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Inequality, growth and welfare

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Abstract

This paper examines the relationship between economic inequality, growth and social welfare, challenging the conventional identification of welfare with GDP and the widespread assumption that greater equality necessarily entails lower growth. An Atkinson-type social welfare function is first adopted in which welfare increases with average income and decreases with inequality. Using stylised income distributions broadly reflecting the contemporary United States and the more egalitarian Scandinavian economies of the 1980s and 1990s, it is shown that faster growth in a highly unequal economy may generate less welfare than slower growth in a more equal one. Progressive taxation combined with uniform transfers increases welfare, even when redistribution involves substantial efficiency losses of the kind represented by Okun's "leaky bucket". Dynamic simulations further indicate that a more unequal but faster-growing economy may require several decades to reach the welfare level of a more egalitarian, slower-growing economy; progressive taxation significantly shortens this convergence period. Finally, an alternative welfare measure is introduced, which is based on individual aversion to disadvantageous inequality, whereby welfare depends partly on the income gap relative to the richest group. Under this approach, aggregate welfare may rise while the welfare of the bottom 90 % declines, thereby undermining conventional applications of both the Kaldor–Hicks compensation principle and the Pareto criterion.

Keywords: Economic inequality; Social welfare; Economic growth; Progressive taxation; Inequality aversion.

JEL codes: D63; I31; O40; H24

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> "The goal of efficiency, to which everyone points, today necessarily involves the relentless pursuit of solutions that alleviate social inequalities – now, rather than in some unspecified future – instead than perpetuating and entrenching them" (Caffè 1974, 113).

1. Introduction

"The welfare of a nation can scarcely be inferred from a measurement of national income". These words were spoken in 1934: the venue was the US Congress, the measure of income was GDP, and the speaker was the father of GDP, Simon Kuznets, an American born in Belarus, who was just 33 years old at the time. Thirty-seven years later, he would be awarded the Nobel Prize in Economics with a citation that is worth quoting: *for his empirically grounded interpretation of economic growth, which led to a new and more in-depth analysis of the social and economic structure and its process of development.* One might say, not just GDP.

Returning to 1934, it can be argued that in the decades following Kuznets's warning ("the welfare of a nation can hardly be inferred from…") one of two things happened: either Kuznets's warning was ignored in the tacit belief that welfare equated to GDP, or welfare itself was ignored. GDP and GDP growth have become virtually the only criteria for assessing countries' performance - independently of the associated inequality - and the dominant objectives of economic policies as if GDP were, contrary to Kuznets' warning, a reliable indicator of social well-being.

Undoubtedly there is no uncontroversial way of linking inequality to social welfare, but equally there can be no reasonable doubt that, given the same GDP, two countries do not have the same level of social welfare if, in one of them, income is concentrated – hypothetically – in the hands of a small number of people, whilst in the other it is distributed equally amongst everyone.

If inequality matters for welfare, then even comparisons between countries based on per capita GDP and its growth over time are inevitably flawed. As Jean Paul Fitoussi (2021) once said: "growth that benefits only a very small number of people is of no interest to us as a social objective, or as a goal to be pursued in our countries. On the contrary, we seek growth that guarantees equality for all citizens as they face the future. Growth and social welfare either go hand in hand, or one – growth for the few – destroys social welfare for the many" (Fitoussi, 2021). For several years now, the need to look beyond GDP has been recognised (Stiglitz *et al.,* 2009), and significant progress has been made towards developing welfare indicators that consider income and wealth inequality, life expectancy (and its inequality across different population groups), environmental conditions, and so on (Usher, 1973, 1980; Decancq et al., 2009; Fleaurbaey, Gaulier, 2009; Jones, Klenow, 2016; d'Albis, Bonnet, 2018; Da Costa, 2025, 2026; United Nations, 2026).

Below the focus will be on the implications of the assumption that social welfare depends positively on income and negatively on inequality, towards which society harbours a certain degree of aversion. This is a social welfare function (SWF) directly linked to Atkinson's well-known inequality index (1970) and incompatible with the compensation principle of Kaldor

(1939) and Hicks (1939), according to which an outcome can be regarded as welfare improving if those who are better off could *in principle* compensate those who are worse off, thus attaching no significance to rising inequality.

A different SWF is then introduced, no longer constructed on the basis of *social* aversion to inequality but based—drawing on a number of behavioural studies—on an individual aversion that varies with the distance of each person's income from that of the reference group, and in particular from that of the wealthiest. It will be shown, that if the welfare of the less wealthy is (negatively) affected by the further enrichment of the wealthiest, the traditional notion of a Pareto improvement breaks down, as one can no longer say that welfare increases when the richest individuals gain and the poorest ones do not lose from the change. It will also be shown that, if the effects of this variable individual aversion to inequality are ignored, it could be claimed that social welfare has increased whilst the welfare of the vast majority of the population has decreased.

It is therefore not a question of investigating the influence of inequality on GDP – that is, the trade-off between growth and equality which has become a cliché used to justify the need to maintain high levels of inequality– but rather of investigating the trade-off between inequality and GDP (or its growth) in terms of welfare[3]. Precise measures of this trade-off (the elasticity of substitution between income and inequality in the welfare function) will be identified and used to interpret the results of simple simulation exercises based on stylised cases of income distributions whose parameters are consistent with the current distribution in the United States (an "unequal country") and with that of the Scandinavian countries (Sweden, Denmark) in the 1980s (a "less unequal country"). The welfare function with inequality aversion also allows us to refute other common misconceptions: that progressive taxation and income redistribution necessarily entail welfare losses, or that the *leaky bucket* inefficiencies (Okun, 1975) inherent in any progressive taxation and redistribution policy *inevitably* result in welfare losses.

Entering the lion's den, it will be assumed that the trade-off between equality and growth actually exists, and two countries will be compared that initially have the same per capita GDP but with very different distributions. Naturally, under the assumptions made, social welfare at the starting point is higher in the more egalitarian country, but what is more significant is that despite the trade-off – whereby the income of the more unequal country

[3] Several (predominantly empirical) studies have examined the potential impact of income inequality on social wellbeing. One example is the paper by Dollar, Kleineberg, Kraay (2014), which – drawing on other works, including that of Atkinson – assigns different weights to the various income deciles; a common feature is that the weights are greater for the lower deciles, albeit graded differently. The aim is to assess, across 117 countries between 1970 and 2012, whether, as a result of growth, social welfare (defined as the sum of incomes per decile, appropriately weighted) has changed due to average income growth and, separately, to changes in inequality. The finding is that the impact of growth in average income is much greater than that of changes in inequality. Our work – whilst acknowledging the need to take inequality into account when defining and measuring social welfare – has different objectives and, in particular, aims to provide examples of economies in which reducing inequalities can have far greater effects on the level and growth of welfare than those that even high rates of income growth might have.

grows faster – the welfare of the former would remain higher for many years. Contrary to common sense, with progressive taxation and appropriate redistribution, the convergence time for the welfare of an unequal country with accelerated growth towards the welfare of a country with slow growth can be shortened.

More specifically, Section 2 introduces Atkinson's approach to welfare and the measurement of inequality. This approach is based on the existence of a social aversion to inequality (ε). It is from this aversion that a trade-off in terms of welfare arises between income (which contributes positively to welfare) and inequality (which contributes negatively).

Section 3 presents the results obtained by applying Atkinson's approach under the assumption that aversion to inequality is largely confined to market incomes, using hypothetical distributions.

Section 4 challenges the common misconception that a progressive tax system, coupled with a uniform distribution of tax revenue, would reduce economic growth and, consequently, welfare.

In Section 5, the 'leaky bucket' hypothesis (to use Okun's well-known expression, 1975) is introduced – namely, that a portion of tax revenue is lost – or, perhaps, one might say 'evaporates' – due to the often-cited inefficiencies of the public sector – to examine whether this necessarily implies a loss of welfare (similar experiments are also mentioned by Atkinson, 2015, 12-13).

Section 6 introduces the time dimension. If growth is uniform and, therefore, inequality remains constant, the level of welfare in a more unequal but faster-growing economy will, sooner or later, catch up with and exceed that of a less unequal economy which, by assumption, grows more slowly. The main question addressed is: given the different starting conditions and assuming reasonable growth rates, how long does it take for that 'overtaking' to occur? And how are the different time paths influenced by taxation and its degree of progressivity?

