Inequality and growth: lessons from recent debates

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Rising inequality’s moderating impact on demand can be counterbalanced by heaping on more debt, but only temporarily, as illustrated by America’s experience in the late 2000s. Looking beyond the impact on demand, recent literature highlights inequality’s unfavourable impact on the accumulation of human capital and thus on supply. This argues in favour of income redistribution, as long as it remains reasonable. In contrast, the top 1%’s share of income distribution does not seem to harm long-term growth prospects as long as it is not linked to “seeking rent” but to the reward of successful innovation.

Inequality has been a hot topic in recent economic thinking. Discussions on the works of T. Piketty (2013) have stirred up interest in the subject, notably whether the r-g gap (return on capital-growth) is a factor that tends to swell inequality (for more on this issue, see De Grauwe (2015), Mankiw (2015), Krusell and Smith (2014)). Inequality is a rather imprecise term that can refer to the inequality of gross or net income, estate accumulation or social mobility, among others. There are numerous instruments for measuring inequality (inter-decile, interquartile and inter-centile ratios, the Gini coefficient, etc.), none of which refers to the same reality. Moreover, different acceptations of inequality do not have the same consequences on growth, as we will show herein.

Economic analysis has given prime importance to functional distribution, much more so than to inequality in the strict sense of the term, as illustrated by the classic works of Ricardo and Marx, or the neo-Keynesian growth models of Kaldor and Pasinetti, with the distinction between the savings rates of employees and capitalists. In the neo-classical analysis, income distribution depends on each factor’s share in production and their marginal productivity, which in a competitive environment is equal to their remuneration. In the Solow model, which laid the foundations for growth analysis, technological progress is considered to be exogenous (unexplained by the model), production factors are subject to diminishing returns, and savings is an aggregate with a linear correlation to income. Models introducing the microeconomic fundamentals of behaviour, such as Ramsey-Cass-Koopmans, are based on the intertemporal maximisation of standard household utility. Overlapping generations models (OLG) distinguish between young people who save and seniors who consume their savings. Other models are based on the distinction between debtor and creditor households, which introduces, at least implicitly, the notion of inequality.

Inequality can be considered as a positive factor for growth as long as it boosts incentives to work, save and invest. To a certain extent, inequality can be justified in the developing world if it enables a country to have a segment of the population capable of accumulating a minimum level of capital, a vital condition for spurring investment and driving the growth process. High inequality, in contrast, can be a source of political and social unrest capable of eroding confidence, thereby undermining investment efforts. If this inequality is derived from rentier income that benefits only a small segment of the population, it can reduce incentives and in the end hamper growth, especially if this rentier situation seems to be immovable, notably when sheltered under the protection of regulators. Acemoglu (2012) thoroughly documents a historical panorama of this phenomenon. Inequality can stimulate demand for redistribution policies, which can in turn have a negative impact on incentives: i.e. higher taxes or transfers hamper the supply of labour, savings and investment (Alesina et al, 1994; Persson et al, 1994).
Inequality can limit potential growth if it ends up reducing the accumulation of human capital (training, health, etc.) by a segment of the population (OECD, 2014, 2015). Yet this inequality-growth correlation does not seem to hold up if we measure inequality based on the share of the top 1% of income distribution (Aghion et al, 2015), since this share is derived from the intensity of innovation, which is correlated to growth.

Inequality can strain demand if it results in a reduction or stagnation of the purchasing power of a large segment of the population. Starting in the 1980s, rising inequality in the United States was accompanied by the stagnation and decline in real revenues for the lowest deciles of income distribution. Nonetheless, household demand was maintained thanks to an upturn in debt, which was fostered by an excessively accommodating monetary policy. It is well known that in the 2000s, monetary policy rates were held well below those indicated by the Taylor rule, a phenomenon reinforced by the impact of capital inflows on long-term rates, creating the famous conundrum. As debt reached excessive levels, it triggered the subprime crisis (d’Arvisenet, 2008, 2014), and the great recession, which was then followed by a slow, sputtering recovery as past excesses were corrected. Rising inequality is also considered to be one of the factors likely to feed the risk of secular stagnation, as insufficient demand (excessive savings in relation to investment opportunities) leads to a decline in the equilibrium real interest rate. Once nominal rates ran up against the zero lower bound and deflationary pressures push up real rates, conventional monetary policy measures are no longer effective since it is impossible to lower key rates. Unless inflationary expectations pick up (via credible forward guidance, for example), we are faced with the problem of how to bring down real rates to the point where they can stimulate investment to a level in keeping with full employment (Summers, 2015)(1).

Macroeconomic policies also have some redistribution effects. Low interest rates and securities purchasing by central banks as part of quantitative easing policies affect household wealth and the situation of pension funds (Brunnermeier, 2012; Bank of England, 2012). Lower yields on targeted securities, more often than not government bonds, encourage purchases of other assets generating higher returns (albeit at greater risk). The correlative increase in value of these securities increases financial wealth, which is highly concentrated. For defined-benefit pension funds, these policies increase in parallel both assets and liabilities (lower interest rates increase the present value of liabilities). If the fund’s balance sheet structure is imbalanced, the increase in liabilities outweighs the increase in assets, widening the deficit.

**Rising inequality: a few benchmarks taken from America’s case**

Based on US Census Bureau data, which provides average household income adjusted for inflation by income bracket, we can see that the 5th to 1st inter-quintile spread has widened sharply over the past 25 years, with the ratio rising from 12.1 in 1990 to 15.9 in 2013. For this review period, real revenues contracted in the first and second deciles (by 5.9% and 2%, respectively), increased slightly in the 3rd decile (1.7%), and rose strongly in the 4th and 5th deciles (7.7% and 23%, respectively). The increase in real revenues was even bigger for the top 5% of households (34.7%). Since the outbreak of the crisis, the spread has widened at an accelerated pace. Between 1990 and 2006, revenues increased in all deciles, but at a faster pace with the increase in each decile: 5.9% for the 1st decile, followed by 6.7%, 8.3%, 13.7% and 29% for the next deciles, respectively (and 43.3% for the top 5%). With the great recession, revenue losses were sharpest for the lower deciles: between 2007 and 2013, revenues plunged 11.2% in the 1st quintile, 8.3% in the 2nd, 6.1% in the 3rd, 5.3% in the 4th and 4.7% in the 5th. If we isolate the post-recession period (2010-2013), we can see that real revenues continued to contract slightly in the first four quintiles (by between 0 and -1%), but increased 2.4% in the 5th quintile and 5% in the top 5%.

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The 1st centile of income distribution plays a major role in inequality trends. Data collected by Piketty (2013) shows that the 1st decile’s share held more or less stable at about 22% of total revenue between 1950 and 1980, but swelled to 36% at the start of the 2010s. Of this 14-point increase, 10 points can be attributed to the 1st centile (20% of total revenue) and 4 points to the next 9 centiles. The surge in inequality is mainly manifest within the distribution of wages: although the share of capital income certainly increases with the increase in income distribution, it does not become preponderant until the very extreme end of income distribution. In 2007, the share of capital income was not preponderant until the top 0.1% of revenues (0.5% in 1929) (Piketty, ibid). This clearly shows that we must look beyond an analysis of the wage-profit trade-off.

