that the former can be *Pareto superior*. This means that inequality in a neo-classical equilibrium growth model permits not only a larger size of the pie and a larger *per capita* consumption but also that all individuals are better off with individual

income and consumption than at the egalitarian equilibria. As a consequence, the optimal long term income and wealth distribution that would be the solution to any utilitarian-type social welfare function, would also be an unequal one even if individuals in the population were identical. This result however confines itself to the case where all individuals possess positive wealth. Both Stiglitz (1969) and Bourguignon (1981) stressed the importance of the positivity of wealth and of individual ability to cover basic needs as key features to insure either long term equality (income convergence in the case of linear or concave saving function) or long term Pareto superiority of unequal equilibria (in the case of convex saving function).

The welfare analysis of the inequality-growth nexus had to be extended to a framework with microeconomic foundations to better understand the relationship between the individual characteristics in the saving behaviour and the long term equilibrium distribution and possibly its Paretian characteristics.

Optimal growth in a neo-classical economy with efficient markets and heterogeneous preferences has been analysed by Lucas and Stokey (1984). Their analysis includes the case of heterogeneous preferences. The causation from optimal saving choices of heterogeneous consumers to observable distributional dynamics has been studied by Chatterjee (1994). In his article, Chatterjee restricts the analysis to 'quasi-homothetic' instantaneous utility functions. This assumption leads to a linear relation between lifetime wealth and saving. As a result, individual consumption plans can be simply aggregated and the per capita consumption, per capita capital stock and prices can be deduced from a representative-agent equivalent economy and its Pareto-optimal planning problem. Chatterjee firstly establishes that the average saving propensity of agents is positively related to wealth if their marginal utility is infinite for some positive level of consumption. If their marginal utility is finite for all non negative consumption levels, then the relation is negative. He subsequently distinguishes growing paths and decaying paths towards a steady state and he crosses these two types of paths with the increasingness (or decreasingness) of the saving propensity. In growing paths with increasing saving propensity (resp. decreasing), the current distribution of wealth Lorenz-dominates (resp. is Lorenz-dominated by) the next period distribution, in the sense that inequality rises (resp. decreases) in between the two periods[7]. In decaying paths the relations are reversed. Chatterjee then studies the normative implications of these distributional dynamics in terms of a social welfare function. Distributional changes on the transition (growing or decaying) have no normative significance. In fact, in his infinitely-lived agents model, transitional changes in the distribution of wealth are determined once and for all by the competitive equilibrium. As such, the evolution of wealth distribution is an aspect

of the competitive equilibrium. On the other hand, initial wealth distribution matters. A modification of the initial wealth distribution can have unambiguous welfare consequences. Chatterjee derives conditions under which an economy which starts with a more equal distribution (in the Lorenz sense) than another economy, while being otherwise identical, (i) will Lorenz-dominate the other economy and (ii) will enjoy higher social welfare. This result applies only if the aggregate dynamics is the same in both economies. However both distributions are Pareto optimal.

Caselli & Ventura (2000) challenge the use of heterogeneous agent to model dynamic distributive issues. They examine the possibility of using a representative-consumer model to deal with these issues and develop tools to study the distributional dynamics of wealth and income. Like Chatterjee (1994), they assume quasi-homothetic instantaneous utility functions and a minimum consumption level which is interpreted as a bundle of publicly-provided goods. They show (i) that a model with an infinitely-lived representative consumer places few restrictions on the nature of observed distributions and (ii) that a wide range of distributive dynamics and income mobility patterns can occur along a competitive equilibrium path.

Bertola et al. (2006) stress this crucial point of preference patterns. They show that if and only if preferences belong to the class of quasi-homothetic utility functions or, equivalently, display 'hyperbolic absolute risk aversion' (HARA), then current and future consumption levels are linearly related at the individual level. Consequently aggregate consumption levels are also linearly related, the individual consumption function is linear and distribution has no impact on the dynamics of macroeconomic accumulation.