Section 7 departs from Atkinson's approach and assume that each individual's welfare depends not only on their own income but also on the gap between that income and the maximum income in the distribution, so that, for a given personal income, welfare will be lower the greater that gap is. This approach is suggested by the findings emerging from repeated behavioural analyses, which point to a widespread aversion to disadvantageous inequality (and sometimes to advantageous inequality as well, though this will not be considered here). The mechanism at work is not one of envy but of a breach of fairness and of the individual recognition implied by inequality (which, of course, could be detected in different ways). And the sense of fairness may be undermined not only by the extent of inequality but also by the mechanism that generates it. Some significant consequences of this hypothesis emerge, and in particular the possibility that social welfare may increase whilst the welfare of the vast majority of the population declines.

Section 8 summarises the main findings of the paper and presents some brief concluding remarks.

2. Inequality and welfare: the common view and Atkinson's approach

In recent decades, a common misconception has become widespread, both in political circles and within a significant strand of economic thought, namely that all that matters for the health of a country's economy – and indeed the global economy – is GDP and, above all, its growth.

According to a widely held view, any intervention aimed at reducing inequality should be avoided because the price to be paid would be a slowdown in economic growth. This applies both to direct interventions aimed at curbing the inequality that arises in markets and, more frequently, to redistributive measures – which obviously include a progressive tax system, the impact of which is feared on the incentives for high income entrepreneurs and managers to work, invest and innovate. In his world-famous textbook *Principles of Economics* (2015), the Harvard economist Gregory Mankiw stated that 'when the government tries to cut the economic pie into more equal slices, the pie gets smaller'. And, if growth is reduced (the pie expands less), the whole of society suffers, including those on lower incomes, who could not benefit from some sort of 'trickle-down' from the upper echelons of income and wealth. Growth would be acceptable even if it were accompanied by a rise in inequality, because the growth in the income of the wealthiest would generate resources to compensate those individuals or social groups that were harmed (impoverished). Those who hold this view appeal (at least implicitly) to the Kaldor (1939) and Hicks (1939) principle of compensation, according to which there would be a Pareto improvement in welfare if the gain of those who become richer exceeds the loss of those who become poorer, regardless of whether the former actually compensate the latter. This principle was originally formulated with reference to social welfare. Subsequently, the equating of welfare with GDP has led to the widespread (and yet spurious) application of the principle to growth in per capita GDP. Growing inequality therefore plays no role whatsoever[4].

The idea that average income (and therefore its growth) is all that really matters when assessing a nation's welfare (and how it changes over time) is linked to the notion that *an individual's* utility depends exclusively on her own income ($U(y) = y$) and that social welfare is given by the sum of individual utilities and, ultimately, by the unweighted sum of individual incomes, that is, by the average income[5]:

$$W = \frac{1}{n}\sum_{i=1}^{n} U(y_i) = \frac{1}{n}\sum_{i=1}^{n} y_i = \bar{y} \quad (1)$$

[4] There is, of course, no shortage of dissenting voices and evidence contradicting the dogma of the inevitable economic cost of reduced inequality. As a matter of fact, evidence to the contrary is far larger and more robust than the (very few) examples to the opposite effect. The relationship between inequality and economic growth has, for example, been investigated on several occasions by a group of researchers at the International Monetary Fund, led by Jonathan Ostry (e.g. Berg, Ostry et al., 2014; Ostry et al., 2018). See also Atkinson (2015), ch. 9. Furthermore, a high proportion of income concentrated in the hands of a few individuals with significant market power, who have a low propensity to consume, reduces the expenditure multiplier and, consequently, limits its expansionary effects on GDP growth (Kalecki, 1954; Pasinetti, 1963; Stiglitz, 2012).

[5] For a discussion of welfare-based inequality indicators, see Schwartz and Winship (1980). For an attempt to bridge the gap between different inequality indices, including Atkinson's, see Ebert (1988). See also Champernowne and Cowell (1998); Cowell 2000) and Cowell (2011).

Where W is social welfare, y_i is the income of the i-th individual,n is the number of individuals and$\bar{y}$ is the average income. With such a function for social welfare, one will always have:

$$W_A > W_B \; if \; \bar{y}_A > \bar{y}_B \quad (2)$$

This approach to utility and welfare goes beyond Benthamite utilitarianism, which did not identify utility (and hence welfare) with income. We claim that precisely this extreme form of utilitarianism is backing (at least implicitly) the contemporary obsession with GDP and its growth over time.

In what follows, an analysis of welfare is presented that accounts for the influence of inequality in the two ways indicated in the introduction. According to Atkinson, social welfare declines as inequality increases. One may say that Atkinson assumes the existence of a social aversion to inequality which is incorporated in the social welfare function.

According to Atkinson's 'value-based' approach (1970), given a constant total income, social welfare is lower the greater the inequality. By introducing some degree of aversion to inequality (i.e. $\varepsilon > 0$), Atkinson shows that the welfare function will be represented by[6]:

$$W_{(\varepsilon)} = \frac{1}{n}\left[\frac{1}{1-\varepsilon}\sum_{i=1}^{n}(y_i)^{1-\varepsilon}\right] \quad (3)$$

The Atkinson (1970) inequality index is associated with the welfare function (4). This index is designed to measure inequalities in welfare rather than in income, and is defined as follows:

$$A_{(\varepsilon)} = 1 - \frac{y_{EDE}}{\bar{y}} \quad (4)$$

Where $\bar{y}$ is the actual average income observed and y_{EDE} is the distributively equivalent income, that is, the income which, if received equally by every member of society, would yield the same level of welfare as the actual distribution. It can be calculated as:

$$y_{EDE} = \left[\frac{1}{n}\sum_{i=1}^{n}(y_i)^{1-\varepsilon}\right]^{\frac{1}{1-\varepsilon}} \quad (5)$$

since, by definition of y_{EDE}, , the following must hold:

$$W = \frac{1}{n}\left[\frac{1}{1-\varepsilon}\sum_{i=1}^{n}(y_i)^{1-\varepsilon}\right] = \frac{1}{1-\varepsilon}\cdot {y_{EDE}}^{1-\varepsilon}.$$

[6] It may also be verified that welfare function (3) is concave in y_i (due to inequality aversion), contrary to the extreme utilitarian welfare function (1). One can also show that welfare function (3) can be derived as a simple sum of individual utility functions all characterised by the same inequality aversion:

$$U(y_i) = \frac{1}{1-\varepsilon}(y_i)^{1-\varepsilon}$$

Where ε is the coefficient of inequality aversion. $\varepsilon = 0$ implies $U(y_i) = y_i$, and thus one goes back to the extreme utilitarian welfare function (1).

Naturally, if $\varepsilon = 0$, then $y_{EDE} = \bar{y}$ and, consequently, $A_{(\varepsilon)} = 0$.

Finally, the choice of the degree of aversion to inequality is, to some extent, arbitrary. ε can vary from 0 to ∞, with $\varepsilon = 0$ implying, as already seen, a crude utilitarian welfare function and $\varepsilon \to \infty$ implying a 'Rawlsian' welfare function, for which welfare increases only if the income of the poorest rises. In what follows, a rather low value ($\varepsilon = 0.8$) is assumed, lower than those generally used in the literature ($1.2 \leq \varepsilon \leq 1.8$), for which our results would hold all the more so.

A simple algebraic derivation allows us to demonstrate the nature (and magnitude) of the trade-off between inequality and average income in terms of welfare. Using equations (3), (4) and (5), welfare W can be directly expressed in terms of inequality (A) and average income ($\bar{y}$), given any value of ε:

$$W = \frac{[(1-A)\bar{y}]^{1-\varepsilon}}{1-\varepsilon} \quad (6)$$

From (6) it follows that welfare is increasing in average income and decreasing in inequality[7] . Therefore, it is not possible to establish a one-to-one correspondence between welfare and income; in other words, (2) does not necessarily hold. Total differentiation of (6) yields:

$$dW = -\bar{y}[(1-A)\bar{y}]^{-\varepsilon} \cdot dA + (1-A)[(1-A)\bar{y}]^{-\varepsilon} \cdot d\bar{y} \quad (7)$$

Substituting $dW = 0$ into (7) allows us to derive the substitution elasticities between inequality and average income whilst keeping welfare constant:

$$\eta_{A\bar{y}} = \frac{\partial \bar{y}}{\partial A} \cdot \frac{A}{\bar{y}} = \frac{A}{1-A}; \quad \eta_{\bar{y}A} = \frac{\partial A}{\partial \bar{y}} \cdot \frac{\bar{y}}{A} = \frac{1-A}{A}$$

Both substitution elasticities are independent of the initial level of average income ($\bar{y}$) but depend on the initial level of inequality (A): $\eta_{A\bar{y}}$ is increasing in$A$, whilst $\eta_{\bar{y}A}$ is decreasing in A . The trade-off between inequality and average income, in terms of welfare, is therefore not constant, but depends on the initial value of A. $\eta_{A\bar{y}}$ highlights that, if initial inequality is higher, any percentage increase in inequality requires a greater increase in average income to keep welfare unchanged. $\eta_{\bar{y}A}$, on the other hand, highlights that a society with low initial inequality is willing to accept, in exchange for a given increase in average income, a greater rise in inequality than a society with high initial inequality.

