Income Inequality and Growth: New Insights from Italy

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Abstract

This paper investigates the impact of income inequality on economic growth in Italy during the period of 1967 to 2012. Specifically, using a technique that allows us to sort out long-run impacts from short-run impacts, we investigate whether income inequality benefits or harms growth, after controlling for human capital, labour, physical capital and inflation within an augmented growth model. Amid the existing debatable theoretical and empirical studies, our results suggest that income inequality has a negative and significant impact on growth in the long run. The negative impact of income inequality on growth still exist in the short run. However, the coefficient becomes insignificant. Overall, we gather that inequality hurts growth in the country. Based on this finding, we provide some policy implications.

JEL Codes: *D63; O15; O47; O52.*
Keywords: *Income inequality; Economic Growth; Italy.*

1. Introduction

Does inequality benefit or hurt growth? This question has remained controversial both in the theoretical and the empirical literature. Theoretically, Kuznets (1955) argues that the relationship between inequality and growth depends on the stage of economic development. During the early stage, high inequality promotes growth, while at the later stage of development high inequality is associated with falling growth. The same argument is put forth in Barro (2000). The studies that followed Kuznets (1955) have leaned on either the negative or positive side of the inequality-growth debate (see Mirrlees, 1971; Bourguignon, 1981; Venieris and Gupta, 1986; Rebelo, 1991; Galor and Zeira, 1993; Perotti, 1993; Persson and Tabellini 1994; Benhabib and Rustichini, 1996; Piketty, 1997; Aghion et al., 1999). The empirical literature is equally divisive on the inequality-growth relationship (see, e.g. Barro, 2000; Sylwester, 2000; Easterly, 2001; Banerjee and Duflo, 2003; Castellò-Climent, 2010; Cingano, 2014; Ostry et al., 2014; Halter et al., 2014).

The inequality-growth debate is clearly widely open for further probing. In this paper, we investigate whether inequality hurts or benefits growth in Italy during the period of 1967 to 2012. The Italian case is particularly interesting because the country has experienced rising income inequality during the past two decades or so. A quick look at some summary statistics will put the story in a proper perspective. The level of income inequality in Italy, measured by the Gini coefficient, was high during the late 1960s and the early 1970s. As the economy developed, the level of inequality gradually improved from 0.38 in 1970 to 0.33 in 1980, and further to 0.29 in 1990. However, inequality started to rise slowly since the 1990s. The Gini coefficient rose from its lowest level of 0.29 in 1990 to 0.33 in 2000, and further increased to 0.35 in 2012 (see Atkinson et al., 2016). The rising trend of income inequality is not unique to Italy. Many of the OECD countries such as France, Germany, Spain, the United Kingdom, and the United States have also experienced similar rising trend since the mid-1980s. The main concern is that, unlike these peer countries, Italy's income inequality is slightly above the OECD average. In 2013, Italy was ranked as the 13th highest in the level of income inequality among the OECD countries (see OECD, 2015).

From this brief analysis, it is evident that the issue of inequality in Italy deserves much attention. Beginning with Brandolini (1999), different studies have covered various aspects of inequality in the country. Brandolini (1999) describes the sample surveys on the personal distribution of incomes conducted in post-war Italy by concluding that the country's changes in income inequality can be classified into three episodes: stability or moderate decline between the early 1950s and the late 1960s; sharp fall in the 1970s; and fluctuations around a flattened trend since the early 1980s. Manacorda (2004), using the Survey of Households' Income and Wealth microdata, finds that the rise in inequality from the mid-1980s was the result of the compression of differentials operated over the previous years by the Scala Mobile. De Vogli et al. (2005) find that income inequality had an independent and more powerful effect on life expectancy at birth than did per capita income and educational attainment in Italy. Ballarino et al. (2009), analysing inequalities in educational outcomes (IEO) by class of family of origin in Italy and Spain find that class IEO diminished in the two countries, and that differences in the timing of expansion and change in IEO can be accounted for through the different institutional settings of the two countries. Lilla and Staffolani (2009), analysing the evolution of inequality in yearly and daily wages between and within groups of blue and white collar using the INPS-ISFOL database, find that between-group inequality increased in the 1990s as clerical wages grew slowly, whereas blue collars' wages remained nearly constant, and that within-group inequality increased only if measured by daily wages. Checchi and Peragine (2010) develop a new methodology for measuring opportunity inequality and for decomposing overall income inequality. Using this methodology, they find that inequality of opportunity accounts for about 20% of the overall income inequality in Italy, and that the South is characterized by a higher degree of opportunity inequality than the North, when population subgroups by gender is considered. Finally, Jappelli and Pistaferri (2010) find that income inequality is higher and has grown faster than consumption inequality in Italy. They also find that most of the increase in income inequality is earning-related owing to earning instability rather than to shifts in the wage structure. Jappelli and Pistaferri (2010) attribute the rising income inequality in the country to the changes in labour market institutions such as the abolition of the wage indexation system, and the extensive market reforms during 1990s and 2000s.

While the existing studies have explored the evolution of inequality and how inequality influences indicators such as health expectancy and social welfare, no study has analysed how the variable affects economic growth in Italy. This assertion is evident in the above studies. The studies that have analysed the inequality-growth relationship are based on cross-country and panel data, whereby Italy is included as one of the countries. It is therefore difficult to conclude that the findings of such studies will adequately represent the Italian experience. Hence, a specific study on Italy regarding the inequality-growth nexus will add to the existing body of knowledge. Moreover, unlike countries with similar evolution in inequality, Italy has a longer time series data on income inequality suitable for analysing the inequality-growth nexus. Against this backdrop, we investigate the impact of income inequality on growth in Italy by employing a technique allowing us to distinguish long-run impacts from short-run impacts. As a preview of our results, we find income inequality to have a negative and significant impact on growth in the long run. This is also the case in the short run except that the coefficient becomes insignificant. These results suggest that inequality hurts growth in the country. We draw the implications of these results.