A variety of explanations

A number of explanations have been put forward in economic literature, from seeking rentier income and the clout of lobbying (Stiglitz, 2012; Rajan, 2010; Zingales, 2012) to the weight of the financial sphere. Productivity gains in the manufacturing sector outpaced the increase in demand, which triggered a shift in labour towards low skilled jobs in sheltered sectors (services that cannot be moved abroad). The extra supply of labour strained wage formation in these sectors. This trend was accentuated by globalisation and growing competition from low-cost countries. Technological progress made a number of job skills obsolete, notably for repetitive tasks that can be easily automated (Stiglitz, 2010). An intriguing situation arose as the increase in the share of graduates was accompanied by a relative increase in their wages: were we facing a skills race between the supply and demand for graduates? Aghion et al (2009) describe a paradigm shift that occurred in the 1980s. The wage premium for workers with graduate degrees compared to those with high school diplomas did not change much between the 1940s and the mid-1960s, just like the relative supply of graduate degrees (number of university graduates as a share of total employment). The wage premium rose from 35% to 43% in the 1960-70s, but then fell back to the levels of the previous decade. This about-face is attributed to the arrival of baby-boomers on the job market, who had a higher share of graduate degrees (40% at the end of the 1970s, vs. 20% at the end of the 1950s): the increase in supply had a negative impact on relative wages. In the following decades, however, this configuration disappeared: the wage premium and the relative supply of graduate degrees increased in tandem to reach 60% and 70%, respectively. Buoyant demand for high-skilled labour was even stronger than supply. The key factor behind this trend is technological progress’ bias towards skilled jobs in production and in the use of IT and new communications technology, which eliminates tasks in which labour can be replaced by computers. This trend mainly affects the middle of income distribution. This problem was formulated by Acemoglu (1998, 2002). The model is based on two sectors, a skilled one (s) that is highly skills intensive, and an unskilled one (u) that is low skills intensive, with the respective production functions: \( X_i = A_i L_i (1-Z_i), i = s, u \), in which \( L \) is labour and \( A \) is productivity. The model results in a \( W_s/W_u \) wage ratio. In other words, the profitability of skills naturally diminishes in keeping with the increase in \( L_s/L_u \), but this is disproved by the facts. This enigma can be resolved by the \( A_s/A_u \) productivity ratio, which increases with the relative supply of skilled labour: the skills intensive sector (s) invests in order to boost productivity \( A_s \), and the increase in the productivity ratio leads to an increase in \( W_s/W_u \). If this effect overrides the direct and inverse impact of a greater abundance of skilled labour, it is possible to achieve a positive link between the \( W_s/W_u \) and \( L_s/L_u \) ratios.

Lemieux (2006) constructed a model that confirms the link between rising wage inequality and the profitability of higher education. According to his estimates in the mid-1970s, a year of additional schooling generated a return of 0.066 at the secondary level and only 0.007 in higher education. Thirty years later, the return is 0.069 (virtually flat) and 0.134, respectively. Conventional models of
human capital that correlate wages to the number of years of education and experience cannot take these trends into account correctly. The relative increase in the average wages of university graduates is accompanied by an even bigger increase in wage dispersion within their group. Between 1973-1975 and 2003-2005, the increase in wage variance for university graduates accounts for more than four fifths of the total increase in wage variance for all employees.

Inequality and growth: supply-side considerations

It does not seem possible to show a positive correlation between inequality and growth. Persson and Tabellini (1994) demonstrated a positive link between the share of the median quintile of income distribution (a measure of equality) and average growth observed between 1960 and 1985 in 56 countries. Also based on a selection of 56 countries, Alesina and Rodrick (1994) used the Gini coefficient[6] as a measure of inequality and concluded that inequality had a negative impact on growth. To take into account the fundamentals of this relationship, the authors constructed a theoretical model based on the redistribution effect: a high level of inequality leads to increased demand for income redistribution, and a high level of redistribution is likely to hamper capital accumulation of wealth and growth[7].

In recent years, international institutions have devoted major research efforts to the question of rising inequality, analysing not only its origins (Dabla-Norris et al, 2015; Ostry et al, 2014), but also the links between inequality and growth and redistribution and growth, which we will examine below.

The link between inequality and redistribution

Until recently, literature has provided few results, essentially due to the lack of data. Some progress has been made in this area. Ostry et al (2014) used a cross sectional analysis of the impact of Gini coefficients on per capita GDP growth over five years to analyse a selection of OECD and developing countries. The study confirms that inequality hampers growth, but finds little evidence of the negative impact of redistribution. Indeed, its impact on reducing inequality far outweighs the direct negative effects. They studied the correlation between inequality and redistribution in 153 countries over a 50-year period (1960-2010) by comparing market inequality (before taxes and transfers) and net inequality (after taxes and transfers). Using net and market Gini coefficients, the correlation between the two measures of inequality was extremely stable. By distinguishing between the OECD countries and developing countries, they show that 1) market inequality began increasing in the OECD countries as of the 1980s, but remained virtually stable elsewhere, and 2) redistribution helped limit the scope of inequality, especially in the OECD countries. The reduction in inequality via redistribution is especially clear in countries with high market inequality. In other words, in countries with high inequality before redistribution, ex-post inequality (after redistribution) is not as high, which is represented intuitively in the graph below.

By defining the size of redistribution (R) using the spread between market Gini and net Gini, and by using a cross-sectional regression for a selection of countries:
\( R = \alpha \text{ market Gini} + \beta \ln Y_i \), in which \( Y_i \) is the average income of country \( i \), the following coefficients are attained (the standard deviation of these estimates is given in parentheses). By simplifying, a coefficient is statistically significant if the ratio of the coefficient and its standard deviation, the Student t-distribution, exceeds a critical threshold of about 1.8 (for further information, see V. Mignon, 2008).

OECD: \( \alpha = 0.619 \ (0.08), \beta = 0.265 \ (2.81), R^2 = 0.91 \)
Non-OECD: \( \alpha = 0.405 \ (0.05), \beta = 1.66 \ (0.99), R^2 = 0.82 \)

Redistribution seems to have a positive impact, especially when market inequality is high.

Inequality and growth

A stripped-down standard regression links growth of per capita income over 5-year periods (\( y \)) from initial per capita income \( Y \) (log), to net inequality (net Gini) and to redistribution \( R \) (market Gini-net Gini):

\[ y = \alpha \ln Y + \beta \text{ net Gini} + \mu R \]

We obtain the following coefficients (with the standard deviation in parentheses):

\( \alpha = -0.0069 \ (0.0034), \beta = -0.1435 \ (0.044), \mu = 0.0046 \ (0.0492) \)

These results, which were recently confirmed by the OECD (2015), suggest that net inequality reduces growth, while the impact of redistribution is statistically insignificant. This calls into question the idea that redistribution has a negative impact on growth (no trade off). To illustrate the significance of their findings, the authors use the following example: increasing net Gini from the US level in 2005 to that of Gabon in the same year would reduce growth by 0.5%.

Although inequality leads to greater redistribution (which thereby reduces inequality), the negative effects of redistribution, such as distortions arising from higher taxation and disincentive effects on labour supply, do not outweigh the positive impact of reduced inequality on growth.