3. Some implications of the Atkinson index

The indicators $A_{(\varepsilon)}$ and $W_{(\varepsilon)}$ will now be used for few simulation exercises. The first refers to market incomes, the following to the effects of the government's redistributive activity and any associated 'leaky bucket' losses.

[7] Indeed: $\frac{\partial W}{\partial A} = -\bar{y}[(1-A)\bar{y}]^{-\varepsilon} < 0$ an $\frac{\partial W}{\partial \bar{y}} = (1-A)[(1-A)\bar{y}]^{-\varepsilon} > 0$.

As in the rest of the paper, simple numerical examples are employed. To this end, we assume population deciles within which all incomes are equal. Thus, each decile can be treated as if it were composed of a single individual representative of the decile's average income. This is a significant, but non misleading, simplification. Furthermore, all changes in income are assumed to be in real terms. Naturally, this implies deflating nominal changes by the average rate of inflation.[8] The welfare effects of growth and changes in inequality are assessed without considering possible changes in the position of individuals relative to the initial situation – that is, the possible shift in decile. In this way social mobility is disregarded[9].

Given these further *caveats*, Table 1 presents two initial distributions of the same real market income of 10,000 (A0 and B0) and relevant variations.

Tab. 1 – *Distributions of market incomes and associated indices of welfare and inequality*

Income deciles (from top to bottom)	A0	B0	A1	B1	A2	A3	B2	B3
1	4700	2700	5170	2520	5700	4300	2940	2646
2	1600	1800	1760	1620	2200	1600	1890	1701
3	900	1000	990	900	1050	900	1050	945
4	800	950	880	855	900	850	998	898
5	650	850	715	765	600	800	893	803
6	400	750	440	675	185	700	788	709
7	350	650	385	585	150	600	683	614
8	300	550	330	495	90	500	578	520
9	200	450	220	360	80	400	420	378
10	100	300	110	225	45	350	263	236
Total income	10000	10000	11000	9000	11000	11000	10500	9450
W(e=0.8)	**18.11**	**19.29**	**18.46**	**18.81**	**17.19**	**19.28**	**19.40**	**18.99**
A(e=0.8)	**0.38**	**0.16**	**0.38**	**0.16**	**0.56**	**0.22**	**0.16**	**0.16**

A0 fairly closely reflects the distribution of market income in the US (2023) as derived from the WID, with the top 10 % of earners accounting for 47 % of income and the bottom 50 % for 13.5 %. The interdecyl ratio (P90/P10) is remarkably high, at 47, and the Gini coefficient of this highly unequal distribution is 0,5.

[8] This may lead to distortions in the measurement of inequality if the baskets of goods (predominantly) purchased by individuals in different deciles were subject to different price changes. In particular, when the prices of goods that account for a larger share of the poorest households' expenditure (basic necessities) rise by more than the average, the actual real income of the poorest households will be lower than that estimated using the rate of change in the general consumer price index (Aprea, Raitano, 2024; Franzini, Raitano, 2025, Chapter 1).

[9] Our approach matches what suggested by Ravallion, Chen (2003) with their (Anonymous) Growth Incidence Curves. Bourguignon (2011) and Palmisano, Peragine (2015) introduced Non-Anonymous Growth Incidence Curves to account for social mobility of individuals over time. See Berman and Bourguignon (2023) for a theoretical framework encompassing AGICs and NAGICs and an empirical analysis of income and inequality changes in the US (1980-1990).

B0 fairly closely reflects the distribution of market income between the top 10 % and the bottom 50 % in Sweden or Denmark between the mid-1980s and the mid-1990s. In B0 total and average incomes are the same as in A0, but the inter-decile ratio is 11.2 and the Gini coefficient 0.319. Furthermore, the top 10 % of income earners account for 28 % of total market income, whilst the bottom 50 % account for 26 %. Thus, total income is the same, but the distribution differs significantly between the two cases.

In A0 and B0 welfare would be the same under the extreme utilitarian hypothesis. On the contrary, the welfare index is higher and the Atkinson inequality index (or *A-index*) lower in B0 than in A0 (see the last two rows of Table 1). With aversion to inequality welfare and income do not coincide and a more egalitarian distribution of the same total income leads to a higher welfare index.

In B1 total and average income is 10% lower than in A0 whilst the income distribution is the same as in B0 (equal Atkinson-inequality index). Hence B1 can be considered less 'efficient' than A0 and B0 as regards GDP. Under the extreme utilitarian welfare function, A0 would be socially preferred to B0. Table 1 shows that this is not the case with an inequality-averse welfare function.

When market income increases uniformly, i.e. by the same percentage for everyone (10% from A0 to A1, 5% from B0 to B2 and from B1 to B3), the welfare index $W_{(\varepsilon=0.8)}$ increases in each transition. Since in these transitions inequality has remained unchanged, the growth in average income increases social welfare, also giving rise to Pareto improvements. The Atkinson index, on the other hand, remains unchanged[10] . Note that, as mentioned earlier, *the A-index* is not affected by increases in absolute income *differences*, which occur in the transition from A0 to A1, from B0 to B2 and from B1 to B3. This shows that the Atkinson index disregards possible utility effects of comparisons between what one can afford to buy and what others can afford.

Comparing cases A2 and A3 (where growth is non-uniform) with A0 and A1 respectively, it is apparent that the same growth in total and average income (+10 %) corresponds to vastly different effects on welfare, contrary to what would occur with an extreme utilitarian SWF such as (1). In A2, the income of the top four deciles of the distribution rises, whilst that of the bottom six deciles falls. As expected, the A-index rises compared with both A1 and A0. It is important to stress that the social welfare index falls significantly compared with A0 (from 18.11 to 17.19): a rise in market incomes that benefits only the wealthy reduces welfare. Conversely, the same growth—but one that benefits the lowest deciles, even at the expense of the highest deciles (A3)—increases welfare (and obviously reduces the A-index) even compared to uniform growth (A1). The *trade-off* between inequality and average income—analytically highlighted at the end of Section 2— stems, of course, from the assumption of social aversion to inequality.

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[10] Indeed, the Atkinson index is defined as: $A_{(\varepsilon)} = 1 - \frac{y_{EDE}}{\bar{y}}$. If all incomes rise by the same proportion (for example, by a factor of $g > 1$), one has $y_i' = g y_i$; thus: $\bar{y}' = g\bar{y}$ and $y'_{EDE} = g y_{EDE}$. From this one obtains: $A'_{(\varepsilon)} = 1 - \frac{g y_{EDE}}{g\bar{y}} = A_{(\varepsilon)}$. The welfare index, on the other hand, does not remain constant: using $y'_i = g y_i$ and equation (3), it is obtained: $W' = W g^{1-\varepsilon}$. Welfare increases as g rises, but at a decreasing rate since $\frac{\partial W'}{\partial g} > 0$, whilst $\frac{\partial^2 W'}{\partial g^2} < 0$.

In fact, for income growth to increase welfare even if associated to a rise in inequality (as in case A2), the following condition (which is derived from equation 7) must hold:

$$\frac{dW}{d\bar{y}} = -\bar{y}[(1-A)\bar{y}]^{-\varepsilon} \cdot \frac{dA}{d\bar{y}} + (1-A)[(1-A)\bar{y}]^{-\varepsilon} > 0, \text{with } \frac{dA}{d\bar{y}} > 0 \quad (8)$$

That is, the following condition must be satisfied:

$$\frac{dA}{d\bar{y}} \cdot \frac{\bar{y}}{A} < \frac{1-A}{A} \quad (9)$$

Condition (9) requires that the elasticity $\eta_{\bar{y}A}$ be small. Since as already seen, $\frac{1-A}{A}$ decreases as A increases, the likelihood of condition (9) holding is all the lower the greater the initial inequality (as in A0). In other words, the greater the initial inequality, the less likely it is that an increase in income, coupled with a further rise in inequality, will lead to higher welfare. Lower inequality creates favourable conditions for growth that generates greater welfare.

The most interesting point emerges from a comparison of situations B2 with A1, A2 and A3, and situations B3 again with A1, A2 and A3. B2 represents a 5 % uniform growth relative to the more egalitarian B0 case. Table 1 contradicts the argument according to which as egalitarian countries "are bound" to grow at a low pace, their welfare must be lower than that of more unequal but faster growing countries. In fact, welfare in the low-growth B2 is higher than in either A1, A2 and A3.