The rest of the paper is organised as follows. In the next section, we review the theoretical and empirical literature on the inequality-growth debate. Then, in section 3, we present the methodology leading to the empirical results. Section 4 reports and discusses the empirical results. Section 5 concludes the paper.

2. Literature Review

2.1. Theoretical Relationship between Inequality and Growth

In his pioneering work, Kuznets (1955) argues that the relationship between inequality and growth depends on the level of economic development. He shows that at the early stage of economic development, which involves a shift of labour and other resources from the agricultural to the industrial sectors, individuals experience a rise in per capita income. Such a change increases the overall level of income inequality in an economy. Hence, at this stage of economic development, the relationship between inequality and growth tends to be positive. As the economy continues to develop, more agricultural workers are able to join the industrial sector. At the same time, the decrease in labour supply in the agricultural sector drives up their wages. The combined effects cause income inequality to fall. This means that, as the economy develops, the relationship between inequality and growth becomes negative. Therefore, the overall relationship between inequality and growth can be described as an inverted-U (Kuznets, 1955). That is, inequality first increases and later decreases as an economy develops (see Barro, 2000).

Following the pioneering work of Kuznets (1955), many theoretical studies have emerged, examining the macroeconomic links between income inequality and growth. Some of these studies argued for a negative relationship between income inequality and growth, while others contended that the two are positively related. In terms of the negative relationship, the imperfect-credit-markets models demonstrated that the ability to borrow and lend is constrained by asymmetric information and imperfect legal institutions. With limited access to credit, the ability to invest mainly depends on individuals' level of income and assets. Facing these constraints, the poor usually tend to forego the investment opportunities on human capital that offer relatively high rates of return. Therefore, a reduction in income inequality through the redistribution of income or assets from the rich to the poor tends to increase the amount and average return on investment, thereby increasing the rate of growth (see Galor and Zeira, 1993; Piketty, 1997; Barro, 2000). The support for this conclusion is found in political-economy models, which demonstrated that people tended to vote for redistribution of resources from the rich to the poor if the mean income is higher than the median income in an economy. These models contended that higher income inequality tends to have more redistribution through the political process. Such redistribution may distort economic decisions, resulting in the decline in investment, thereby hindering growth (see Perotti, 1993; Persson and Tabellini 1994). The negative impact of income inequality on growth may still arise even if there is no income redistribution. This happens if the rich try to prevent redistribution policies through lobbying, which consumes resources and promote corruption in an economy (see Perotti, 1993; Persson and Tabellini, 1994; Benabou, 1996; Barro, 2000). From a socio-political perspective, inequality of wealth and income can lead to social and political unrest, as the poor are motivated to engage in crime and riots. The political stability may also be compromised by revolutions, casting greater uncertainty on expected duration of laws and orders. These disruptive activities not only directly lead to the wastage of resources, but also hinder investment due to the concern over the protection of property rights. In this sense, high income inequality tends to lower productivity and hence growth (see Venieris and Gupta, 1986; Benhabib and Rustichini, 1996; Barro, 2000).

In contrast, other theoretical studies have demonstrated that income inequality is growth-enhancing. The first argument is related to the saving rates. According to this view, the saving rates of the rich are higher than those of the poor. This implies that the aggregate level of saving will be lowered if there is a redistribution of resources from the rich to the poor. Hence, increases in income inequality enhance saving rates, leading to higher economic growth (see Bourguignon, 1981; Aghion et al., 1999; Barro, 2000). The second argument is based on the investment indivisibility thesis. Some investment projects, such as setting up new industries or implementing new technology, involve huge setup costs. Owing to the huge setup costs, the concentration of asset ownership (i.e. higher inequality) is required to cover these costs to promote a new industry or technology. Therefore, high income inequality is critical in promoting growth, from this point of view (Aghion et al., 1999). Barro (2000) provided further support for this conclusion by showing that, in the imperfect-credit-market models, a positive effect of inequality on growth is possible if there are some setup costs associated with investment. He argued that increasing returns to investment only set in over some range of investment quality. For example, the returns to secondary schooling is superior to primary schooling in human capital investment (see Barro, 1996). The former also requires huge capital investment than the latter. A reduction in inequality lowers investment in secondary schooling by enhancing primary schooling which does not improve the overall level of returns to investment, thereby hurting growth. The third argument is related to the trade-off between productive efficiency and equality based on incentive considerations. According to Mirrlees (1971), in a moral hazard setting, where output depends on the unobservable effort of labour, rewarding workers based on their observable output performance instead of paying constant wage will encourage them to improve their marginal productivity. Therefore, income inequality due to performance incentives is conducive for growth. The incentive argument is also modeled in an aggregate economy by Rebelo (1991). He demonstrated that redistribution by taxation reduces the returns to saving. This lowers the incentive to invest, thereby hindering growth.

2.2. The Empirical Relationship between Inequality and Growth

Accord with the theoretical ambiguity, the empirical findings on the relationship between income inequality and growth is also far from conclusive. These findings can be broadly classified into three categories: (i) negative; (ii) positive; and (iii) inconclusive. Some empirical studies found inequality to exert a negative impact on growth. In this category, the earlier studies have used cross-sectional data to examine the inequality-growth association for a group of countries, including Italy. Such studies include Alesina and Rodrik (1994), Persson and Tabellini (1994), Clarke (1995), Birdsall et al. (1995), Perotti (1996), Tanninen (1999), Sylwester (2000), and Easterly (2001), among others. However, as Forbes (2000) pointed out, these cross-country studies failed to directly address the important policy question of how a change in the level of inequality within a given country will affect growth in that country. To address this issue, panel data has been used to specifically estimate how a change in a country's level of inequality affects growth within that country. The studies following this approach are Banerjee and Duflo (2003), Castellò-Climent (2010), Cingano (2014), and Ostry et al. (2014), among others. Note that these studies also found a negative inequality-growth relationship.