The introduction of standard determinants used in growth models (investment, population growth, human capital, indebtedness and the quality of institutions) in the regressions does not change the relationship shown between inequality and growth, which is robust. However, when redistribution is already high (i.e. countries in the upper quarter in terms of redistribution), increasing redistribution seems to have an adverse effect on growth (the trade-off between redistribution and growth reappears). A cross-country analysis of the dataset shows that this non-linear effect appears when redistribution reaches 13 Gini points (which is the case for France, Germany and the Netherlands, for example).

Inequality and growth spell duration

Ostry et al (2014) studied the probability \( R_I \) that a growth spell would end the following year as a function of how long it had already lasted and the various growth determinants at the beginning of the spell. Net inequality has an unfavourable impact on the duration of the growth spell.

For \( R_I \), the risk that the growth spell will end the next year:

\[ R_I = \alpha \ln Y + \beta \text{ net Gini} + \mu R^{\text{top 25th percentile}} + \sigma R^{\text{bottom 75th percentile}} \]

the estimates for the baseline regression are:

\( \alpha = 1.024 \ (0.03), \beta = 1.060 \ (0.02), \mu = 1.098 \ (0.03), \sigma = 0.987 \ (0.06) \). Here we can see a negative correlation between the growth spell duration and inequality: a 1-point increase in Gini is associated with a 6 percentage point higher risk that the growth spell will end the next year (which is equivalent to a decrease in the expected spell length of 7% on average).

While keeping in mind the limits of this analysis (which does not account for the effects of redistribution on market inequality and ignores potentially favourable in-kind redistribution effects, such as health and education), it seems to confirm the negative effects of income inequality (as measured by Gini coefficients) on growth. Yet the use of Gini coefficients is a rather simplistic procedure that does not indicate which part of income distribution has an impact on growth: are the observed negative effects of inequality found at the top of income distribution, or to the contrary at the bottom? The positive effects of inequality (via the propensity to save and invest) depend on inequality.
at the top of income distribution, while the negative effects (political instability, market imperfections) tend to be found more towards the bottom. A simple statistic like the Gini coefficient only captures the average impact. A 2015 OECD report looked at 130 observations that distinguished between inequality at the upper end of income distribution (income in the 10th decile/average income) and at the bottom distribution range (average income/1st decile).

The OECD report uses a 5-year growth regression based on inequality measured at different levels of income distribution using the ratio Y/Yi, in which Y is average income and Yi is that of the i th decile. The effect is negative and statistically significant for the lower four deciles (especially the 3rd and 4th deciles, i.e. the lower middle class) with the following estimated coefficients: 1st decile: -0.031 (0.012), 2nd: -0.071 (0.037), 3rd: -0.121 (0.067), 4th: -0.196 (0.11). Estimates pertaining to the top deciles were not significant (10th: -0.065 (0.05)). Inequality at the bottom of income distribution seems to have a much stronger impact on growth than at the top. A reduction in income disparities at the bottom of income distribution has a much more positive impact on growth than a reduction at the top of income distribution. A 50% reduction in the disparity at the bottom of income distribution (i.e. if the situation in the UK was modelled on that of France, or if the US was modelled on Japan) would boost growth by 0.3%, or a cumulative 7% of GDP over 25 years. All in all, these results suggest that the income disparity’s impact on growth can be found in the bottom half of income distribution. The real issue is the erosion of the middle class, more so than the share of the top 1% of income distribution.

A prime channel: the impact of human capital accumulation

Growth model estimations show that human capital plays a fundamental role in accounting for long-term growth (see box, next page). It is notably by undermining human capital accumulation that inequality has a negative impact on growth. The 2015 OECD report sheds a lot of light on this point. For all OECD countries as a whole, the enrolment of 15-19 year olds in upper secondary education seems to have a negative correlation with the Gini coefficient: a 10-point spread in the Gini coefficient (switching from the US to the Norwegian level, for example) is associated with a 7.5 point increase in the proportion of 15-19 year olds in the upper secondary education. A negative correlation can also be seen between the level of Gini and intergenerational mobility on the earnings ladder. The OECD report distinguishes between three levels of parental educational background (low, medium and high PEB). For youth whose parents have a low educational background, the higher the inequality, the lower the probability of accessing higher education (estimated at 25% for Gini of 20 and 15% for Gini of 34). The probability of not completing lower secondary schooling also increases with inequality (25% for Gini of 20 and 35% for Gini of 34). This correlation does not exist for the other two groups (medium and high PEB). Inequality compounds the impact of a low parental education background. A regression analysis of the length of time spent in school (S) using the interaction variables inequality x parental education background with three levels of PEB, low, medium and high (l_b, l_m, l_e), can be written:

\[ S = a_1 l_b + a_2 l_m + a_3 l_e \]

The OECD report estimates these coefficients at -0.076 (0.024), -0.013 (0.025) and -0.019 (0.016), respectively. Only the first seems to be statistically significant: inequality accentuates the negative impact of a low parental educational background on the time spent in school. Yet this formula does not take into account the quality of schooling, which also plays a key role, as demonstrated by the Schumpeterian model (see box). To summarise, according to these estimates, a 6-point increase in Gini reduces the time spent in education for students from low PEB by 0.5 years. Looking beyond the impact on education, inequality also undermines job prospects.

Comparable results were obtained by using PIAAC indexes of proficiency (Programme for the International Assessment of Adult Competences Survey) and a regression analysis of numeracy scores and literacy scores using the same explanatory variables l_b, l_m, l_e. The coefficients were estimated at -1.077, -0.244 and -0.028, respectively, for numeracy.
scores and -1.11, -0.306 and -0.312 for literacy scores. The OECD report highlights the negative correlation between inequality and the numeracy skills of individuals from low parental educational backgrounds (numeralcy score of 270 for Gini of 20, and 255 for Gini of 36). For students with a high parental educational background, in contrast, inequality has no effect. The observations are the same using literacy scores: for students with a low parental educational background, the literacy score drops from 278 to 260 when Gini rises from 20 to 36). The same can be said about the probability of being unemployed for individuals with a low PEB: the OECD estimates that a 6-point increase in Gini increases the fraction of time spent out of employment by 3 percentage points (8). Inequality clearly has a negative impact on human capital accumulation, and, as the growth models show, on the long-term growth potential of economies (see box below on human capital and growth models).

The labour market

So-called atypical forms of labour (part time and temporary jobs, self-employment) have spread rapidly in recent decades. They account for more than half of job creations in the OECD countries since 1995. Some are concentrated in the 15-29 age group (which comprises 43% of temporary employment). The incidence of these job types is much lower than average for the highly educated population (less than 29%). The 2015 OECD report distinguishes between three types of job profiles, those requiring cognitive capacity, those comprised of routine tasks (which does not imply a low educational level) and non-routine manual work (drivers, healthcare professionals). The share of the first and third groups has increased since the mid-1990s, by 21% and 9%, respectively, to the detriment of the second group. For comparable tasks, there is an hourly wage gap between standard and atypical job contracts (11% for temporary employment and 13% for part-time work for men, for example). With atypical job contracts, this is a higher risk of unemployment and deskilling.