In B3 incomes grow at a much lower (5%) uniform rate, and one has both lower initial income and lower growth. Table 1 shows that welfare in B3 is higher than in A1 and A2 and lower than in A3. This proves that, in a lower-income, lower-growth but more equal country, welfare can be higher than in higher-income higher-growth but highly unequal countries. However, if a fast-growing *efficient* country achieves a more equal distribution of income (A3) its welfare may become higher than in the *less efficient* country (B3).

Thus, by adopting an approach that is slightly more nuanced than extreme utilitarianism (and without assuming individual decreasing marginal utility of income) it emerges that both growth and inequality contribute to social welfare: growth positively and inequality negatively. High growth in an economy with deep-seated inequalities – which either maintains or exacerbates them – may result in lower welfare than that achievable in a less unequal (and even with a lower total income) economy that grows at a lower rate. In terms of welfare, there is a trade-off between growth and inequality that runs counter to what is traditionally assumed in applied welfare analysis.

4. Progressive taxation

This section examines the impacts on social welfare of different levels of tax progressivity, associated with corresponding transfers to citizens. The same aversion to inequality as in the previous section is used, whilst assuming that all tax revenue (T) is utilised for transfers of equal size to all deciles of the population, each of which therefore receives $T/10$. One could, of course, envisage a transfer scheme favouring lower market incomes. However, in this paper, transfers also serve as a proxy for public expenditure aimed at ensuring

universal access to essential social services on the basis of an equal right of citizenship. The alleged inefficiencies "inevitably" due tax progressivity are not considered in this section. A discussion of the welfare impact of possible inefficiencies due to taxation and redistribution is left to section 5.

Two different tax systems are considered: a mildly progressive one, based on a *flat tax* of 25 %, with an exemption threshold for incomes below or, at most, equal to 400. This is a system (FT) in which progressivity is ensured exclusively by the exemption threshold:

$$t = 0.25(y - 400)\ if\ y > 400;\ t = 0\ if\ y \leq 400 \quad (10)$$

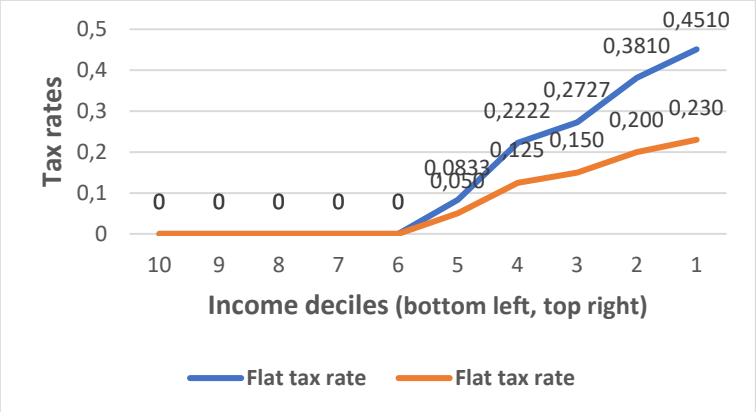
The second tax system, which is more progressively structured, is based on a continuous function of the type suggested by Estévez and Sommer (2018) and discussed by Paladini (2021)[11], which is referred to as *the CTR* (*continuum tax rate*). Again, the minimum taxable income is $x > 400$, the maximum tax rate is $a = 50\%$ (as in Germany), and the parameter which determines the curvature of the function is $k = 100$. The formula for the average tax rate is:

$$CTR: t = a \cdot \frac{y - x}{y + k} = 0.5 \cdot \frac{y - 400}{y + 100} \quad (11)$$

For simplicity's sake, let us assume that neither system provides for deductions from taxable income, tax credits or various allowances. The differing degrees of progressivity between the two tax systems are clearly illustrated in Fig. 1, which refers to the highly unequal distribution already seen in case A0, Table 1.

The results in terms of income and welfare after tax and transfers are summarised in Table 2 for some of the most significant cases already examined in Table 1. For each case there are two columns: under *FT* and *CTR* one finds the distributions of disposable income after taxation and transfers, in the flat tax scenario and in the continuous tax rate scenario, respectively.

The results can be summarised as follows, recalling that total disposable income is always equal to market income, because the entire tax revenue is redistributed.



[11] See also Visco (2019) and Longobardi et al. (2020).

Fig. 1 *– Effective tax rates under flat taxation (FT) and continuous-rate taxation (CTR), A0 case*

a) The welfare index $W(\varepsilon = 0.8)$ is always higher after taxation and transfers, whether the initial distribution is highly unequal (A0) or much less so (B0 and B1). This stems from the assumption that aggregate (and average) net income is equal to gross income, but its distribution – after taxation and transfers – is more egalitarian and there is a moderate aversion to inequality.

Table 2 – *Social welfare indices under flat taxation (FT) and continuous rate taxation (CTR)*

Income deciles (from top to bottom), after taxation and equal transfers	A0		B0		A2		B2		B1	
	FT	*CTR*	*FT*	*CTR*	*FT*	*CTR*	*FT*	*CTR*	*FT*	*CTR*
1	3779	3096	2346	1794	4586	3516	2471	2022	1821	1589
2	1454	1589	1596	1410	1961	1758	1683	1493	1436	1311
3	1054	1078	996	995	1099	1170	1053	1064	1226	1158
4	854	973	958	984	986	1076	1014	1036	1086	1055
5	741	809	883	954	761	929	935	981	841	872
6	554	551	808	961	396	581	857	926	666	736
7	504	551	733	895	361	546	778	870	596	679
8	454	501	658	864	301	496	699	812	561	650
9	354	451	526	645	291	486	581	722	411	500
10	254	401	496	495	256	441	428	573	361	450
Total income	10000	10000	10000	10000	11000	11000	10500	10500	9000	9000
W(e=0.8)	**18.91**	**19.21**	**19.51**	**19.71**	**18.79**	**19.52**	**19.71**	**19.90**	**19.15**	**19.29**

b) For each level of net income, the welfare index is higher when taxation is more progressive (*CTR*) regardless of whether an exemption threshold is provided for the flat tax. This points to the conclusion that a more progressive tax system, if accompanied by adequate transfers and no loss of efficiency, can increase welfare rather than reduce it in an inequality-averse society, although a change from flat to progressive taxation is not a Pareto improvement.

c) Cases A2 and B2, where market income grows at a uniform rate (10 % and 5 %) respectively, allow for common misconception that greater equality reduces growth. It can be seen that welfare is higher in B2 than in A2, in terms of both market and disposable income and under both *FT* and *CTR*. Moreover, the welfare index in Tab. 2 reaches its highest value precisely in the case of lower growth and more progressive taxation.

d) One might also guess that the lower growth in case B2 (compared with B0) is due to the greater progressivity of taxation (again, accepting another common misconception). The increase in welfare with a more progressive tax system (from $B0_{CTR}$ to $B2_{CTR}$) is, however, equal to 0.91 %, whereas switching from a *CTR* system in B0 to an *FT* system in B2, thereby

reducing progressivity, there would be a slight reduction in welfare (from $W = 19.72$ to $W = 19.71$)[12].

e) B1 has a lower market (and after tax/transfer) income than both A0 and B0. After tax/transfer welfare in B1 is still higher than in A0 - both under *FT* and *CTR* – whilst being obviously lower than in B0 (due to lower average market income and equal *A-index*). Interestingly, a more progressive taxation (*CTR*) may increase the welfare in the very unequal (but high growth) A2 case above the twofold 'inefficient' B1. Progressive taxation may turn a twofold 'efficient' but low welfare economy into a high welfare one, disregarding alleged disincentives due to a more progressive taxation.

A provisional conclusion can be drawn: with a moderate social aversion to inequality, welfare may be higher when the growth in market incomes is lower. Furthermore, and above all, lower growth accompanied by more progressive taxation can lead to better outcomes in terms of welfare, provided that the tax revenue is entirely redistributed (albeit in equal shares) with no loss of GDP. Hypothetical reforms aimed at reducing tax progressivity would be *coeteris paribus* welfare-reducing (besides not generally being Pareto improvements). Our results support Ostry and his colleagues' view that 'fiscal redistribution, unless it is extreme, can be a "win-win" strategy, thanks to its equality-inducing effects' (Ostry et al., 2018, p. 292).