As far as the reverse causation is concerned (i.e. from the dynamics of aggregate accumulation to the dynamics of distribution), for all HARA utility functions, except that with a positive minimum consumption level[8], there is convergence (divergence) in the distribution of lifetime income in a growing (decaying) economy.

5.2. Market inefficiencies

We now address the issue of welfare in growing and unequal economies in the presence of market inefficiencies. There are many sources of inefficiencies: local segregation, discrimination, employer monopsony, existence of mobility costs and firm-specific human capital. However we shall focus here on the imperfection of credit market and more precisely on credit constraints which have been the object of much attention.

Credit constraints are borne by poor borrowers when the amount of credit they require for investment is limited by their initial wealth or income. The consequence of these constraints is that the amount of investment is correlated with the level of initial wealth/income. Investment can be in physical capital or in human capital. Poor households cannot exhaust all the gains from investment and therefore the distribution of wealth hampers efficiency. This source of inefficiency paves the way for policy intervention for correcting the market failure within a context in which the trade-off between equality and efficiency is looser.

Loury (1981) models an economy in which parents have a recursive altruistic motive to finance their offspring's training and in which innate abilities are drawn randomly and learnt after investing in human capital. The focus is on earnings distribution and there is no accumulated production factor. Poor parents investing less face a higher expected return than rich parents. If they could engage in a loan with the other parents then both types of families could be better off. However, if these trades are impossible because markets for lendable funds are incomplete, the overall investment in training will be inefficient and earnings distribution is necessary for the sake of efficiency. Loury points to the efficiency properties of the equilibrium earnings distribution. If income is redistributed among future generations the current altruist's welfare is modified. In fact, future redistribution operates like an insurance, and egalitarian redistributive measures can be designed which make all current members of society better off. In addition, public provision of training is shown to increase output and reduce inequality under certain conditions.

At odds with Loury (1981) but like Laitner (1992), Galor & Zeira (1993) model economy-wide factor markets. The factors of production are capital, skilled and unskilled labour. Parents are altruistic, i.e., they make bequests to their children. Galor and Zeira show that the introduction of non-convexities in the technology of production of the unique good, in addition to credit market imperfection, extends the impact of initial wealth distribution to the long term equilibrium outcome. Rich dynasties with positive human capital investment at every generation, skilled occupations and high bequeathed wealth coexist with poor dynasties characterised by low or zero human capital investment, unskilled occupations and low or zero bequeathed wealth. In such a second-best setting, there is substantial room for welfare improvements. Pareto improvements can be reached if intertemporal exchanges are facilitated at a lower cost than the costs of monitoring borrowers. For instance, the government can subsidize education, which reduce individual costs of investment in human capital, and finance this subsidy by a tax on the skilled workers in the subsequent period. This policy can be Pareto-improving if debt-collection costs are higher than tax-collection costs, a reasonable

condition since such a policy does not mean keeping track of borrowers if all students are subsidized and all skilled workers are taxed.

6. Conclusion

We have reviewed the main links between growth, inequality and welfare. From this (too) quick assessment, it is clear that no simple and unidirectional link with a well defined impact (positive or negative) can be put forward. If growth and development impact on inequality, inequality also influences growth and development. In addition, this influence is not straightforward. In a traditional physical capital-driven framework, inequality fosters growth by boosting saving and accumulation. In contrast, when growth is based on human capital accumulation and when inequality-related social disturbances are considered, inequality tends to weigh on growth. Consequently, pro-equality policies (redistribution, progressive tax systems, educational policies etc.) may produce very different effects upon growth depending on their influence on factor accumulation behaviours. Finally, the impacts on welfare may be ambiguous whenever there is a growth-inequality trade-off, or when the improvement of the situations of certain agents is reached at the expense of the situation of others. These mixed and somewhat contradictory reciprocal influences may explain the ambiguous findings provided by the empirical literature. If most of the estimates carried out in the 1990s seemed to confirm that inequality was damaging for growth, the 2000s empirical literature reconsiders this diagnosis. Considering advanced economies, it seems that the countries that have substantially lessened their welfare state and social policies (Anglo-Saxon countries, particularly the US) have benefited from higher growth rates than those who have maintained social nets (continental Europe). Does this mean that pro-growth inequality is back? This may be the case. Nevertheless, other scenarios are possible. Within a globalised World, anti-welfare state and pro-inequality policies may well jeopardise growth in the long term though they can benefit those countries that implement such policies in the short and medium terms. In that case, social competition may lead to sub-optimal low-growth equilibria. Fields of research thus still remain open…