Although, most of the earlier studies have tended to document a trade-off between inequality and growth, recent studies have favoured a positive association between the two variables. These recent studies have mostly employed panel estimation methods to examine the inequality-growth linkage. The studies showing a positive association between inequality and growth include Li and Zou (1998), Deininger and Olinto (2000), Forbes (2000), and Halter et al. (2014), among others. Furthermore, there are studies documenting inconclusive results. For example, Birdsall and Londoño (1997) found that inequality has negative impact on growth, when other factors are excluded from the specification. However, the results become insignificant when income, land and human capital inequality are considered simultaneously. Similarly, Deininger and Squire (1998) also found a negative relationship between inequality and growth when regional dummies are controlled for. However, the results become insignificant when regional dummies are included in the estimation. Castellò and Domenéch (2002) also obtained a negative relationship when continental dummies are uncontrolled for. However, the results become insignificant when continental dummies are included in the regression. In addition, Barro (2000) found that the relationship between inequality and growth depends on the country's level of economic development. The relationship is positive in rich countries and negative in poor countries. Similarly, Knowles (2005) found a negative relationship in poor countries but insignificant relationship in high and middle-income countries.

From these empirical studies, it is clear that there is no general consensus on the relationship between income inequality and growth. The diverse and inconclusive empirical results reveal a number of limitations. First, many of the estimates of inequality on growth are not robust. When any forms of sensitivity analysis are performed, such as adding additional explanatory variables or regional dummies, the coefficient becomes insignificant (see, for example, Birdsall and Londoño, 1997; Deininger and Squire, 1998; Castellò and Domenéch, 2002). Second, data availability and quality is another issue. The constraint on the availability and quality of income distribution data across countries implies that inequality measures usually differ in terms of coverage, reference unit, and weighting of income. This may have affected the results of earlier studies which used heterogeneous national data (see Knowles, 2005; Cingano, 2014). Third, the coverage of countries is a limitation. The manner in which inequality affects growth depends on a country's level of economic development. For example, the negative impacts of credit market imperfection and socio-political instability are likely to play a more important role in developing countries than developed countries (see Barro, 2000; Cingano, 2014). As a result, studies that cover both developing and developed countries may capture an average effect, thereby giving misleading results (see, also, Barro, 2000; Knowles, 2005). Finally, measurement errors in inequality could generate positive or negative bias in the results, depending on how the errors related to the covariates in the specification (see Forbes, 2000).[1]

Our study re-assesses the inequality-growth relationship by focusing on Italy, thus avoiding regional or country-specific factors that can compromise the empirical estimates. Rather than using alternative proxies of income inequality that are more likely to be prone to measurement errors, we employ the widely-accepted measure, namely the Gini coefficient. The data on this inequality measure is consistent because it is drawn from a single source. Moreover, since data on inequality measures for most countries is particularly short, the one used in this study is quite long – that is from 1967 to 2012. In statistical sense, this data may not be long enough. We make up for this limitation by using econometric techniques argued to perform well in small samples. Finally, unlike most studies, we employ standard variables that often appear in growth models, including human capital, labour, physical capital, and inflation. Therefore, our empirical estimates are based on a quite standard growth regression. In the next section, we present the methods and the data leading to our empirical results.

3. Methodology

3.1. Empirical Specification

This study follows studies such as Barro (2000), Castellò and Domenéch (2002), Banerjee and Duflo (2003), Castellò-Climent (2010), Cingano (2014), and Ostry et al. (2014), and specifies the following growth model featuring income inequality:

$$lnY_t = \delta_0 + \delta_1 lnHC_t + \delta_2 lnL_t + \delta_3 lnK_t + \delta_4 lnGINI_t + \delta_5 lnINF_t + \delta_6 DUM_t + \mu_t \qquad (1)$$

where where Y is the aggregate output, HC is human capital, L is labour, K is capital, $GINI$ is income inequaltiy, INF is inflation, DUM is a dummy variable which captures structural breaks (taking values of zero and one, denoting no break and break, respectively), δ_i for $i = 1, \dots, 6$ are the shares of these inputs in the aggregate output, δ_0 is the constant term, t denotes time, ln is the natural logarithm operator, and μ_t denotes the white-noise error term.

The limitation of Eq. (1) is that it does not allow the policymaker to distinguish the short-run contribution of the factors to output from the long-run contribution. While growth policies are targeted toward achieving long-run results, production decisions take into account the short-run contribution of the factors of production. Therefore, by neglecting the short-run dynamics of the factors to the overall growth process, key insights are lost. Also, over a longer horizon, the determinants of growth may be non-stationary. Hence, estimating Eq. (2) results in spurious relationships. Towards this end, we re-specify the growth model to account for both short and long-run behaviour of the determinants. To do this, we employed the ARDL approach advanced by Pesaran *et al*. (2001). This approach is suitable because: First, it allows us to explore both the short and long-run relationships between growth and its determinants, including inequality; second, it does not impose the restrictive assumption that all the variables under study should be

[1] This point is much related to the second point.