5. The leaky bucket and the trade-off between growth and inequality

'The most insidious attacks on an equalisation programme are those that view the discovery of any leakage as *prima facie* evidence against the desirability of the programme' (Okun, 2015, 152). As already suggested in *Equality and Efficiency* (1975), Okun proposes identifying the level of leakage at which the additional benefit derived from greater equality offsets the additional cost of an efficiency reduction. Assessing this trade-off in monetary terms (by simply calculating the difference between aggregate benefit and aggregate loss) implicitly entails accepting an extreme utilitarian welfare function and, therefore, assuming that there is no aversion to inequality. This is *not* what Okun does (Atkinson, 2015, 13). However, Okun does not specify a welfare function embodying different weights attached to the income of different payers/recipients.

In this section it will be used the SWF under conditions of inequality aversion ($\varepsilon = 0.8$) to determine by how much social welfare would be reduced, in a subset of the cases already examined in Table 2, in the event of the pure 'vaporisation' of resources derived from tax revenue, under the two different taxation systems previously considered. One might harbour legitimate doubts about the assumption of pure 'vaporisation': after all, tax revenue, even if it did not result in effective social spending or were not transferred in full to citizens in the prescribed manner, would still end up in someone's pockets (including, possibly, some foreign nationals), thereby distorting income distribution in unintended ways but without reducing welfare as if there were a net loss of disposable income. Okun had in mind efficiency losses capable, in fact, of reducing market income or its rate of growth

[12] It would be even more *welfare-reducing* to switch from a *CTR* system to an *FT* system in the case of 10 % uniform growth, i.e. in the transition from $A0_{CRT}$ to $A2_{FT}$.

due to disincentive effects on labour supply or effort. But the exact determination of these disincentive effects requires the specification of questionable behavioural assumptions. The 'vaporisation' hypothesis in the following analysis, therefore, serves only to examine what would happen, by way of *reductio ad absurdum*, in an extreme case.

First the welfare losses are examined that occur when – as Okun (2015, 153) considers likely – only 80 or 90 % of resources remain in the 'bucket'; then it will be determined what percentage of tax revenue would need to be lost for welfare to return to the level guaranteed by market income, thereby offering a possible quantitative response to Okun's suggestion. Naturally, this is just one of many possible answers, closely dependent on the (moderate) value of inequality aversion adopted.

Table 3 presents comparisons between welfare indices with different levels of 'leaky bucket' loss, with reference to welfare derived from market income (MI column) and from post-tax income (*FT* and *CTR*), and the transfer of tax revenue in equal shares to the various income deciles. Naturally, the 'no bucket leakage' row shows the same welfare index values as those found in Table 2. The main results can be summarised as follows.

Table 3 – *The consequences of possible bucket leakages on welfare*

	A0			B0			A2			B2		
	MI	*FT*	*CTR*	*MI*	*FT*	*CTR*	*MI*	*FT*	*CTR*	*MI*	*FT*	*CTR*
	18.11			19.21			17.19			19.40		
no bucket leakage		18.89	19.21		19.54	19.71		18.79	19.52		19.71	19.90
10% leakage		18.80	19.02		19.42	19.58		18.65	19.31		19.63	19.77
20% leakage		18.70	18.82		19.31	19.45		18.50	19.10		19.55	19.64
break even leakage		74.5%	50.0%		28.0%	37.5%		86.5%	85.0%		40.0%	37.0%

i) Whether there are 10% or 20% losses of total revenue, the social welfare index after taxation and transfers remains higher than that derived from market income, regardless of how unequally the latter is distributed (A0, A2 or B0, B2).

ii) Even with 'leaky bucket' losses, the welfare indices of the more egalitarian distribution B0 are consistently higher than those of the highly unequal distribution (A0). This holds true whether taxation is flat above an exemption threshold (*FT*) or markedly progressive with a continuous tax rate (*CTR*). Greater progressivity is, however, advantageous in terms of welfare in all situations, even if the advantage diminishes as the leakage increases.

iii) Even in an economy with reduced growth (transition from B0 to B2), the benefit of redistributive measures is maintained despite the 'leaky bucket' losses being compounded by the reduced efficiency, allegedly due to greater equality in the distribution of market income.

(iv) When the distribution of market income is markedly and increasingly unequal (from A0 to A2), despite high growth, the 'leaky bucket' necessary to restore the welfare index to the

market distribution level is implausibly large. In A2, the transfer 'bucket' would lose as much as 86.5 % of its resources under a *FT* tax system and 85 % under a *CTR* system. With a very unequal market distribution, even highly inefficient equalisation programmes may increase social welfare compared with the 'no intervention' scenario. It is hard to believe that distortions of incentives to work, innovate or else can reach output losses as high as 80% of tax revenues.

v) With more egalitarian market distributions and lower growth (B0 and B2), the need for redistribution is lower; consequently, the 'leaky bucket' loss required to restore the welfare index to the (high) level of the market distribution is also lower. With both *FT* and *CTR*, the 'break even' point is reached with losses not exceeding 40 %. These are high figures, which Okun considered unlikely (especially when combined with the lower growth assumed in the transition from B0 to B2), but they highlight how equalisation programmes must be all the more efficient the less unequal the starting situation is.

6. Growth and inequality over time

The welfare index used so far depends as much on average income as on inequality. With constant inequality, therefore, a more unequal economy that grows consistently faster should, sooner or later, catch up with and surpass the welfare of a less unequal economy that is either stagnant or growing at a lower rate. This is, in fact, one of the arguments most frequently put forward in support of high growth, even if it is unequal. Table 1 has shown that a uniform 10 % growth in all incomes (from A0 to A1) is not sufficient to enable A1 to reach the level of welfare of B0 – where the average income is the initial level, in the absence of any growth – let alone the level of welfare of B2, where a 5 % uniform growth rate has been assumed.

One may therefore ask how long it would take, given a constant average annual growth rate in market income, for welfare starting from A0 to reach the level attained in B0. Different growth rates will be considered (higher for the more unequal economy and lower for the less unequal one) and simulations run to calculate the time required for the welfare of A to reach and exceed that of B, and what role taxation and transfers might play in the process, considering disposable income rather than market income.

To tackle the first problem, return to equation (4), which defines the welfare index. The growth required for the more unequal country (A) to reach the (initial) welfare of the more equal country (B) is identified. Defining b as the coefficient that multiplies all of A's incomes, one can write A's welfare as:

$$W_A^b = \frac{1}{n}\left[\frac{1}{1-\varepsilon}\sum_{i=1}^{n}(by_i)^{1-\varepsilon}\right] \quad (12)$$

One has to find $W_B^0 = W_A^b$, where W_B^0 represents the initial welfare of B (as shown in Table 1). b can be determined as follows:

$$b = \sqrt[(1-\varepsilon)]{\frac{W^0\, n\,(1-\varepsilon)}{\sum_{i=1}^{n}(y_i)^{1-\varepsilon}}} \quad (13)$$

Now, $b = 1 + g$, where g is the rate of income growth. To apply (13) to cases A0 and B0, the following data are used:

$$W_B^0 = 19.21; n = 10;\ \varepsilon = 0.8;\ \sum_{i=1}^{n} (y_i)^{1-\varepsilon} = 36.2224$$

thus:

$$b^{(1-\varepsilon)} = \frac{19.21 * \ 10 * 0.2}{36.2224} = 1.06067 \ (14)$$

$$b = \sqrt[0.2]{1{,}06067} = 1.34246$$

In conclusion, every y_i in A0 would need to grow by a total of 34.25% to achieve the same initial welfare as B0. The result can also be interpreted as follows: given that 1.06067 is the ratio of 19.21 to 18.11 (i.e. the ratio of the welfare indices in B0 and A0), all incomes in A0 must grow at a rate equal to the $(1 - \varepsilon)$ root of that ratio (minus 1). This seems reasonable, given that, by assumption, it is only income that increases welfare, and in the same proportion for everyone.

One can also calculate how many years are required for the welfare of A to reach that of B, assuming an annual growth rate of g for all y^i in A0. In this case, $b = (1 + g)^t$, i.e. each year, every income y^i in A0 will be $1 + g$ times the income of the previous year, or $y_i(t) = y_i(0)(1 + g)^t$. For $W_B^0 = W_A^b$ to be achieved, a number t of years is required that solves the following logarithm:

$$t = log_{(1+g)} b \ \ (15)$$

With an annual growth rate of $g = 3\%$, $t = log_{1{,}03}(1{,}34246) \cong 10$ years, whilst with $g = 2\%$, $t = log_{1{,}02}(1{,}34246) \approx 15$ years.