References

Aghion, Ph. and P. Bolton (1993) 'A Theory of Trickle-Down Growth and Development with Debt Overhang', *LSE Financial Markets Group Discussion Paper* #170.

Aghion P., E. Caroli and C. Garcia-Penalosa (1999) 'Inequality and Economic Growth: The Perspective of the New Growth Theories', *Journal of Economic Literature*, 27, 1615-60.

Akçomak, S and B. ter Weel (2008) 'Social Capital, Innovation and Growth: Evidence from Europe', *IZA Discussion Paper* No 3341.

Alesina, A. and R. Perotti (1996), Income Distribution, Political Instability and Investment, *European Economic Review*, 40, 1203-28

Alesina, A. and D. Rodrik (1994) 'Distributive politics and economic growth', *Quarterly Journal of Economics*, 109, 465–90.

Ahluwalia, M.S. (1976) 'Inequality, Poverty and Development', *Journal of Development Economics*, 3(4), 307-42.

Anand, S. and S.M.R. Kanbur (1993a) 'The Kuznets process and the inequality-development relationship', *Journal of Development Economics*, 40(1), 25-52.

Anand, S. and S.M.R. Kanbur (1993b) 'Inequality and Development: A critique', *Journal of Development Economics*, 40(1), 19-43.

Antoci, A., F. Sabatini and M. Sodini (2011) 'The Solaria syndrome: Social capital in a growing hypertechnological economy', *Journal of Economic Behavior & Organisation*, doi: 10.1016/j.jebo.2010.12.018.

Banerjee, A.V. and E. Duflo (2003) 'Inequality and Growth: What can the data say?', *Journal of Economic Growth*, 8(2), 267-99.

Banerjee, A.V. and A.F. Newman (1991) 'Risk-Bearing and the Theory of Income Distribution', *Review of Economic Studies*, 58, 211-35.

Banerjee A. and A.F. Newman (1993) 'Occupational Choice and the Process of Development', *Journal of Political Economy*, 101, 274-98.

Barham, V., Boadway, R., Marchand, M. and Pestieau P. (1995), Education and poverty trap, *European Economic Review* 39(7), 1257-1275.

Barro R. J. (2000), Inequality and growth in a panel of countries, *Journal of Economic Growth*, 5(1), 5-32

Bartolini, S. and L. Bonatti (2008) 'The role of social capital in enhancing factor productivity: Does its erosion depress per capita GDP?', *The Journal of Socio-Economics*, 37, 1539–1553

Becker G.S. and Tomes N. (1979), An equilibrium theory of the distribution of income and intergenerational mobility, *Journal of Political Economy*, 87(6), 1153-1189.

Becker, G. and N. Tomes (1986) 'Human capital and the rise and fall of families', *Journal of Labor Economics*, 4(3), S1-39.

Benabou, R. (1993), Workings of a city: location, education and production, *Quarterly Journal of Economics* 108, 619-652.

Benabou, R. (1196a), "Inequality and Growth", *NBER Macroeconomics Annual*, 11, 11–74.

Benabou, R. (1196b), "Heterogeneity, stratification and growth: macroeconomic implications of community structure and school finance", *American Economic Review*, 86, 584-609.

Benabou, R. (1196c) 'Equity and efficiency in human capital investment: the local connection', *Review of Economic Studies*, 63, 237-64.