integrated of the same order – it is applicable to variables that are integrated of order zero, one, or a mixture of both; and third, it is robust in finite samples (Pesaran *et al*., 2001). The ARDL specification of Eq. (1) will take the form:

$$\Delta lnY_t = \rho_0 + \rho_1 DUM_t + \sum_{i=1}^{q} \rho_{2i}\,\Delta lnY_{t-i} + \sum_{i=0}^{q} \rho_{3i}\,\Delta lnHC_{t-i} + \sum_{i=0}^{q} \rho_{4i}\,\Delta lnL_{t-i} + \sum_{i=0}^{q} \rho_{5i}\,\Delta lnK_{t-i} + \sum_{i=0}^{q} \rho_{6i}\,\Delta lnGINI_{t-i} + \sum_{i=0}^{q} \rho_{7i}\,\Delta lnINF_{t-i} + \sigma_1 lnY_{t-1} + \sigma_2 lnHC_{t-1} + \sigma_3 lnL_{t-1} + \sigma_4 lnK_{t-1} + \sigma_5 lnGINI_{t-1} + \sigma_6 lnINF_{t-1} + \varepsilon_t \quad (2)$$

where ε, ρ, and σ are the white-noise error term, the short-run coefficients, and the long-run coefficients of the model, respectively; and Δ is the first-difference operator. t denotes time period; q is the maximum number of lags in the model to be selected by the Akaike Information Criterion (AIC) or the Schwarz Information Criterion (SIC). The variables lnY, $lnHC$, lnL, lnK, $lnGINI$, and $lnINF$ are the natural logarithm of growth, human capital, labour, physical capital, income inequality, and inflation, respectively.

It has been demonstrated in most growth models that the size of a country's human capital stock is critical for its growth (Lucas, 1988; Barro, 1991). Therefore, a growth regression should contain human capital (Psacharopoulos, 1994; Barro, 2001). Besides, growth models have underscored the relevance of physical capital in economic growth (Barro, 1991; Mankiw et al., 1992). Most fast-growing countries boast of a substantial stock of physical capital (Grossman and Helpman, 1991). A higher inflation rate is not conducive for growth because it pushes up the cost of borrowing, leading to a fall in the rate of physical capital investment (Sarel, 1996; Barro, 2003). Hence, these variables are justifiably included in our specifications.

For the estimates of Eq. (2) to be reliable, the coefficients σ_1, σ_2, σ_3, σ_4, σ_5, and σ_6 must be jointly significant. In other words, the variables in Eq. (2) should be cointegrated for the results to be reliable. To verify the existence of cointegration, we test the hypothesis that $\sigma_1 = \sigma_2 = \sigma_3 = \sigma_4 = \sigma_5 = \sigma_6 = 0$. Pesaran et al. (2001) have derived two sets of critical values under this null hypothesis. The first set of critical values are derived by assuming that the variables in Eq. (2) are integrated of order zero, I(0), while the second set are derived by assuming that they are integrated of order one, I(1). We can reject the presence of cointegration if the calculated F-statistic is smaller than the first set of critical values. Similarly, we fail to reject the presence of cointegration if the calculated F-statistic is larger than the second set of critical values. The test is inconclusive if the calculated F-statistic lies in-between both sets of critical values.

3.2. Data

This study uses annual time series data covering the period 1967 to 2012. The time span is dictated by data availability. We sourced the data from Atkinson, Morelli, and Roser (2016), the Penn World Table version 9.0, and the World Development Indicators (2017) databases. In this study, we use: the log of GDP per capita (constant 2010 US$) to measure output (*Y*), so that its first-difference measures economic growth; human capital index to measure human capital (*HC*);

population growth (annual percentage) to measure labour (*L*); capital stock at constant 2011 national prices to measure physical capital (K); Gini coefficient to measure income inequality (*GINI*); and annual percentage change in consumer price index to measure inflation rate (*INF*). All the variables are in natural logarithm. Tables 1 and 2 show the description and justification of the variables, and their descriptive statistics, respectively.

Table 1: Description and Justification of Variables.

Variable	**Proxy**	**Source**	**Justifications**
Economic growth (Y)	GDP per capita (constant 2010 US$)	WDI (2017)	Arestis and Demetriades (1997), Temple and Wöβmann (2006), Hartwig (2012)
Human capital (HC)	Human capital index	Penn World Table 9.0	Li and Liu (2005), Mirestean and Tsangarides (2016)
Labour (L)	Population growth (annual percentage)	WDI (2017)	Temple and Wöβmann (2006), Rajan and Zingales (2008), Moral-Benito (2012)
Physical capital (K)	Capital stock at constant 2011 national prices	Penn World Table 9.0	Barro (1991), Mankiw et al. (1992), Grossman and Helpman (1991)
Income inequality (GINI)	Gini coefficient	Atkinson, Morelli, and Roser (2016)	Alesina and Rodrik (1994), Deininger and Squire (1998), Barro (2000), Forbes (2000)
inflation rate (INF)	Annual percentage change in consumer price index	WDI (2017)	Sarel (1996), Barro (2003), Boyd *et al.* (2001)

Table 2: Descriptive Statistics of the Variables.

Statistic	*lnY*	*lnHC*	*lnL*	*lnK*	*lnGINI*	*lnINF*
Mean	10.230	0.918	4.038	15.743	3.523	1.576
Median	10.327	0.932	4.043	15.836	3.511	1.562
Maximum	10.552	1.109	4.090	16.282	3.709	3.058
Minimum	9.622	0.702	3.961	14.809	3.378	-0.287
Std. Dev.	0.273	0.126	0.032	0.423	0.086	0.843
Skewness	-0.630	-0.169	-0.554	-0.629	0.466	0.174
Kurtosis	2.170	1.762	3.063	2.364	2.759	2.101
Jarque-Bera	4.365	3.154	2.359	3.808	1.777	1.779
P-value	0.113	0.207	0.307	0.149	0.411	0.411
Sum	470.592	42.229	185.748	724.155	162.051	72.514
Sum Sq. Dev.	3.364	0.712	0.046	8.042	0.331	31.945
Observations	46	46	46	46	46	46

Note: Std. Dev. and Sum Sq. Dev. denote, respectively, the standard deviation and the sum of squared deviation.