In 14 countries, the OECD observed that atypical job contracts accounted for 50% of employment in the 1st decile of wage distribution, but less than 15% in the top three deciles. The negative impact of atypical job contracts on wages decreases as we move up the earnings ladder: the Gini coefficient for this selection of countries was 32 for standard employment alone, but rose to 35 if we add households with two members holding atypical jobs.

BOX

GROWTH MODELS AND HUMAN CAPITAL, A BRIEF OVERVIEW

Econometric models and estimates concur in attributing greater weight to human capital accumulation as an explanation for long-term growth. For countries situated along the technological frontier, investment in higher education is a key factor for developing innovation and supporting growth. Inversely, for countries in catch-up or imitation phases, such as France during the thirty glorious years and South Korea in 1970-2000, investment in secondary education is essential, as verified empirically based on estimates for all countries, as well as for a dataset comprised of the 50 US states (see results presented by Aghion et al, 2009).

The Solow fundamental model (1956) remains the basis of growth theory. Net accumulation of capital or investment (dK = l - δK) triggers an increase in output (Y), which is used to produce savings S = sY = l. It helps finance the ongoing accumulation dK and the replacement of obsolete capital δK. The production function Y = F(K,L) can be expressed in per capita terms:

\[ y = f(k) \text{ with } K = K/L \text{ and } y = Y/L, \text{ the accumulation } - \delta k \text{ can be written } \]

\[ dk = sf(k) - (\delta + n)k, \text{ with } n \text{ being the population growth rate.} \]
This is known as the Solow fundamental dynamic equation. Given the decrease in the marginal productivity of production factors (F′(K) >0, F″ (K)<0), the increase in per capita output (y) associated with that of an extra unit of capital per capita (k) decreases with the stock of capital per capita. The same applies to savings (a stable proportion (s) of output). Moreover, the amount of capital to be replaced δk increases, as does the capital necessary to equip the population, if it is growing (n>0). There comes a time when savings barely suffice to cover the replacement of capital and to maintain the capital allocation for each worker (in other words, dk=0). The economy reaches a stable state with constant quantities per capita k∗, y∗. This is the same as saying that output, consumption and capital grow at the same rate as population growth. An increase in the savings rate has a transitory positive effect on investment and output per capital, which eventually results in a new stable state at higher levels of y∗, k∗… (The transition towards this stable state is presented in most macroeconomic manuals). This simplified analysis is disproved by the facts: GDP per capita and consumption per capita are not trending towards stability. Moreover, when accounting for GDP growth trends using capital and labour production factors, we are left with a very large but unexplained residual that is attributed to technological progress (the Solow residual). The technological progress introduced in the model is exogenous (unexplained by the model, a kind of “manna from heaven”). When expressed as a parameter reflecting total factor productivity B (neutral technological progress in the Hicks sense of the term), it leads to a Cobb-Douglas production function:

\[ Y = B F(K,L) \text{ or with elasticities a and } (1-a): \ Y = B K^a L^{1-a} \]

The production function can also be expressed by linking technological progress and labour (Harrod-neutral technological progress), in which case \( Y = K^a (AL)^{1-a} \), with \( A = B^{-1/(1-a)} \)

The variables Y,K,D… can be expressed in the form of efficient units of labour \( y = Y/AL \), \( k = K/AL \). Given the dynamics of accumulation described above, the Solow fundamental equation becomes:

\[ Dk = sf(k) - (n + \delta + g)k, \text{ in which } g \text{ is the growth rate of } A. \]

In a stable state \( (Dk = 0) \), per capita output, consumption and capital increase at rate g, and output, consumption and capital increase at \( (g + n) \).

This analysis can be enriched by introducing human capital. Mankiw et al (1992) incorporates human capital (H) as a kind of exogenous factor in the Solow model. The production function is written as follows:

\[ Y = K^a H^{1-a} (AL)^{1-a}, \text{ or expressed using per capita variables, with the usual ratings, and by setting } h = H/L: \]

\[ Y = k^a h^{1-a} \]

The model is based on two equations for the accumulation of capital \( l_k = s_k Y \) and the accumulation of human capital \( l_h = s_h Y \). In a stable state \( (dh = dk = 0) \), i.e. at point \( (k = k^*, y = y^*) \), GDP growth is equal to technical progress increased by the population growth rate. An increase in \( s_h \), the human capital accumulation effort (when immediate income is sacrificed to generate a higher level of income in the future, typically measured by the length of education), has a transitory effect, similar to the increase in the savings rate in the Solow model. Taking into account another source of growth (h) is justified, not only theoretically but also empirically. Econometric estimates of per capita output using a vast sample of countries are much more realistic and robust than those made solely in reference to the basic model (for more information see Sorensen et al (2005)).

In the Romer model, the production of goods is linked to the use of skilled labour h and capital K formed by a continuum of intermediary goods i with the number η, \( K = \int k(i)di \), for which the production function at constant returns is:

\[ Y = h^a \int k(i)^{1-a} di. \text{ Output increases with the variety of intermediary products, which is to say an increase in } \eta, \text{ which depends on human capital } h \text{ used in the research sector: } \frac{dn}{h} = \Phi h, \eta \]

The Lucas model, one of the founding endogenous growth models, is comprised of two sectors, the production of goods with the production function:

\[ Y = AK^a hi^b, \]
in which \( u \), the share of labour (or time) allocated to goods production, and \((1-u)\), the share allocated to human capital production. \( h = H/L \) is the ratio of human capital to labour, \( h_o \) the positive externality linked to the accumulation of human capital (a worker’s productive efficiency depends on his own human capital but also on the population’s accumulated human capital). The accumulation of capital is written \( dK = Y - C \).

The output of the human capital training sector can be expressed as follows (simplified because physical capital is not used):

\[
dh = \mu(1-u)h \text{ or } dh/h = g(u) \text{ where } \mu \text{ is the productivity of human capital in the formation of human capital.}
\]

The standard household maximises its inter-temporal utility \( \int u(c(t))e^{-\sigma t} dt \)

With \( u(c(t)) = c(t)^{1-\sigma} / (1- \sigma) \), in which \( \sigma \) is the inverse of the intertemporal elasticity of consumption, when \( \sigma \) is high, it signifies that the consumer does not have much of an appetite for substituting a higher future consumption but with a low marginal utility, for a lower present consumption but with a high marginal utility.

The resolution of the model gives the optimum time devoted to education \((1-u^*)\) and production \((u^*)\). In a decentralised equilibrium, the individual does not take into account the externality \((b = 0)\) and underinvests in human capital, especially given the high preference for the present. The growth of magnitude per capita \((y, k, c)\) is equal to \((1/\sigma)(\mu - y)\). It decreases with the discount rate (preference for the present \( Y \)) and with the marginal utility of consumption. Growth is lower than that obtained under the “benevolent dictator”, which takes into account externality \((b>0)\). We can show that it has increased by \( bY/(1-a) \). Empirical estimates (Aghion et al, 2009) show a positive correlation between growth, stocks and the human capital accumulation rate, and that education takes on growing importance in countries close to the technological frontier.