Bertocchi, G. and M. Spagat (2004) 'The evolution of modern educational systems. Technical versus general education, distributional conflict, and growth', *Journal of Development Economics*, 73, 559-82.

Bertola, G. (1993) 'Factor Shares and Savings in Endogenous Growth', *American Economic Review*, 83(5), 1184-98

Bertola G. (2000) 'Macroeconomics of distribution and growth', in: Atkinson A.B. & Bourguignon F. eds , *Handbook of Income Distribution*, (Elsevier, Noth Holland).

Bertola G., R. Foellmi and J. Zweimüller (2006), Income Distribution in Macroeconomic Models, *Princeton University Press*

Beugelsdijk S and Smulders S. (2009), Bonding and bridging social capital and Economic growth, *CentER Discussion paper* No 2009-27.

Borissov, K. and S. Lambrecht (2009), 'Growth and Distribution in an AK-model with endogenous impatience', *Economic Theory*, 39, 93-112

Bourdieu, P. (1980) 'Le capital social', *Actes de la Recherche en Sciences Sociales*, 31, 2–3.

Bourdieu, P. (1986) 'The forms of capital', in: J.G. Richardson (ed.), *Handbook of Theory and Research for the Sociology of Education* (NewYork , Greenwood Press), 241–58.

Bourguignon, F. (1981) 'Pareto Superiority of Unegalitarian Equilibria in Stiglitz' Model of Wealth Distribution With Convex Saving Function', *Econometrica*, 49, 1469–75.

Bourguignon, F. and Morrisson C. (1990), "Income Distribution, Development and Foreign Trade: A Cross-Sectional Analysis", *European Economic Review*, 34, 1113-1132.

Bulir, A. (2001) 'Income Inequality: Does Inflation Matter?', *IMF Staff Papers*, 48(1), 139-159.

Caselli, F. and J. Ventura (2000) 'A Representative Consumer Theory of Distribution', *American Economic Review*, 90(4), 909-926

Castello, A. and R. Domenech (2002) 'Human capital inequality and economic growth: some new evidence', *Economic Journal*, 112, C187-C200.

Campano, F. and D. Salvatore (1988) 'Economic Development, Income Inequality and Kuznets' U-Shaped Hypothesis', *Journal of Policy Modeling*, 10(2), 265-80.

Chatterjee, S. (1994) 'Transitional Dynamics and the Distribution of Wealth in a Neoclassical Growth Model', *Journal of Public Economics*, 54, 97-119

Chou, Y.A. (2006) 'Three simple models of social capital and economic growth', *The Journal of Socio-Economics*, 35, 889–912

Chusseau, N., M. Dumont and J. Hellier (2008) 'Explaining Rising Inequality: Skill-biased technical Change and North-South Trade', *Journal of Economic Surveys*, 22(3), 409-57.

Chusseau, N. and J. Hellier (2007) 'Impact de l'ouverture Nord-Sud sur le progrès technique et les inégalités salariales' (The impact of North-South trade upon technical change and wage inequality), *Revue Economique*, 58(2), 455-79.

Chusseau, N. and J. Hellier (2008b) 'Social Policies and R&D Subsidies: Impact on Inequality, Unemployment and Growth', *International Journal of Manpower*, 29(3), 239-262.

Chusseau, N. and J. Hellier (2011) 'Educational systems, intergenerational mobility and social segmentation', *European Journal of Comparative Economics*, 8(2), 255-86.

Chusseau, N. and J. Hellier (2012) 'Education, intergenerational mobility and inequality', in: J. Hellier & N. Chusseau Eds, *Growing Income Inequalities, Economic Analyses*, Chapter 8, Palgrave MacMillan.

Clarke, G.R.G., (1995), More Evidence on Income Distribution and Growth, *Journal of Development Economics*, 47, 403-28.

Coleman, J.S. (1988) 'Social capital in the creation of human capital', *American Journal of Sociology*, 94, S1–S95.