When comparing the two situations in terms of intertemporal welfare (with a social discount rate of zero), one should still consider two aspects: 1) throughout the period from 0 to t, starting from A0, welfare was lower than that achievable in B0; 2) to recoup this loss and thus make intertemporal welfare equal in the two cases, further years are required after the point at which welfare in A0 overtakes that in B0. With regard to point 1, with a constant 3 % yearly income growth, starting from A0, the growth in welfare from W_A^0 to $W_A^b = W_B^0$ would be 0.657 per annum. Since the (undiscounted) sum of the differences in welfare is greater than 5.5, to make up for these losses (point 2) with income growth continuing at 3 %, it would take roughly another 10 years; this time interval would be even longer whether growth rate were 2 %.

It is interesting to explore the case in which both economies, starting from A0 and B0, grow, but the more unequal economy (A) grows at a higher constant annual rate (let us assume $g_A = 2$ %) than the less unequal one (B, $g_B = 1$ %). How many years will it take for the higher growth rate of the more unequal country to bring its welfare level up to that of the less unequal low-growth country? Once again, constant inequality over time is assumed, i.e.

uniform growth of all incomes in both countries. The simulation allows one to find the value of t that satisfies $W_t^A = W_t^B$, where these values of the welfare indices are given by:

$$W_t^A = \frac{1}{n}\left[\frac{1}{1-\varepsilon}\sum_{i=1}^{n}\left[(1+g_A)^t y_i^A\right]^{1-\varepsilon}\right] \quad (16)$$

$$W_t^B = \frac{1}{n}\left[\frac{1}{1-\varepsilon}\sum_{i=1}^{n}\left[(1+g_B)^t y_i^B\right]^{1-\varepsilon}\right] \quad (17)$$

assuming that $g_A = 0.02$ and $g_B = 0.01$. The results, in the absence of taxation and transfers, are shown in Fig. 2.

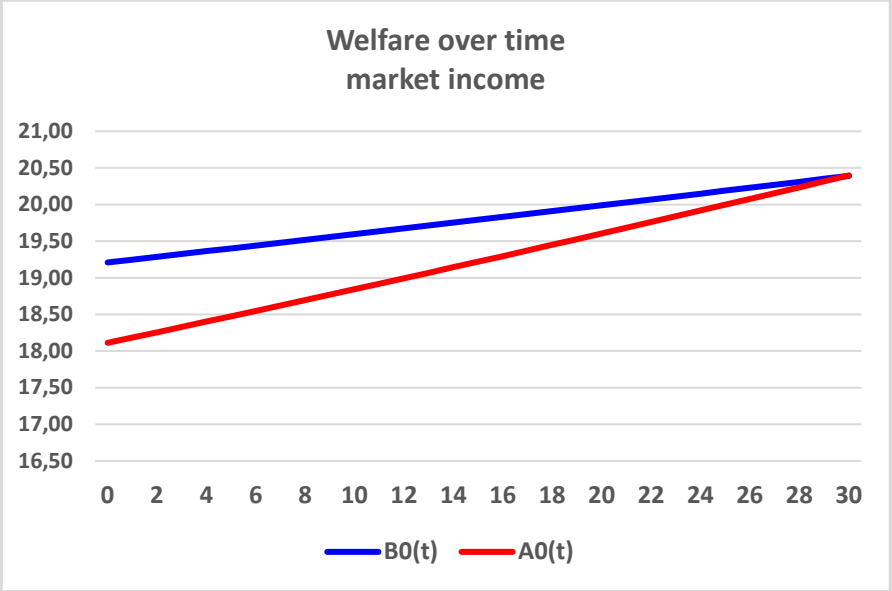


Fig. 2 – *Time for welfare in A (agr 2%) to reach welfare in B (agr 1%)*

It takes around 30 years for the fast-growing unequal country to reach the level of welfare of the slow-growth more egalitarian country. And this is without considering the time required for A to make up for the lower level of welfare enjoyed over those thirty years, i.e. the time needed to equalise intertemporal welfare.

However, if inequality were to initially increase in fast-growing A, whilst remaining constant in slow-growth B the time needed for A to converge to B's welfare level would be greatly extended and the loss of intertemporal welfare would widen considerably. In particular, it has been assumed that the incomes of the first 4 deciles, starting from A0, grow by 2.7% for the first 6 years, then by 2.6% up to year 14, and by 2.4% from year 15 to year 24; by 2.3 % from year 25 to year 32, and by 2.2 % from year 33 to year 40. The average incomes of the bottom six deciles, on the other hand, fall by 2 % over the first 40 years. As a result, aggregate growth averages around 2 %. From year 41 onwards, inequality no longer increases in scenario A and all incomes grow by 2 % per year.

In B, growth remains constant at 1 % per annum for all incomes (inequality is kept constant). The result of the simulation is shown in Fig. 3: a gradual widening of the welfare gap to the detriment of the high-growth (but increasingly unequal) country up to year 40. From that point onwards, thanks to inequality remaining unchanged, a process of convergence begins. However, the increased inequality means that it takes country A almost another 60 years to reach the same level as country B (rather than 30 years as in the case of unchanged market inequalities), with convergence only being achieved between years 97 and 98.

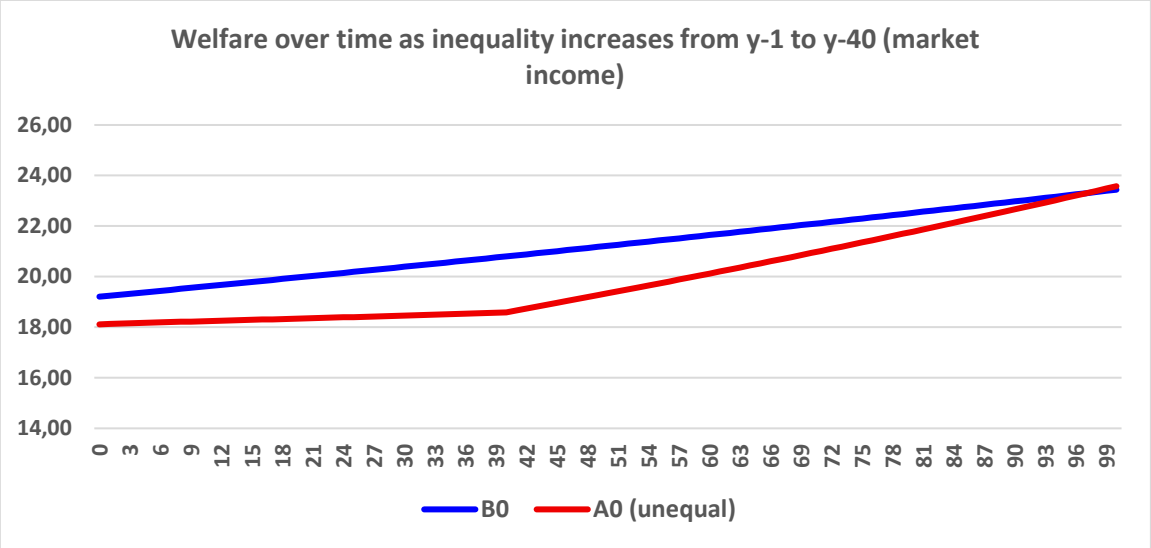


Fig. 3 *– Welfare dynamics with changing inequality in A and constant inequality in B*

Figures 4 and 5 show the trend in welfare, assuming the same two (uniform) market income growth rates used for Figure 2 (2% starting from A0 and 1% from B0), but taking into account taxation and transfers, in the two scenarios discussed in Section 4: a flat tax with an exemption up to €400 and a progressive tax, again with an exemption up to €400. In both cases, it is assumed that the tax rate structure remains constant over time, whilst tax revenue is transferred in equal shares to all deciles.

Taxation and redistribution considerably reduce the time required for the more unequal but faster-growing country (A) to reach the same level of welfare as the more egalitarian but slower-growing country (B). With a flat tax (slightly progressive, *FT*), the time is halved compared with the market income scenario: it takes just over 15 years for the welfare of A0 to equal that of B0. With progressive taxation, based on a continuous *tax rate* (*CTR*), the time is reduced further to 9 years. In other words, by shortening the time taken to achieve the same level of welfare, progressive taxation makes it more acceptable to maintain high market income inequality accompanied by sustained growth, compared with a flat tax.