In a Schumpeterian model (Aghion et al, 2009), a distinction is made between countries close to the technological frontier and those further away, in a catch-up phase. For the first group, competition stimulates innovation. Business leaders seek to beat competitors via innovation and to generate monopoly profits by investing in research. The profit is temporary due to imitation and the arrival of new innovation, which makes earlier products obsolete. This is called the creative destruction process. Leading-edge innovation requires a high level of human capital (usually post-graduate and doctoral degrees). To encourage imitation, primary and secondary education is primordial, and competition has a negative impact. Consequently, we cannot reduce the accumulation of human capital to the average duration of schooling in a given country. The quality of education is also of prime importance. There is a positive correlation between the excellence of the university system (measured by the Shanghai ranking of world universities, for example) and performance in terms of innovation, and thus in the productivity of production factors. Using total factor productivity \( A \), and \( A^* \), the level at the technological frontier (usually that observed in the United States), the distance from the frontier can be written \( A^* - A \) (or \( A^*/A \)). We can draw from this the change in productivity, with \( \mu \) the frequency of innovation at the frontier and \( \lambda \) their implementation (imitation). We thus obtain:

\[
A_{t+1} - A_t = \mu (Y-1) + \lambda (A^* - A). \text{ The growth rate of } A, \text{ or } g_A, \text{ is thus:}
\]

\[
g_A = \mu (Y-1) + \lambda (A^*/A - 1). \text{ It is comprised of two elements, the first linked to innovation at the frontier and the second to the distance from the frontier.}
\]

In contrast with the neo-classic Solow model, in which human capital accumulation \( \Delta H \) plays a role similar to physical capital: \( \Delta Y = f (\Delta K, \Delta H) \), the level of human capital plays an essential role in the Schumpeterian model: \( \Delta Y = f (\Delta K, \Delta H, H) \). When the initial level of \( H \), or \( H_o \), is high, it is only natural that the increase in \( H \) is limited. The increase is even smaller when \( H \) is high: \( \Delta H = \alpha - \beta H \), which limits the magnitude of the impact of increasing \( H \) on that of output \( Y \).

If we write \( \Delta Y = a \Delta H + b H_o \) and withdraw \( H_o \) from the expression below, \( H_o = (\alpha - \Delta H)/\beta \) and place it in the equation \( \Delta Y \), it becomes: \( \Delta Y = (a - b/\beta) \Delta H + ba/\beta. \) The first term reflects the convergence effect: the effect of \( \Delta H \) is reduced when \( H_o \) is high.
As we have seen, these OECD estimates lead us to conclude that inequality has a certain moderating effect on growth. Through its impact on human capital accumulation, inequality seems to undermine social mobility. Lastly, we should not look for these negative effects in the share of the top 1% of income distribution but in the inequality found at lower levels of income distribution. This naturally raises the question of why the share of the top 1% does not have a negative impact on growth.

Aghion et al (2015) provides one answer by highlighting the role of innovation in the Schumpeterian model. They start with the following observation: the share of revenues of the top 1% (including capital gains) and the ratio of patents per 1000 inhabitants were both relatively flat from the early 1960s to the early 1980s (at about 0.3-0.4% and 0.1%, respectively), but then began rising in tandem (to 0.9% and 0.22%, respectively). By regressing the share of the top 1% by the flow of patents (per 1000 inhabitants) and by their quality, as measured by the frequency of patent citations, they show that patents (and the quality of patents) explain nearly 20% of the increase in the share of income of the top 1% over the period. These results are robust even after the introduction of control variables (per capita GDP, population growth, share of the financial sector, output gap and the size of public expenditure) and using different measures of innovation (number of patents among the 5% cited the most often). The estimated coefficients were not affected. In California, for example, between 1975 and 2009 there was a 3-fold increase in the number of patents, a 2.3-fold increase in the share of the top 1%, and patents still explained 22% of this increase. If a state rose from the 1st to 4th quartile in terms of patents, the share of the top 1% would increase by 1.5 points. A regression analysis of the other measures of the Gini inequality coefficient, such as Gini excluding the top 1% (Gini 99), the top 10% and the top 2%, the impact of innovation on inequality loses its robustness and even disappears. For the frequency of patent citations over a 3-year window, the estimated coefficient is 0.168 (3.65) for the top 1%; 0.014 (1.12) for the top 10%; -0.003 for Gini and -0.021 for Gini 99. These results reveal a definite link between innovation and inequality, but only at the highest levels of income distribution. By distinguishing between new innovators (entrants) and existing ones (incumbents), the authors show that the impact of innovation on the share of the top 1% is mainly due to entrants. Through a regression analysis of the share of the top 1% in each category, they obtained coefficients of 0.032 (t = 2.97) for entrant patents and 0.017 (2.32) for incumbent patents. We obtain similar results if we conduct the regression on patent citations. The authors also show that there is a positive correlation between social mobility and the intensity of innovation: of the 50 main urban areas, those with the highest social mobility were also the ones where the share of the top 1% was the highest.

The probability that an individual aged 30, whose parents were in the bottom quintile (Q1) 15 years earlier, will reach the top income quintile (Q5) appears to have a positive correlation with innovation intensity (patents), with a coefficient of 0.073 (t = 2.1), alongside the positive incidence of education spending and the job market participation rate. Moreover, for this transition between the 1st and 5th quintiles, the correlation is stronger for the innovation intensity of entrants (coefficient of 0.058 (2.39)) than for incumbents (0.032 (0.97)). The innovation effect is not as distinct for the transition from Q2-Q5 (0.046 (1.76)).

Whereas innovation, especially innovation by entrants, has the inherent quality of boosting the share of income of the top 1%, it also fosters growth through the emergence of new products and improved production processes. This explains why the negative correlation that can be seen between inequality and growth does not hold up when we measure inequality based on the share of the top 1%. Innovation is a major source of growth, and the two play a central role in driving social mobility and reducing poverty. Taking a Rawlsian perspective, we could say that inequality doesn’t matter as long as poverty regresses. Or this to happen, there must be a propitious institutional environment for stimulating innovation (i.e. one that reduces...
entrance barriers and does not prevent the least efficient companies from folding). This leads us to the remarkable observation that social mobility is positively correlated to product market flexibility (Aghion, 2015). The countries closest to the technological frontier can only count on innovation to stimulate productivity gains and potential growth, since they have already developed beyond the imitation phase. The appropriate institutions for stimulating growth under these conditions are not the same (i.e. market flexibility, higher education, research & development), which is why structural reforms are needed.

Inequality, debt and economic instability

How consequences of inequality have been dealt with before the crisis: the US experience

If we assume that the savings rate rises as we move up the income ladder (in the early 2000s, the average propensity to consume was about 82-83% for the top 5% of households, and 92% for the others), then we should expect rising inequality to have a negative impact on demand. The truth of the matter is totally different.

The share of the five centiles at the upper end of income distribution held virtually flat at 21% between 1960 and 1980, but then entered a strong upward phase that brought it to 36% in the early 2010s (Alvaredo et al, 2013). Even so, household demand remained buoyant during this period of “great moderation”: the propensity to consume rose from 86% in 1960-1980 to 93% on the eve of the crisis. In other words, savings were cut back sharply, reflecting not only the decision to maintain consumption, but also the increase in the share of revenue allocated to debt servicing.

Consumer spending and debt services charges drove down the savings rate. For the period 1989 to 2007, Cynamon et al (2014) simulated how strong consumption would have been for the bottom 95% if debt had not increased. They also froze income distribution (i.e. the share of the bottom 95% was held constant at 74%, the level at the start of the period). Based on this hypothesis, they show that the level of consumption would have been the same as that made possible by the upsurge in debt. Taking on more debt seems to be the response to rising inequality. Although it helped build up estate assets, it also considerably weakened balance sheets.