Coleman, J.S. (1990) *Foundations of Social Theory*, (Cambridge, Harvard University Press).

Das, M. (2007) 'Persistent inequality: An explanation based on limited parental altruism', *Journal of Development Economics*, 84(1), 251-70.

Das, M. (2007), 'Persistent Inequality: An Explanation Based on Limited Parental Altruism', *Journal of Development Economics*, 84, 251-70

Deininger, K. and Squire L. (1998) 'New ways of looking at old issues: inequality and growth', *Journal of Development Economic*, 57, 259–87.

Dinda S (2008) 'Social capital in the creation of human capital and economic growth: A productive consumption approach', *The Journal of Socio-Economics*, 37, 2020–33.

Durlauf, S. (1994) 'Spillovers, stratification, and inequality', *European Economic Review*, 38 (3-4), 836-45.

Durlauf, S. (1996) 'A Theory of Persistent Income Inequality', *Journal of Economic Growth*, 1, 75-93.

Durlauf, S. and M. Fafchamps (2004) 'Social Capital', *NBER Working paper* 10485, Cambridge, MA.

Easterly, W. and S. Rebelo (1993) 'Fiscal Policy and Growth', *Journal of Monetary Economics*, 43, 417-58.

Eusufzai, Z. (1997) 'The Kuznets Hypothesis: An Indirect Test', *Economics Letters*, 54(1), 81-5.

Frazer, G. (2006) 'Inequality and Development Across and Within Countries', *World Development*, 34(9):1459–81.

Forbes, K.J. (2000) 'A reassessment of the relationship between inequality and growth', *The American Economic Review*, 90(4), 869-87.
Fukuyama, F. (1995) *Trust: The Social Virtues and the Creation of Prosperity* (New York, The Free Press).
Galor, O. and O. Moav (2004) 'From physical to human capital accumulation: Inequality in the process of development', *Review of Economic Studies*, 71, 1001–26.
Galor O. and D. Tsiddon (1996) 'Income distribution and growth: The Kuznets hypothesis revisited', *Economica*, 63, S103–S117.
Galor O. and D. Tsiddon (1997) 'The distribution of human capital and economic growth', *Journal of Economic Growth*, 2(1), 93-124.
Galor, O. and J. Zeira (1993) 'Income distribution and macroeconomics', *Review of Economic Studies*, 60, 35-52.
Glomm, G. (1992) 'A Model of Growth and Migration', *Canadian Journal of Economics*, 25, 90l-22.
Glomm, G. (1997) 'Whatever happened to the Kuznets curve? Is it really upside down?', *Journal of Income Distribution*, 7(l), 63-87.
Glomm, G. and M. Kaganovich (2003) 'Distributional effects of public education in an economy with public pensions', *International Economic Review*, 44, 917–37.
Glomm, G. and M. Kaganovich (2008) 'Social security, public education and the growth–inequality relationship', *European Economic Review* 52, 1009–34.
Glomm, G. and B. Ravikumar (1992) 'Public versus private investment in human capital: endogenous growth and income inequality', *Journal of Political Economy*, 100(4), 818-34.
Glomm, G. and B. Ravikumar (1998) 'Increasing returns, human capital, and the Kuznets curve', *Journal of Development Economics*, 55, 353–67.
Gradstein M, M. Justman and V. Meier (2005) *The political economy of education. Implications for growth and inequality*, (Cambridge and London, The MIT Press).
Greenwood, J. and B. Jovanovic (1990) 'Financial Development, Growth, and the Distribution of Income', *Journal of Political Economy*, 98, 1076-107.
Grossman, H.L. (1991) 'A general equilibrium model of insurrections', *American Economic Review*, 81, 912-21.
Grossman H.L. (1994) 'Production, appropriation, and land reform', *American Economic Review*, 84, 705-12.
Harris, J. R. and M. P. Todaro (1970) 'Migration, unemployment and development: A two-sector analysis', *American Economic Review*, 60(1), 126–42.
Huang, H-C.R. (2004) 'A Flexible Nonlinear Inference to the Kuznets Hypothesis', *Economics Letters*, 84(2), 289–96.
Jain, S. (1975) *The size distribution of income: A compilation of data*, (Baltimore, Johns Hopkins University Press).
Jha, S.K. (1996) 'The Kuznets Curve: A Reassessment', *World Development*, 24(4), 773-80.
Kaldor, N. (1955-56) 'Alternative theories of distribution', *Review of Economic Studies* 23, 94-100.
Kuznets S. (1955) 'Economic Growth and Income Inequality', *American Economic Review*, 45(1), 1-28.
Kuznets, S. (1963) 'Quantitative Aspect s of the Economic Growth of nations, VIII. Distribution of Income by size', *Economic development and Cultural Change*, 45(1), 1–80.
Knack, S. (1999) 'Social capital, growth and poverty: A survey of cross –country evidence', *Social Capital Initiative WP*, No. 7, The World Bank.
Laitner, J. (1992) 'Random Earnings Differences, Lifetime Liquidity Constraints, and Altruistic Intergenerational Transfers', *Journal of Economic Theory*, 58, 135-70.
Lewis, W.A. (1954) 'Economic Development with Unlimited Supply of Labour', *The Manchester School*, 22, 139-91.
Lindert, P.H. (2000) 'Three centuries of inequality in Britain and America', in A.B. Atkinson and F. Bourguignon (eds.), *Handbook of Income Distribution*, (Elsevier, North Holland).
Lopez, H. (2006) 'Growth and Inequality: Are the 1990s different?', *Economics Letters*, 93, 18-25.
Loury, G.C. (1981) 'Intergenerational Transfers and the Distribution of Earnings', *Econometrica*, 49(4), 843-67.