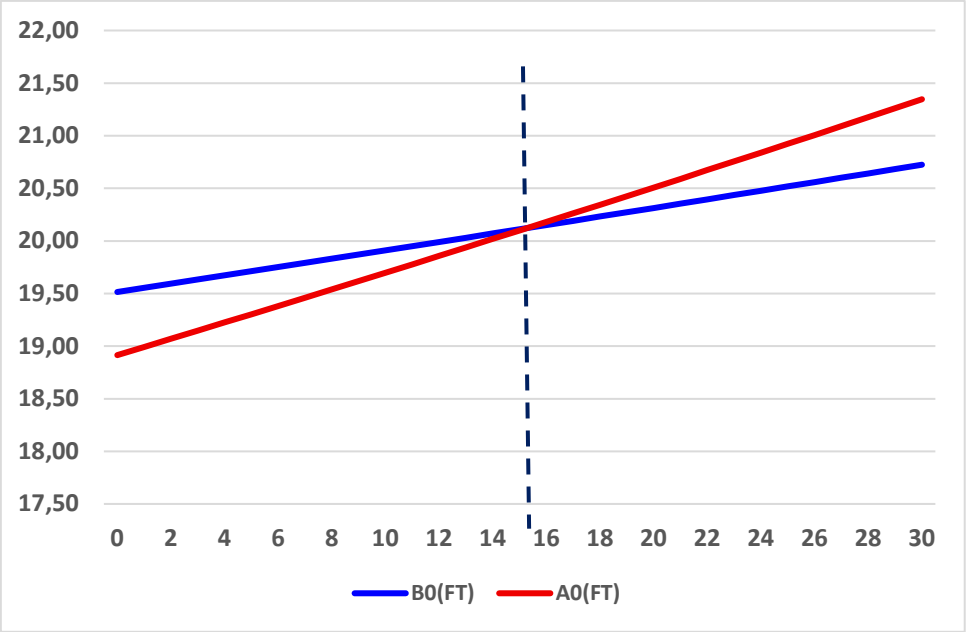


Fig. 4 *– Welfare dynamics with different growth rates, FT and redistribution*

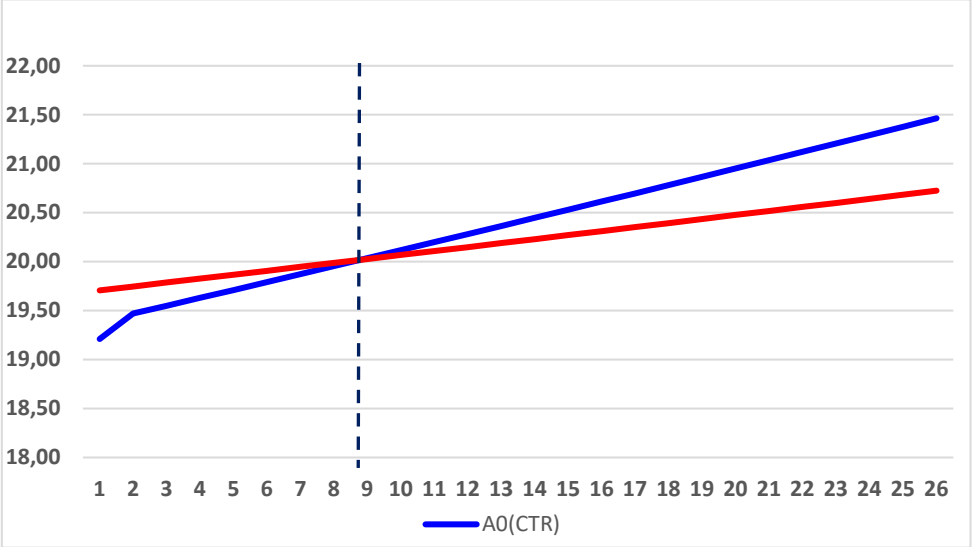


Fig. 5 – *Welfare dynamics with different growth rates, CTR and redistribution*

7. Individual aversion to inequality

The welfare and inequality indices used so far may raise a number of questions. One of these concerns the fact that, constructing those indices in a strictly individual perspective, the same inequality aversion (ε) was assumed for each individual ($\varepsilon_i = \varepsilon, \forall i$), regardless of whether one is rich or poor. As many behavioural studies show, the impact of inequality on individual welfare depends on the gap (real or perceived) between one's own income and that of a reference group. For the disadvantaged, the mechanism at play is not envy but a sense of fairness and a feeling of not being recognised. This effect has been observed both

in adults (Güth et al., 1982; Sanfey et al., 2003) and in children (Fehr et al., 2008), prompting research aimed at determining at what age this aversion to inequality develops (Sanchez Hernandez, Hyde, 2026).

Inequality in itself can lead to a loss of welfare both when it is disadvantageous (one's own income is lower than that of the reference group) and when, conversely, it is advantageous. This latter form of aversion has also emerged from a number of experiments and has led, in particular, to a reformulation of the theory of attitudes towards redistributive policies (Fehr-Schmidt, 1999; Galasso, 2003; Iacono, Ranaldi, 2021). Its impact on individual and social welfare could be relevant, but this will be disregarded in the following analysis, focusing exclusively on the aversion to disadvantageous inequality represented by the gap between one's own income and the maximum income, caused by the distress of feeling 'below' others which, moreover, is—after appropriate adjustments—fully captured by the concept of relative poverty.

Specifically, individual utility is assumed to be:

$$U_i = y_i^{\frac{y_i}{y_{max}}} \quad (18)$$

Obviously, $U_i < y_i$ for all those with an income below the maximum. This index is open to criticism. For example, it is not sensitive to absolute changes in income but only to relative ones. Yet several behavioural studies show that the former are often important (Ball, Chernova, 2005). Furthermore, it does not consider other dimensions of welfare and inequality, such as those relating to capabilities and opportunities (Sen, 1985, 2010; Nussbaum, 1997; Granaglia, 2022) and, more generally, to the possibility of leading a life of satisfaction and self-fulfilment. Nevertheless, it is reasonable to assume that economic inequalities are to some extent positively correlated with other dimensions of inequality (Franzini, Raitano, 2025, Chapter 4 and the literature cited therein) and that, therefore, examining the relationship between welfare and economic inequality is nonetheless an important first step in the right direction.

Summing up individual utilities (18) one can get a welfare index which can be applied to the cases examined above and compared to the Atkinson index . The results are set out in detail in the Appendix. In Table 4, a summary of the findings for the eight cases is presented, not only in terms of income but also in terms of the Gini index, the Atkinson index (WA) and the index incorporating individual inequality aversion (Wia), referring both to the entire population and to the 'poorest' 90 % only, for the reasons indicated above.

From Table 4, the correlation coefficients between the various indices are derived. Several points of interest emerge. The correlation coefficients are presented in table 5. One should immediately notice the strong negative correlation between Wia tot and Wia 90; that is, an increase in total welfare (due to the sharp rise in the welfare of the wealthiest 10 %) can easily be associated with a reduction in the welfare of the least wealthy 90 %.

Table 4 – *Indices of income, inequality and welfare (in various senses) for the eight cases*

	Income	Gini	WA	Total Wia	90 % Wia
A0	10,000	0.5	18.11	4,729	28.6
A1	11,000	0.469	18.46	5,199	29.2
A2	11,000	0.577	17.19	5,733	33.5
A3	11,000	0.338	19.28	4,338	37.8
B0	10,000	0.319	19.21	2,971	171.4
B1	11,000	0.27	19.58	3,261	180.6
B2	10,500	0.295	19.4	3,116	176.1
B3	10,500	0.219	19.69	2,793	293.3

Table 5 – *Correlation between various indices of welfare and inequality*

Gini – WA	-0.977
Gini – Wia tot	0.938
Gini – Wia 90%	-0.849
WA – Wia total	-0.893
Wia tot – Wia 90%	-0.895
WA – Wia 90%	0.737
Y - WA	-0.100
Y - Wia total	0.399
Y - Wia 90%	-0.252
Y - Gini	0.113

Such possibility challenges the argument that an increase in the income of those who are already very wealthy, without a reduction in others' incomes, can be regarded as a Pareto improvement (Feldstein, 1999): this is not the case if the welfare of the less wealthy is adversely affected for the reasons just mentioned.

Returning to the correlations (Table 5), it can also be noted that the Gini coefficient is correlated positively with Wia tot and negatively with Wia90: the reason is that a high Gini coefficient normally implies high income – and welfare – for those at the top. By similar reasoning, one can explain the strong positive correlations between WA and Wia tot (positive) and WA and Wia90 (negative).

It may also be considered that, by comparing situations of greater and lesser inequality as done previously, the uniform or 'equitably distributed' growth required to raise the welfare of the least wealthy 90 % to their level under a more egalitarian distribution would be very high and greater than that resulting from the use of the Atkinson index. This would imply an increase in the number of years required for the welfare of a fast-growing but unequal country to reach the welfare level of a slow-growth but more egalitarian country.

8. Summary of the main results and conclusions

We started discussing the properties of the inequality-averse social welfare index associated with Atkinson's inequality index and comparing such a welfare index with the extreme utilitarian welfare index which underpins the common identification of welfare with GDP (section 2). Making use of the welfare index derived from Atkinson, it was shown that, even assuming a limited social aversion to inequality, if the initial inequality is high, any percentage increase in it requires a greater increase in the average income to keep welfare unchanged. Meanwhile, a society with low initial inequality is 'willing to accept', in exchange for a given increase in average income, a greater rise in inequality than a society with high initial inequality.