If consumption is not adjusted, a negative income shock triggers an increase in the debt ratio, all other factors being equal. Balance sheets erode and the value of asset portfolios also deteriorate. The ratio of total assets to income rose from 100 in 1989 to 120 in 2007 for households in the top 5%, and from 100 to 110 for the bottom 95%. Thereafter, the ratio plunged through 2010, dropping 10 points for the top 5% and 20 points for the bottom 95%. Excluding real estate assets, the index rose from 110 in 1998 to 125 in 2007 for the top 5%, but dropped from 110 to 76 for the bottom 95%. This gap reflects the fact that the top 5%, unlike the bottom 95%, did not increase their debt load.

Neither the decline in net wealth nor the increase in debt could continue indefinitely. There eventually comes a moment when deteriorated balance sheets force demand to be brought in line with revenues. We reach a Minsky moment in which the asset bubble can no longer support debt, the upturn in debt comes to a halt, and house prices collapse, triggering a crisis.

With estimates based on data from the Bureau of Economic Analysis, Cynamon et al (idem) show that with the onset of the crisis, the propensity to consume for households at the bottom end of income distribution dropped from 92.6% in 2007 to 87% in 2009 (88% in 2012). The upper five centiles, in contrast, followed the opposite trend, with the propensity to consume rising from 77% in 2007 to 92% in 2009-2010, before falling back to 88% with the 2012 recovery(9). This confirms the very different behaviour observed prior to the crisis. The propensity to consume for upper income households is clearly countercyclical, and fluctuates sharply (i.e. 80% in 1989, 85% in 1994, 87% in 2001, 77% in 2007, 92% in 2010, 87% in 2012). In other words, households at the top of income distribution smoothed consumption over the course of the cycle, which was not the case for the others.
In classic consumption models, the savings rate is not linked to inequality. In Friedman’s permanent income model, an income shock triggers a temporary decline in the savings rate in order to smooth consumption (in keeping with permanent income). In a rational expectations model based on efficient financial markets, consumption is smoothed via placements and loans. In life-cycle models, individuals borrow when they are young, then save, and finally consume their savings. Most of these models are based on a standard agent. A spending boom can be explained by an increase in the preference for the present or by increased optimism about future revenue trends, although this is not very realistic in the midst of a sustained stagnation of real income. Till van Treek (2012) turned to Duesenberry’s relative income hypothesis to explain the surge in debt in the 2000s. If an individual’s attitude to consumption is linked to that of its reference group, rising inequality would not result in higher savings (Keynesian theory), but in a decline in savings reflecting the interplay of demonstration effects (i.e. the median surface area of new homes increased twice as fast as median income between 1980 and 2001, from approximately 1600 square feet to 2100 sq ft). In 1989, according to the Survey of Consumer Finance, the debt ratio was 60% for the top decile and 80% for the other groups. By 2007, the debt ratio was still 80% for the 1st decile but had soared to 250% for the bottom deciles. Van Treek claims that this debt trend is one possible reaction to smaller than expected revenues to ensure consumption in keeping with that of the reference group, alongside the increase in labour supply (via the activity rate or the number of hours worked)\(^{10}\).

Iacoviello (2007) built a simulation model with two types of agents. A fragment of households are assumed to have a low preference for the present and unrestricted access to the credit market, which means they can easily smooth expenditure to meet fluctuations in income. The remaining households (55%, half of which are in debt, the situation observed in the US in 1983) have a higher preference for the present and are credit constrained (i.e. they can only borrow up to a fraction of their collateral holdings). This is the group that is responsible for the pro-cyclical behaviour of household debt. The model explains the changes in the household debt ratio, which -- like inequality -- holds steady between 1963 and 1983 before increasing in keeping with the concurrent rise in inequality. The household debt of the impatient group corresponds to an increase in the wealth for the other fraction. Over this period, the Gini coefficient for income inequality rose from 0.3 to 0.38; for wealth inequality, from 0.5 to 0.85; and for consumption inequality, from 0.3 to 0.32, which was made possible by household debt.

Kumhof et al (IMF, 2010) examine the periods 1920-1929 and 1983-2008 to see how high household leverage and crises can arise as a result of changes in income distribution. The share of the top 5% of income distribution rose from 23% to 34% of income between 1983 and 2007, while over the same period the household debt ratio more than doubled. During this period, the real hourly wage for the top decile increased 70%, the median wage declined 5% and that of the lowest decline dropped 25%. The debt ratio of the top 5% fluctuated at around 70%, while that of the bottom decile doubled to 140%. The authors constructed a model with two types of agents: savings investors (5% of the population) and the others (95%). The first hold capital and accumulate financial wealth that is backed by loans to bottom earners, which allows them to limit the drop in their consumption following their loss of income. Through this mechanism, consumption inequality does not increase as quickly as income inequality, but generates greater demand for bank intermediation, which increases the financial sector’s weight as a share of GDP (from 5% to 8% during the review period). The crisis is characterised by an increase in household debt defaults and output contraction. For the authors, given the cost of crises, proactive redistribution policies that aim to avoid excessive household debt are preferable to ex-post measures such as bailouts and debt restructuring.

The lessons from the US experience, which counts as an extreme case, must be kept in perspective. In a study of European countries, Denk et al (2015) looks at the relationship between the share of debt of the various quintiles of the population and inequality. They show that the household debt/income ratios of the
Bottom quintiles are not higher in countries with higher inequality, which, unlike the American case, calls into question the causal link between income inequality and loan distribution (when Gini increases from 0.25 to 0.34, the bottom quintile’s share of household loans is still stable at close to 5% and that of the 2nd quintile at 10%).

Bordo and Meissner (2012) put into perspective the importance of inequality in the development of credit booms. It is well known that credit booms are associated with expansion phases and a swelling of economic imbalances (real exchange rate appreciation, capital inflows, swelling current account deficits, asset price bubbles), as illustrated by Mendoza and Terrones (2008) based on 49 credit booms observed in 48 developed or emerging countries between 1960 and 2006. We also know that credit booms are leading indicators of a crisis. Borio and White (2003) point out the conjunction of the financial market liberalisation starting in the 1970s with the great moderation characterised by low inflation expectations and an expansionist monetary policy that accommodated higher asset prices against high demand for debt and swelling imbalances.

Bordo and Meissner (2012) built a simple model based on the credit booms in 14 OECD countries between 1920 and 2007. They linked the increase in credit volume to the level of credit, investment, real money supply growth, short-term interest rates and the share of the 1st centile in income distribution. The increase in the share of the 1st centile did not seem to be a significant factor in credit booms. Only interest rates and economic activity, i.e. the traditional cyclical components, provided solid explanations. This can be seen as a warning against trying to generalise the analyses of the US case in the 2000s.