Lucas, R.E. (1988) 'On the Mechanism of Economic Development', *Journal of monetary Economics*, 22,3-42.

Lucas, R. E. and N. Stokey (1984) 'Optimal Growth with Many Consumers', *Journal of Economic Theory*, 32, 139-71.

Maoz, Y.D. and Moav O. (1999) 'Intergenerational mobility and the process of development, *Economic Journal*, 109, 677–97.

Mbaku, J.M. (1997) 'Inequality in Income Distribution and Economic Development: Evidence Using Alternative Measures of Development', *Journal of Economic Development*, 22(2), 57-67.

Mollick A.V. (2012), 'Income inequality in the US: The Kuznets hypothesis revisited', *Economic Systems*, 36, 127-44.

Morisson, C. (2000) 'Historical perspective on income distribution. The case of Europe', in A.B. Atkinson and F. Bourguignon (eds.), *Handbook of Income Distribution*, (Elsevier, North Holland).

Ogwang, T. (1995) 'The Economic Development-Income Inequality Nexus: Further Evidence on Kuznets' U-Curve Hypothesis', *American Journal of Economics and Sociology*, 54(2), 217-29.

Perotti, R. (1993) 'Political Equilibrium, Income Distribution', and Growth, *Review of Economic Studies*, 60(4), 755-76.

Perotti, R. (1996) 'Growth, Income Distribution and Democracy: What the Data Say', *Journal of Economic Growth*, 1(2), 149-87.

Persson, T. and G. Tabellini (1994) 'Is inequality harmful for growth', *American Economic Review*, 84(3), 600-21.

Piketty, T. (2000) 'Theories of Persistent Inequality and Intergenerational Mobility', in: A. Atkinson and F. Bourguignon (eds), *Handbook of Income Distribution* (Elsevier, North Holland), 429-76.

Putnam, R.D. (1995) 'Bowling alone: America's declining social capital', *Journal of Democracy*, 6, 65–78.

Putnam, R.D. (2000) *Bowling Alone: The Collapse and Revival of American Community* (New York, Simon & Schuster).

Ram, R. (1995) 'Economic Development and Income Inequality: An Overlooked Regression Constraint', *Economic Development and Cultural Change*, 43(2), 425-34.