Using as reference data those that reflect the fundamental characteristics of current inequality in the United States, on the one hand, and of countries such as Sweden and Denmark between the mid-1980s and the mid-1990s, on the other, it has been shown that greater inequality leads to lower welfare (section 3). When market income increases in equal proportion, the welfare index rises, thereby confirming the traditional hypothesis of a positive association between income growth and welfare growth. Conversely, with the same growth in average income, but skewed in favour of higher incomes, the welfare index can easily fall below its pre-growth level. The welfare gains of the rich does not compensate for the welfare losses of the poor. The Kaldor-Hicks compensation principle is no longer applicable. If the same growth favours lower-and middle-income earners, the benefits of greater equality are added to those due to average income growth. However, if a more egalitarian economy grows at a slower rate, welfare can still increase and reach levels higher than those achievable with higher growth in a more unequal economy.

A tax system characterised by continuous and sustained progressivity, accompanied by the equal redistribution of tax revenue, has a more favourable impact on social welfare than a flat tax system made mildly progressive by the existence of an exemption threshold (section 4). However, no form of taxation and redistribution can offset the negative effects of greater market inequality; the challenge, therefore, is to curb market inequality through pre-distributive policies (Franzini, 2022; Bozio *et al*., 2024; Kanbur, 2025).

Assuming, by way of reductio ad absurdum (section 5), that a portion of the tax revenue lost due to the alleged inefficiencies of the public sector (Okun's 'leaky bucket', 1975) were to 'vanish' and thus benefit no one, it has emerged that welfare after taxation (especially if progressive) and transfers is still greater than that associated with market incomes; indeed, this is all the more true the more unequal the initial distribution is, assuming the losses are of the magnitude deemed reasonable by Okun (10–20 %). Even if 'reasonable' leaky bucket losses were combined with low growth, the welfare benefits of the redistributive effects of

taxation (particularly if progressive) and transfers would still remain. Only with implausibly high losses (which no distortion of incentives could ever attain) would taxation and transfers lead to levels of welfare lower than those of the market.

If greater inequality were to mean faster growth (though many doubts have been raised on this point), a more unequal society – and therefore one with lower initial levels of welfare – could, sooner or later, reach and surpass the level of welfare enjoyed by the less unequal society, precisely thanks to higher growth. The examples in Section 6 show that – with the assumed moderate social aversion to inequality - the benefits of higher growth take a long time to materialise: with a constant 2 % growth rate, the more unequal country would take 30 years to reach the level of welfare of the country with a more equal distribution and a constant 1 % growth rate. It would take many more years to achieve intertemporal equality of welfare, that is, to recoup the full loss of welfare incurred over those 30 years due to greater inequality. The timeframe would be extended further—and significantly so—if the unequal country were to become even more unequal for a certain number of years. Taxation (particularly if progressive) combined with (uniform) redistribution of tax revenue would enable the most unequal country to recover its welfare more quickly, thus confirming that the effects of progressive taxation on social welfare are all the greater the higher the initial level of inequality.

Finally, a welfare index was used which, unlike Atkinson's, makes individual welfare dependent not only on one's own income but also on the gap between that income and the maximum income, in line with the notion of aversion to disadvantageous inequality adopted in several behavioural studies (section 7). Using the same cases examined in Section 4, it emerges that what appears to be an increase in social welfare can easily coexist with a reduction in welfare for the least wealthy 90 %. In other words, the welfare of the 'poor' 90 %, due to aversion to inequality, decreases when the income of the wealthiest 10 % increases, both in absolute terms and relative to their own income. Overall welfare increases, whilst the welfare of the bottom 90 % of the population deteriorates.

Moreover, if the welfare of the less wealthy is (negatively) affected by the further enrichment of the wealthiest, one can no longer say that an increase in income of the rich, without any poor's income loss, is a Pareto improvement. Standard correlations emerge between the various indicators relevant to welfare. Although these are easy to explain given the way they are constructed, it is useful to bear them in mind when addressing the relationship between inequality and welfare.

A few brief concluding remarks are offered below.

If GDP, as its 'inventor' was keen to point out, is not a measure of welfare and, therefore, if its growth is not equivalent to an increase in social welfare, then many of the reasons for prioritising GDP and its growth over other social objectives cease to apply. In this article, it was argued, specifically, that the reasons for regarding economic inequality as a non-issue – and even as a necessary condition for increased welfare, understood, of course, as GDP – no longer hold. This was done based on a set of hypotheses (certainly not the only possible ones) regarding the direct negative effects of inequality on social welfare – or rather, on a conception of social welfare that appears reasonable – as well as on the (not merely material) welfare of those who are harmed by inequality.

Naturally, adopting a different perspective, one could argue that inequality does not, in itself, have negative effects on social welfare, essentially because it increases the welfare of those who benefit from it, and does so to a greater extent than the reduction it causes in the welfare of those who are harmed by it. The mechanisms at work would, for example, be those linked to the satisfaction derived from observing a growing gap between oneself and others or, perhaps, to the euphoria brought about by the perception of power – in its various forms – associated with that gap.

All this can be argued by reviving, with the necessary adjustments, the idea that the marginal utility of income (and not only in terms of effects linked to the consumption of goods) is, especially above certain levels, increasing, and that all forms of utility contribute equally to the building of social welfare. But adopting this perspective effectively means elevating greed to a positive social value and making social welfare positively dependent on the greed of those who have the most. Yet for us, it is not easy to accept such a patch as social welfare.

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Appendix

Table A.1 – The Atkinson Welfare index and the Welfare index with individual aversion to inequality applied to our 8 cases

A0	Yi/Ymax	W	b0	Yi/Ymax	W	a1	Yi/Ymax	W	B1	Yi/Ymax	W
4700	1.00	4,700.00	2800	1.00	2,800.00	5,170	1.00	5,170.00	3,080	1.00	3,080.00
1,600	0.34	12.32	1,800	0.64	123.79	1,760	0.34	12.73	1980	0.64	131.61
900	0.19	3.68	1,000	0.36	11.79	990	0.19	3.75	1,100	0.36	12.20
800	0.17	3.12	950	0.34	10.24	880	0.17	3.17	1,045	0.34	10.58
650	0.14	2.45	850	0.30	7.75	715	0.14	2.48	935	0.30	7.98
400	0.09	1.67	750	0.27	5.89	440	0.09	1.68	825	0.27	6.04
350	0.07	1.55	650	0.23	4.50	385	0.07	1.56	715	0.23	4.60
300	0.06	1.44	550	0.20	3.45	330	0.06	1.45	605	0.20	3.52
200	0.04	1.25	400	0.14	2.35	220	0.04	1.26	440	0.14	2.39
100	0.02	1.10	250	0.09	1.64	110	0.02	1.11	275	0.09	1.65
10,000	2.13	4,728.58	10,000	3.57	2,971.40	11,000	2.13	5,199.18	11,000	3.57	3,260.55
90% W		28.58			171.40			29.18			180.55
A2	Yi/Ymax	W	A3	Yi/Ymax	W	B2	W	W	B3	Yi/Ymax	W
5700	1	5,700.00	4300	1.00	4,300.00	2,940	1	2,940.00	2,500	1	2,500.00
2,200	0.39	19.50	1,600	0.37	15.57	1,890	0.642857	127.73	1800	0.72	220.70
1,050	0.18	3.60	900	0.21	4.15	1,050	0.357143	11.99	1000	0.4	15.85
900	0.16	2.93	850	0.20	3.79	998	0.339456	10.42	950	0.38	13.54
600	0.11	1.96	800	0.19	3.47	893	0.303741	7.88	900	0.36	11.58
185	0.03	1.18	700	0.16	2.91	788	0.268027	5.98	850	0.34	9.91
150	0.03	1.14	600	0.14	2.44	683	0.232313	4.55	800	0.32	8.49
90	0.02	1.07	500	0.12	2.06	578	0.196599	3.49	700	0.28	6.26
80	0.01	1.06	400	0.09	1.75	420	0.142857	2.37	550	0.22	4.01
45	0.01	1.03	350	0.08	1.61	260	0.088435	1.64	450	0.18	3.00
11,000	1.93	5,733.48	11,000	2.56	4,337.75	10,500	3.57	3,116.05	10,500	4.20	2,793.33
90% W		33.48			37.75			176.05			293.33

The last row outside the table shows the W values relative to 90 % of the population, excluding the top 10 %, for the reasons explained in the text.

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