**Inequality and the distorted sharing of value added**

In the United States, but also in Japan and Germany, profits have increased as a share of value added. In the 25 years since 1990, real wages (adjusted by the GDP price deflator) increased 20% in the United States, but labour productivity increased by nearly 65%. Similar configurations can be seen in Japan (5% wage growth vs. a 17% increase in productivity since 1998) as well as in the averages for the OECD countries and for the world economy. The table below shows that real wages grew at a slower pace than productivity gains almost continuously in the US, Japan and Germany. The second table shows that the increase in GDP deflators surpassed that of unit labour costs, which boils down more or less to the same thing.

**Real wages and productivity**

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Table 1: Source: Eurostat

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**Real wages and productivity**

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Table 1: Source: Eurostat
Unit labour costs and the GDP deflator

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<td>-4.5</td>
<td>0.8</td>
<td>-1.6</td>
</tr>
<tr>
<td>P. PIB</td>
<td>-0.4</td>
<td>-1.4</td>
<td>-1.0</td>
<td>-2.2</td>
<td>-1.9</td>
<td>-0.9</td>
<td>-0.6</td>
</tr>
</tbody>
</table>

Table 2
Source: Eurostat

The reduction in wages as a share of value added is a factor that curbs consumption and market outlets, which in turn tends to dampen investment. The swelling share of profits lifts the corporate self-financing rate, stimulates financial placements (acquisitions and liquidities, especially during a period of uncertainty and low interest rates) and creates incentives for generous dividend pay-outs and share buybacks (a recurrent trend in the United States, see charts below). Together, they increase the accommodating nature of monetary policy, which encourages risk taking and asset price inflation, which in turn stimulates indebtedness via the valuation of collateral. All of this leads to the creation of asset bubbles.
Inequality and the theory of secular stagnation

Eggertsson et al (2010) abandoned the usual reference to a standard household (in this case, indebtedness does not count since the debt of some was equivalent to the assets of others). They considered two categories of individuals, debtors (at the bottom of the income ladder) and creditors. When a shock prevents the first group from increasing debt, the second group must resort to dissaving to maintain constant demand, which assumes a sufficient decline in real interest rates. If inflation and nominal rates are in positive territory, a nominal rate cut should suffice to reduce the real rate. If to the contrary, monetary policy is up against the zero lower bound, real rates can only be reduced by raising inflation expectations. In this case, the classic AD-AS model is profoundly changed (see diagram below) and the AD curve has a positive slope: demand is a rising function of the level of prices. It can be hard for monetary policy to boost inflationary expectations, notably if the commitment to accept higher inflation lacks credibility (problem of inter-temporal inconsistency).

Under this environment, demand can be stimulated by an expansionist fiscal policy that aims for a temporary and targeted increase in public spending, in which case AD shifts to the right. Yet some fiscal policies work better than others: since reducing labour costs (to stimulate supply) has a negative impact on prices, it could be counterproductive. In an open economy, however, this would also lead to gains in competitiveness. Direct stimulation of investment (and thus demand), in contrast, would have a positive impact.

Eggertsson and Mehrotra (2014) propose an overlapping generations model that distinguishes between three categories of agents: young people who borrow, mature workers who save and lend to the first category, and seniors who consume their own savings. Youth who are prevented from adding to their debt due to the outbreak of a crisis have a smaller debt burden when they reach middle age. They dispose of more savings, which pushes down the equilibrium real interest rate, where it remains mired in negative territory. Rising inequality encourages individuals to take on debt, but once it reaches a certain limit, savings begin to rise resulting in insufficient demand. This can become a protracted situation. This mechanism can be accentuated by demographics, if there is a reduction in the share of youth with a high propensity to consume.
In most of the OECD countries, inequality has been on the rise since the 1980s, regardless of the measurement used. It is the inequality situated in the lower half of income distribution (median deciles/last decile ratio) -- sometimes referred to as the erosion or shrinking of the middle class -- that has a negative impact on growth via its impact on human capital accumulation. Inversely, no correlation can be found between the share of the top 1% of income distribution and growth. This is because the increase in the top 1%’s share is linked in part to innovation, which in turn is vital for growth in countries situated along the technological frontier.

When rising inequality is accompanied by excessive household debt, household financial situations deteriorate. When monetary policies have been overly accommodating for too long, the deterioration in household balance sheets can contribute to the outbreak of a crisis, followed by a slow, sputtering recovery, bogged down by the correction of past excesses. This has been the case since the end of the 2000s.

How should inequality be handled and to what extent? Ideally, real wage trends would eventually move into line with productivity gains. But as Japan’s recent example shows, this can be difficult to achieve.

It is possible to try to limit inequality through a redistribution policy whose positive impact on growth outweighs its inconveniences (distortion of supply), except in countries where redistribution is already very high. Looking beyond the limits of these policies and the various obstacles that might be encountered when implementing them (public finance situation, etc.), it is possible to reduce tax loopholes and subsidies whose effectiveness is dubious, while maintaining fiscal incentives for innovation. Through greater competition, we can attack rentier income positions that hamper innovation and growth while aggravating inequality.

Much more than inequality, it is the shortage of growth that is the main cause of poverty. Looking beyond macroeconomic policy considerations, an economy close to the technological frontier can only achieve sustainable momentum through innovation. The institutions and policies that foster innovation are not the same as those adopted during catching-up phases. These innovation-friendly factors are well known: support for research & development, high quality higher education, and competitive markets for goods and services, which encourage the creation and development of new companies and a more efficient job market (training, mobility, etc.).

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The role of finance.

The financial sector accounts for 4% of employment in the European countries, but 19% of jobs in the top centile of income distribution. Part of the income gap between finance and the other sectors, which averages 60% in the European Union, can be attributed to differences in the individual characteristics of employees, foremost of which is their skills level. The wage premium – the unexplained share of the income differential – accounts for only about a third. In the financial sector, the variable portion of wages is 14%, compared to 8% in other sectors. Yet given its limited weight, the sector makes only a very small contribution to the general level of inequality (Denk, 2015).

Denk et al (2015) conducted an econometric analysis of the relationship between finance and inequality in 33 OECD countries between 1974 and 2011. They did not find a significant correlation between the added value of the financial sectors as a share of GDP and the Gini coefficients, once they had factored in the unemployment rate, the level of human capital (years of education) and openness to trade. The weight of the financial sector and inequalities simply moved in tandem, without any causality. If we base our measurements on the size of intermediation (credit/GDP), the correlation is positive but negligible (a 10-point increase in the credit ratio is associated with an increase in Gini of only 0.13). The same can be said for an increase in the stock market capitalisation to GDP ratio: a 10-point increase is associated with a 0.11 increase in Gini. In a regression analysis of income trends in 30 OECD countries based on different variables (investment, human capital (years of education), population growth and value added in the financial sector), the latter is not statistically significant. If we replace it with the credit/GDP ratio, a negative correlation appears: a 10-point increase reduces the growth of disposable income by 0.8% in the bottom two deciles and by 0.4-0.5% in the median deciles. Using the market capitalisation ratio, a 10-point increase is associated with a 0.2% reduction in income growth in the bottom decile, but an increase of 0.1% in the median decile and 0.5% in the top decile. Once again, there is no obvious causality. Note that the increase in market capitalisation/GDP ratios at the end of recessions or in the beginning of recoveries contributes to the rise of inequality, especially since it occurs in the midst of deteriorated job market conditions.