Rauch, J.E. (1993) 'Economic Development, Urban Underemployment, and Income Inequality', *Canadian Journal of Economics*, 26, 901-18.

Ravallion, M. (1995) 'Growth and poverty: Evidence from developing countries in the 1980s', *Economic Letters*, 48, 411-17.

Robinson, S. (1976) 'A note on the U-hypothesis relating income inequality and economic development', *American Economic Review*, 66(3), 437-40.

Roed, K. and S. Strom (2002) 'Progressive tax and the labour market: Is the trade-off between equality and efficiency inevitable', *Journal of Economic Surveys*, 6 (1), 77-110.

Routledge, B.R. and J. VonAmsberg (2002) 'Social Capital and Growth', *Journal of Monetary Economics*, 50(1), 167-96.

Saint-Paul, G. and T. Verdier (1993) 'Education, Democracy and Growth', *Journal of Development Economics*, 42, 399-407

Saint-Paul, G. and T. Verdier (1996) 'Inequality, redistribution and growth: A challenge to the conventional political economy approach', *European Economic Review*, 40, 719-28

Saith, A. (1983) 'Development and Distribution: A Critique of the Cross-Country U-Hypothesis', *Journal of Development Economics*, 13(3), 367-82.

Sala-I-Martin, X. (1997) 'Transfers, Social Safety Nets and Economic Growth', *IMF Staff Papers*, 44(1), 81-102.

Scarth, W. (2000) 'Growth and Inequality: A Review Article', *Review of Income & Wealth*, 46, 389-97.

Stiglitz, J. (1969) 'Distribution of Income and Wealth among Individuals', *Econometrica*, 37(3), 382-97.

Sylwester, K. (2000) 'Income inequality, education expenditures, and growth', *Journal of Development Economics*, 63, 379–98

Temple J. (1998) 'Initial Conditions, Social Capital and Growth in Africa', *Journal of African Economie*, 7(3), 309-47

Thornton, J. (2001) 'The Kuznets Inverted-U Hypothesis: Panel Data Evidence from 96 Countries', *Applied Economics Letters*, 8(1), 15-6.
Tsakloglou, P. (1988) 'Development and Inequality Revisited', *Applied Economics*, 20(4), 509-31.
Zhou, X. and K-W. Li (2011) 'Inequality and development: Evidence from semiparametric estimation with panel data', *Economics Letters*, 113, 203–07.

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[1] Surveys on the inequality and growth relationship can be found in Benabou (1996a), Aghion et al (1999), Bertola (2000), Scarth (2000) and Piketty (2000). Barro (2000) describes the different relations that bind inequality and growth. Gradstein et al. (2005) provide an excellent survey of the impact of education and human capital accumulation upon both growth and inequality.

[2] Inequality $\tau < (1-q)(1-w_T / w_M)$ is the condition for the after-tax income of the 'traditional' workers $w_T + \tau q w_M / (1-q)$ to be lower than the after-tax income of the modern workers $(1-\tau)w_M$.

[3] This argument has been modelled by Robinson (1976).

[4] Certain estimates use the equation $i_t = \alpha y_t + \beta y_t^{-1} + AX_t + b$ with the expected values $\alpha < 0$ and $\beta < 0$.

[5] See Figure 9.2. and the related discussion in subsection 9.2.1. Subsection 8.5.3 in Chapter 8 provides a broader presentation.

[6] Bourdieu (1980, 1986), Coleman (1988, 1990) and Putnam (1995, 2000).

[7] A distribution A of wealth shares is said to Lorenz-dominate another distribution B if, after ordering these wealth shares in both distributions, any sum of wealth shares in distribution A, from the poorest individuals to the wealthiest one, will be larger or equal to the corresponding sums in distribution B, with at least one of these sums being strictly larger (Chatterjee, 1994, p103).

[8] This case corresponds to the Generalized Stone-Geary, with Decreasing Absolute Risk Aversion (DARA).