4. Empirical Results

4.1. Results of Stationarity Tests

As a preliminary analysis, we first test the stationary properties of variables in the model. Macroeconomic time series, such as the ones used in the study may contain structural breaks. Domestic incidents[2] such as the three episodes of recessions in Italy (i.e. 1981-83, 1992-93, 2001-04), two major pension reforms (i.e. the Amato reform of 1992 and the Dini reform of 1995), accession to the Eurozone in 1999, together with international developments such as the oil price shocks, the recent global financial crisis, the European sovereign debt crisis, may have generated shocks that could have distorted the paths of these variables, making an assumption of parameter constancy unrealistic. The presence of structural breaks has been found to distort the statistical power of unit root tests. According to Perron (1989), the standard unit root tests often fail to reject the null hypothesis of unit roots in the presence of structural breaks, even when there are clear indications of no unit roots. Since this discovery, some unit root tests have been developed to capture structural breaks in the underlying series. In this study, we utilize the Perron test developed by Perron (1997), and the Zivot-Andrews test developed by Zivot and Andrews (1992) to examine the stationarity properties of the underlying series. These tests are able to detect structural breaks in the transition parameter of the time series process. Table 3 shows the results of the unit roots tests of the variables in their levels and at first differences.

From these results, it is clear that lnY, lnL lnK, $lnGINI$, and $lnINF$ are stationary at their first differences. Looking at the results in Table 3, we may be convinced that $lnHC$ is not stationary. However, the overall p-value reported under the Zivot-Andrews test suggest that this conclusion can be rejected at 10% or less.[3] Moreover, there is no evidence in the literature suggesting that human capital is non-stationary after first difference. Therefore, having found that the variables are integrated of order zero or one, we then proceeded to test the evidence of long-run relationships between growth and its determinants by using the ARDL bounds testing procedure.

Table 3: Results of Stationarity Tests with Structural Breaks.

Perron Test

	Stationarity of all variables in levels						Stationarity of all variables at first differences					
Variable	No trend	Lag	Break date	Trend	Lag	Break date	No trend	Lag	Break date	Trend	Lag	Break date
lnY	-0.278	2	2005	-2.549	2	2004	-6.973***	0	1975	-7.146***	0	2002
lnHC	-1.196	1	1980	-3.504	1	1994	-4.024	0	1990	-3.002	0	1984
lnL	-5.179*	2	1999	-3.078	2	1976	-6.583***	4	1997	-3.156	4	1988
lnK	-2.821	4	2006	-2.821	4	1996	-4.167	3	1993	-5.343**	1	1984
lnGINI	-3.902	0	1974	-4.238	0	1984	-7.920***	0	1982	-7.383***	0	1994
lnINF	-2.845	0	1991	-4.350	0	1976	-8.427***	0	1974	-8.582***	0	1986

Andrew-Zivot Test

	Stationarity of all variables in levels	Stationarity of all variables at first differences

[2] For the macroeconomic conditions in Italy, the interested reader may refer to Jappelli and Pistaferri (2010).

[3] The p-values are not reported in order to keep the table clean. The data is available for replication purposes.

Variable	No trend	Lag	Break date	Trend	Lag	Break date	No trend	Lag	Break date	Trend	Lag	Break date
lnY	-0.104	2	2005	-2.031	2	2002	-6.530***	1	1986	-6.736***	1	2000
lnHC	-1.123	1	1981	-3.135	1	1988	-4.071	0	1991	-4.295	0	1991
lnL	-4.598*	3	1999	-4.015	3	1979	-6.376***	4	1998	-3.522	4	1992
lnK	-2.370	4	2006	-4.467	4	2006	-5.088**	4	1981	-6.482***	1	1981
lnGINI	-3.950	0	1975	-4.670	0	1980	-7.670***	0	1983	-7.810***	0	1983
lnINF	-2.899	0	1986	NA	NA	NA	-8.439***	0	1975	-8.358***	0	1986

Notes: *, ** and *** denote, respectively, 10%, 5% and 1% levels of significance. NA denotes non-applicable.

4.2. Results of the Cointegration Test

The results of the ARDL bounds test for cointegration reported in Table 4 show that the calculated F-statistic of 17.942 is higher than the upper bound critical values reported by Pesaran et al. (2001) at 1% level of significance. Therefore, lnY, $lnHC$, lnL, lnK, $lnGINI$, and $lnINF$ are cointegrated. Hence, we proceeded to estimate the short and long-run coefficients and discuss their relevance.

To do this, we first need to determine the optimal lag length used in the model by using AIC or the SIC. By restricting the maximum lag of the model to 3, we found that the preferred specification is ARDL(1, 0, 2, 3, 1, 3) for both the AIC and the SIC. Hence, the results obtained using these two criteria should be the same. Table 5 provides the resulting short and long-run estimates of the growth specification using these information criteria.

Table 4: Results of the Cointegration Test.

Dependent Variable	**F-statistic**	**Lags**	**Break Dates**
lnY	17.942***	1, 0, 2, 3, 1, 3	1975,1986, 2000, 2002, 2004, 2005

k=5	Lower Bound	Upper Bound
10%	2.26	3.35
5%	2.62	3.79
2.50%	2.96	4.18
1%	3.41	4.68

Notes: *** denotes 1% significance level. Lags are based on automatic AIC. k is the number of regressors. Critical values for lower and upper bounds are from Table CI(iii) Case III: Unrestricted intercept and no trend of of Pesaran *et al.* (2001, p.300). Regression errors are OLS.

Table 5: The long and short-run results of the selected ARDL specification.