(4) We can distinguish between several types of job profiles:
- The highest paid tasks are management and creativity, which complement IT capital;
- Manual tasks (maintenance, security services, road transport, etc.) that are not threatened by new technologies. They complement the first group by increasing productivity and thus wages;
- Low or unskilled tasks that are easily replaced by information technology;
- Superstars (Rosen, 1981), positioned in the upper range of the highest paid 1% (the 0.1% or 0.01%); media stars, top athletes, CEOs of major companies, etc. whose services are hard to compete with (a successful media star cannot be replaced by two mediocre players). It’s a “winner takes all” game. The development of communication channels at constant costs, which are virtually nil, provides access to an ever broader market. The least successful are quickly demoted and can only provide secondary services or must change jobs. This winner-take-all phenomenon was studied by Saint Paul (2008).

(5) For further information see Aghion et al (2009).

(6) The Gini coefficient: if the first decile of income distribution receives 10% of income, the first quintile 20%, the first quartile 25%, and so forth, then the Gini coefficient is zero and there is no inequality. A Gini coefficient of 1 indicates maximum inequality. Egalitarian societies like those in Northern Europe have Gini coefficients of about 0.3. The unequal societies of Latin America and Africa are characterised by Gini coefficients of 0.5 or more. According to the US Census Bureau, the Gini coefficient for the United States was 0.4 in 1980 and is now 0.47.

(7) The authors propose an explanation for this negative correlation based on an overlapping generations (OLG) model:
Young people have income of \( Y_{0,i} = (w + e_i) K_{0,i} \), in which \( w \) represents shared skills, \( e_i \) specific skills and \( K_{0,i} \) an externality linked to the accumulation of knowledge accumulated in human capital (like AK growth models). Income is affected by consumption \( C_{0,i} \) and by savings \( S_i \). The consumption of seniors is expressed as \( D_i = (1 - \theta) K_i + \theta K_s \), where \( \theta \) is the discount factor.

Individuals maximise the utility \( U(O) = \ln C \) drawn from consumption over the course of their lives. The model can be resolved to express a growth rate:
\[
g = (K/K_{0,i})^{1-\theta} = -1 + (1-\theta) (w + e_i)/ (2-\theta),
\]
dimension rises with redistribution \( \theta \), which also appears as an increasing function for inequality. Redistributing \( \theta \) maximises inter-temporal utility, i.e. \( V(\theta) \), and provides the optimal level of redistribution:
\[
\frac{\partial V}{\partial \theta} = K_i - K_s + \theta (w K_{0,i}) / (2 - \theta); 
\]
redistribution demand diminishes with savings \( K_s \) and thus with the initial allocation \( (w + e_i) \), i.e.: the poorest demand more redistribution. The more unequal the distribution of skills, the greater the demand for redistribution by the average voter and the lower the accumulation rate.

(8) The econometric analysis conducted on the US states unsurprisingly verifies the incidence of superstars – as measured by the number of patent citations during a given year – on the share of the top 1% (coefficient of 0.10 (t = 2.04)). Certain business lines make a significant contribution to the top 1%’s share of income. This is true for the financial sector as a share of GDP (which accounts for 18% of the population of the top 1%, compared to 5.3% for the rest of the population). It also applies to oil extraction as a share of GDP. Innovation plays an essential role in explaining the evolution of the share of the 1%, and this role is not called into question if the above sectors are factored into econometric estimates or the states in which these sectors play a preponderant role are excluded from the estimates. Erecting, defending and
strengthening entrance barriers is an inherent part of lobbying activities. The intensity of lobbying (measured by lobbying income in each business sector according to their share in each state) modifies the impact of innovation on the share of the top 1%. The coefficient linking the quality of innovation (frequency of patent citation) with the share of the top 1% is 0.059 (t = 6.06), the coefficient of the lobbying x innovation interaction variable is negative and significant: -0.6 (t = -9.48). The distinction between innovation by entrants and incumbents shows that this moderating effect only affects the innovation of entrants (innovation coefficient for entrants): 0.02 (3.71), coefficient for incumbents: 0.012 (1.87), and the interaction variable coefficients are -0.034 (-6.79) and -0.004 (-0.65), respectively.

The increase in debt can be expressed as follows:

\[
dD = dA - S, \text{ in which } A \text{ is assets and } S \text{ is savings;}
\]

\[
dD = dA - Y - C - rD;
\]

\[
dD = dA - (Y - C - rD)
\]

\[
d/dt(S/Y) = (g_y - g_c)(1 - s) + r(D/Y) (g_y - g_c) \text{ in which } g_y \text{ and } g_c \text{ are the growth rates of income and consumption. When there is a decline in income, and consumption does not decrease as sharply as the reduction in income, the savings rate falls, especially since a bigger portion of income must be allocated to debt servicing.}
\]

In deriving the debt ratio \( d/Y \) over time, we can write:

\[
d/dt(D/Y) = (1/Y)(YdD/dt - DdY/dt), \text{ or given the definition of } dD:
\]

\[
da/Y + C/Y - 1 + rD/Y - g_y(D/Y) = da/Y - s - g_y(D/Y)
\]

The debt ratio rises continuously after the income shock, especially without an adjustment in consumption. The increase in the debt ratio can be slowed by the disposal of assets, but that too weakens balance sheets.

(9) The increase in debt can be expressed as follows:

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\[
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\]

The debt ratio rises continuously after the income shock, especially without an adjustment in consumption. The increase in the debt ratio can be slowed by the disposal of assets, but that too weakens balance sheets.

(10) From 1987 to 2007, median household income increased 16.9%, while the real wage of women increased 13.9% and that of men declined 1.5%, a difference attributable to the increase in the female participation rate and the increase in working hours concentrated in the 2nd and 3rd quintiles of income distribution.
References

ARVISENET d: “From Great Moderation to Secular Stagnation”, Conjuncture, BNP Paribas monthly bulletin, April 2015
BORDO.M, MEISSNER.C: “Does Inequality Lead to Financial Crisis”, NBER WP 17896, 2012
COURNEDE.B, DENK.O: “Finance and Income Inequality in OECD Countries”, OECD WP 1224, 2015
CYNAMON.B, FAZZARI.S: “Inequality, the Great Recession, and Slow Recovery”, FRB St Louis, 2014
DABLA-NORRIS, KOCHHAR. K, SUPHAPHIPHAT.N, RICKA. F, TSOUNTA.E: “Causes and Consequences of Income Inequality: a Global Perspective”, IMF Staff discussion papers 15/13, June 2013
DARREAU.P: “Croissance et Politique Economique”, de BOECK, 2003
KUMHOF.M, RANCIERE.R: “Inequality, Leverage and Crisis”, IMF, WP 10/268, 2010
LEMIEUX.T: “Post-Secondary Education and Increasing Wage Inequality”, NBER, 2005
MANKIW.G: “Yes, r>g. So What?”, AER, May 2015
OECD, a: Employment Outlook, 2015
OECD, b: “In it Together: Why Less Inequality Benefits All”, 2015
OSTRY.J, BERG.A, TSANGARIDES.C: “Redistribution, Inequality and Growth”, IMF Staff discussion papers 14/02 Feb 2014
ROSEN.S: “The Economics of Superstars”, AER n° 71, 1981
SCHUBERT.K: “Macro Economie, Comportements et Croissance”, Vuibert, 1996
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