Panel 1
Long-run results: Dependent variable is *lnY*

Regressor	Coefficient	Standard Error	T-statistics	P-value
lnHC	-3.403***	0.716	-4.755	0.000
lnL	-4.204***	0.244	-17.246	0.000
lnK	2.013***	0.192	10.505	0.000
lnGINI	-0.129***	0.042	-3.083	0.005
lnINF	-0.059***	0.017	-3.592	0.001
Constant	-0.858***	0.078	-10.941	0.000

Panel 2
Short-run results: Dependent variable is Δ*lnY*

Regressor	Coefficient	Standard Error	T-ratio	P-value
Δ*lnHC*	-3.668**	1.626	-2.256	0.033
Δ*lnL*	-1.9948***	2.965	-6.727	0.000
Δ*lnL(-1)*	2.2370***	3.194	7.004	0.000
Δ*lnK*	5.203***	0.425	12.257	0.000
Δ*lnK(-1)*	-1.287***	0.412	-3.120	0.004
Δ *lnK(-2)*	-0.742**	0.295	-2.519	0.018
Δ*lnGINI*	-0.019	0.038	-0.497	0.623
Δ*lnINF*	0.000	0.004	0.054	0.957
Δ*lnINF(-1)*	0.036***	0.006	6.266	0.000
Δ*llnINF(2)*	0.017***	0.004	3.943	0.001
ECM(-1)	-0.975***	0.095	-10.296	0.000

Notes:
(1) ** and *** denote 5% and 1% significance levels, respectively.
(2) Δ is the first difference operator.

Panel 1 of Table 5 reports the long-run results of the growth determinants. We found that, in the long run, physical capital has positive and significant impact on growth, while human capital, labour, income inequality and inflation have negative and significant impacts. First, let us look at the impact of income inequality on growth. We found that income inequality has a negative and significant impact on growth. In the long run, a 1% increase in income inequality will hurt growth by nearly 0.13%. This negative impact of inequality on growth could be explained from the socio-political perspective (see Venieris and Gupta, 1986; Benhabib and Rustichini, 1996; Barro, 2000). In Italy, the incidence of poverty has increased markedly during the 2000s compared with peer countries. The country was ranked as the 5th highest in poverty compared with OECD countries in 2011 (OECD, 2011). In particular, young people aged between 18 and 25 have faced higher poverty rate in Italy than the average in OECD countries (see OECD, 2011, 2015). The rising poverty has led to rising income inequality in the country. That, combined with the European sovereign debt crisis, increasing joblessness, industrial actions, and frequent public protests have hurt the country's growth prospects. The negative relationship between inequality and growth has also been documented in other empirical studies including Alesina and Rodrik (1994), Clarke (1995), Birdsall et al. (1995), Perotti (1996), Banerjee and Duflo (2003), Castellò-Climent (2010), and Ostry et al. (2014), among others.

Considering the other growth determinants, we gather from the results that physical capital plays a positive and significant role in growth. In particular, a 1% increase in physical capital leads to a 2.01% increase in growth, in the long run. This is in line with both the neoclassical and endogenous growth models, which argued that higher levels of investment increase productivity and hence the growth of an economy (see Mankiw et al., 1992; Barro, 2003; Moral-Benito, 2012; Mirestean and Tsangarides, 2016). In addition, labour is found to have a negative and significant influence on growth. A 1% increase in labour hurts growth by about 4.2%, in the long run. The negative impact is due to the reason that higher population growth will lower the capital per capita, hence reducing the output per capita. This result is also documented in Moral-Benito (2012). In terms of the impact of inflation on growth, we found that it has a negative and significant impact on growth – although, the impact is mild. A 1% increase in inflation hinders growth by about 0.06%. Some studies (see, e.g., De Gregorio, 1993, 2006) suggested that higher inflation could increase the cost of capital, which in turn lowers capital accumulation, capital productivity, and economic growth. A similar empirical finding is documented in Aghion and Saint-Paul (1998), and Dotsey and Sarte (2000). Regarding the impact of human capital on growth, contrary to the conventional wisdom, we found that it has a negative and significant impact on growth. The negative impact is quite strong. A 1% increase human capital hinders growth by nearly 3.4%, in the long run. The negative impact of inequality on growth could be passed-through from human capital. This may be so because the recent evidence suggests that joblessness has increased in Italy during the last two decades, indicating that the funds channelled into developing human capital do not enhance growth. The young trained population do not have jobs to transfer their skills into productive purposes. This view may not entirely capture the Italian story. Hence, given this unique finding, further research on human capital and growth in this country should be conducted to shed more light.

We now turn to Panel 2 of Table 5 for the short-run results. Similar to the long-run results, human capital also show a negative and significant impact on growth in the short run. In addition, income inequality also shows a negative impact on growth which is similar to the long-run result, despite the fact that the coefficient is insignificant. The short-run coefficients of labour, capital and inflation, all show differential impacts on growth at different lags. Finally, the results show that the coefficient of the error-correction term, which measures the short-run dynamics and the adjustment towards the long-run equilibrium path, is negative and statistically significant. The results suggest that, when the variables drift apart from the equilibrium level in the short run, they adjust back in the next period at a rate of 0.98%.

Overall, the selected ARDL specification is well-fitted with the adjusted R-squared equals 90%. Table 6 reports the diagnostic tests. The tests reveal that the estimates are free from serial correlation, heteroscedasticity, and functional misspecification. In addition, Figures A.1 and A.2 in the Appendix show the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of recursive residuals (CUSUMSQ) plots, respectively. They show that the estimates reported above are structurally stable. Therefore, the results are reliably estimated.

Table 6: Results of the diagnostic tests.

Test	Statistic	*P*-value
Serial Correlation: CHSQ(1)	0.0004	0.984
Heteroscedasticity: CHSQ (1)	0.045	0.831
Functional Form: F(1, 25)	0.428	0.519
Normality: CHSQ (4)	7.117	0.130

5. Conclusion

In this paper, we investigated the impact of income inequality on growth in Italy during the period of 1967 to 2012. Specifically, we investigated whether income inequality hurts or benefits growth in the country after controlling for human capital, labour, physical capital and inflation. Using a technique permitting us to distinguish between long-run impacts and short-run impacts, we found that income inequality has a negative and significant impact on growth in the long run. In the short run, the negative impact of income inequality on growth still holds, despite the fact that the coefficient became insignificant. In addition, we found that physical capital plays a positive and significant role in growth, while labour, human capital and inflation inhibit growth, in the long run. These findings suggest that policymakers should pursue policies that reduce the level of income inequality. A comprehensive approach to tackling inequality should be adopted. According to Jappelli and Pistaferri (2010), the cause of rising level of income inequality in Italy is mainly due to the changes in labour market institutions. These changes led to an increase in the degree of earnings' instability, thereby increasing the level of income inequality. Against this background, perhaps policies such as flexible working-hours arrangement and childcare support should be pursued to promote women participation in the labour market (see, also, OECD, 2015). In addition, other programmes to improve access to the public services such as high-quality education, on-the-job training, and healthcare, should be pursued (see, also, Cingano, 2014). On the one hand, these programmes constitute a long-term social investment, which will directly boost economic growth through increases in physical capital. On the other, these programmes will create greater equality of opportunities in the long run, which will be beneficial to long-run growth. Lastly, a better design of tax and benefit systems is needed to ensure an efficient redistribution to ease the needs of the lower income group, while minimising the distortionary effects of redistribution in the country. The implications drawn here are by no means exhaustive. Hence, further policy implications may be inferred from our findings. One way future studies could extend our results is by using microdata on inequality and firm level output. Although, this will involve substantial cost in terms of data assortment and funding, evidence from such an extension will yield a more comprehensive picture on the inequality-growth relationship in Italy.

References

Aghion, P., Caroli, E., & Garcia-Penalosa, C. (1999). Inequality and economic growth: the perspective of the new growth theories. *Journal of Economic literature*, *37*(4), 1615-1660.

Aghion, P. & Saint-Paul, G. (1998). Virtues of bad times interaction between productivity growth and economic fluctuations. *Macroeconomic Dynamics*, 2(03), 322-344.

Alesina, A., & Rodrik, D. (1994). Distributive politics and economic growth. *The Quarterly Journal of Economics*, *109*(2), 465-490.

Arestis, P., Demetriades, P. (1997). Financial development and economic growth: Assessing the evidence. *The Economic Journal,* 107, 783-799.

Atkinson, Morelli, & Roser (2016). Chartbook of Economic Inequality. (www.chartbookofeconomicinequality.com/)

Ballarino, G., Bernardi, F., Requena, M., & Schadee, H. (2009). Persistent inequalities? Expansion of education and class inequality in Italy and Spain. European Sociological Review, 25(1), 123-138.

Banerjee, A. V., & Duflo, E. (2003). Inequality and growth: What can the data say? *Journal of economic growth*, *8*(3), 267-299.

Barro, R. J. (1991). Economic Growth in a Cross Section of Countries. *Quarterly Journal of Economics* 106(2): 407–443.

Barro, R. J. (1996). *Determinants of economic growth: a cross-country empirical study* (No. w5698). National Bureau of Economic Research.

Barro, R. J. (2000). Inequality and Growth in a Panel of Countries. *Journal of economic growth*, *5*(1), 5-32.

Barro, R. J. (2001). Human capital and growth. *The American Economic Review*, 91(2), 12-17.

Barro, R. J. (2003). Determinants of economic growth in a panel of countries. *Annals of Economics and Finance*, *4*, 231-274.

Benabou, R. (1996). Heterogeneity, stratification, and growth: macroeconomic implications of community structure and school finance. *The American Economic Review*, 584-609.

Benhabib, J., & Rustichini, A. (1996). Social conflict and growth. *Journal of Economic Growth*, *1*(1), 125-142.

Birdsall, N., Ross, D., & Sabot, R. (1995). Inequality and growth reconsidered: lessons from East Asia. *The World Bank Economic Review*, *9*(3), 477-508.

Birdsall, N., & Londoño, J. L. (1997). Asset inequality matters: an assessment of the World Bank's approach to poverty reduction. *The American Economic Review*, *87*(2), 32-37.

Bourguignon, F. (1981). Pareto superiority of unegalitarian equilibria in Stiglitz'model of wealth distribution with convex saving function. *Econometrica: Journal of the Econometric Society*, 1469-1475.

Boyd, J. H., Levine, R., & Smith, B. D. (2001). The impact of inflation on financial market performance. *Journal of Monetary Economics,* 47, 221–248.

Brandolini, A. (1999). The distribution of personal income in post-war Italy: source description, data quality, and the time pattern of income inequality. Giornale degli economisti e Annali di economia, Vol. 58(112), No. 2 183-239.

Castelló-Climent, A. (2010). Inequality and growth in advanced economies: an empirical investigation. *Journal of Economic Inequality*, *8*(3), 293-321.

Castelló, A., & Doménech, R. (2002). Human capital inequality and economic growth: some new evidence. *The economic journal*, *112*(478).

Checchi, D., & Peragine, V. (2010). Inequality of opportunity in Italy. Journal of Economic Inequality, 8(4), 429-450.

Cingano, F. (2014). Trends in Income Inequality and its Impact on Economic Growth. *OECD Social, Employment and Migration Working Papers*, No. 163, OECD Publishing, Paris. http://dx.doi.org/10.1787/5jxrjncwxv6j-en

Clarke, G. R. (1995). More evidence on income distribution and growth. *Journal of development Economics*, *47*(2), 403-427.

De Gregorio, J. (1993). Inflation, taxation, and long-run growth. *Journal of Monetary Economics*, 31(3), 271-298.

De Gregorio, J. (2006). *Economic Growth in Latin America: From the Disappointment of the twentieth Century to the Challenges of the Twenty-first*. Banco Central de Chile.

Deininger, K., & Olinto, P. (2000). Asset distribution, inequality, and growth. The World Bank Development Research Group *Working Paper No. 2375*.

Deininger, K., & Squire, L. (1998). New ways of looking at old issues: inequality and growth. *Journal of development economics*, *57*(2), 259-287.

De Vogli, R., Mistry, R., Gnesotto, R., & Cornia, G. A. (2005). Has the relation between income inequality and life expectancy disappeared? Evidence from Italy and top industrialised countries. Journal of epidemiology and community health, 59(2), 158-162.

Dotsey, M. & Sarte, P. D. (2000). Inflation uncertainty and growth in a cash-in-advance economy. *Journal of Monetary Economics*, 45(3), 631-655.

Easterly, W. (2001). The middle class consensus and economic development. *Journal of economic growth*, *6*(4), 317-335.

Forbes, K. J. (2000). A Reassessment of the Relationship between Inequality and Growth. *American economic review*, 869-887.

Galor, O., & Zeira, J. (1993). Income distribution and macroeconomics. *The Review of Economic Studies*, *60*(1), 35-52.

Grossman, G. & Helpman, E. (1991). Innovation and Growth in the Global Economy (Cambridge, Mass: MIT Press).

Halter, D., Oechslin, M., & Zweimüller, J. (2014). Inequality and growth: the neglected time dimension. *Journal of Economic Growth*, *19*(1), 81-104.

Hartwig, J. (2012). Testing the growth effects of structural change. *Structural Change and Economic Dynamics*, *23*(1), 11-24.

Jappelli, T., & Pistaferri, L. (2010). Does consumption inequality track income inequality in Italy? *Review of Economic Dynamics*, *13*(1), 133-153

Knowles, S. (2005). Inequality and economic growth: the empirical relationship reconsidered in the light of comparable data. *The Journal of Development Studies*, *41*(1), 135-159.

Kuznets, S. (1955). Economic growth and income inequality. *The American Economic Review*, 1-28.

Li, X., & Liu, X. (2005). Foreign direct investment and economic growth: an increasingly endogenous relationship. *World development*, *33*(3), 393-407.

Li, H., & Zou, H. F. (1998). Income inequality is not harmful for growth: theory and evidence. *Review of development economics*, *2*(3), 318-334.

Lilla, M., & Staffolani, S. (2009). The evolution of wage inequality in Italy. Applied Economics, 41(15), 1873-1892.

Lucas, R. E. (1988). On the mechanics of economic development, Journal of Monetary Economics, Volume 22, 1, 3-42.

Manacorda, M. (2004). Can the Scala Mobile explain the fall and rise of earnings inequality in Italy? A semiparametric analysis, 1977–1993. Journal of labor economics, 22(3), 585-613.

Mankiw, G. N., Romer, D., & Weil, D. N. (1992). A contribution to the empirics of economic growth*. Quarterly Journal of Economics, 107* (2), 407–437.

Mirestean, A., & Tsangarides, C. G. (2016). Growth Determinants Revisited Using Limited-Information Bayesian Model Averaging. *Journal of Applied Econometrics*, *31*(1), 106-132.

Mirrlees, J. A. (1971). An exploration in the theory of optimum income taxation. *The Review of Economic Studies*, *38*(2), 175-208.

Moral-Benito, E. (2012). Determinants of economic growth: a Bayesian panel data approach. *Review of Economics and Statistics*, *94*(2), 566-579.

Organisation for Economic Co-operation and Development (OECD) (2011). An overview of growing income inequalities in OECD countries: main findings. *Divided We Stand: Why Inequality Keeps Rising, OECD publishing, Paris*.

Organisation for Economic Co-operation and Development (OECD) (2015). *In It Together: Why Less Inequality Benefits All*. OECD Publishing.

Ostry, M. J. D., Berg, M. A., & Tsangarides, M. C. G. (2014). *Redistribution, inequality, and growth*. International Monetary Fund.

Penn World Table, version 9.0. (2017). Available at < www.ggdc.net/pwt>, accessed on 11th Febuary 2017.

Persson, T., & Tabellini, G. (1994). Is inequality harmful for growth?. *The American Economic Review*, 600-621.

Perotti, R. (1993). Political equilibrium, income distribution, and growth. *The Review of Economic Studies*, *60*(4), 755-776.

Perotti, R. (1996). Growth, income distribution, and democracy: what the data say. *Journal of Economic growth*, *1*(2), 149-187.

Perron, P. (1989). The great crash, the oil price shock, and the unit root hypothesis. *Econometrica* 57(6), pp1361-1401.

Perron, P. (1997). Further evidence on breaking trend functions in macroeconomic variables. *Journal of Econometrics*, *80*(2), 355-385.

Pesaran, H. M., Shin, Y. & Smith, R. J. (2001). Bounds testing approach to the analysis of level relationships. *Journal of Applied Econometrics,* 16(3), 289–326.

Piketty, T. (1997). The dynamics of the wealth distribution and the interest rate with credit rationing. *The Review of Economic Studies*, *64*(2), 173-189.

Psacharopoulos, G. (1994). Returns to investment in education: A global update. *World Development*, 22(9), 1325-1343.

Rajan, R.G., & Zingales, L. (2008). Financial dependence and growth. *American Economic Review* 88(3), 559–586.

Rebelo, S. (1991). Long-run policy analysis and long-run growth. *Journal of political Economy*, *99*(3), 500-521.

Sarel, M. (1996). Nonlinear Effects of Inflation on Economic Growth. *IMF Staff Papers*, 43, 199-215.

Sylwester, K. (2000). Income inequality, education expenditures, and growth. *Journal of Development Economics*, *63*(2), 379-398.

Tanninen, H. (1999). Income inequality, government expenditures and growth. *Applied Economics*, *31*(9), 1109-1117.

Temple, J., & Wößmann, L. (2006). Dualism and cross-country growth regressions. *Journal of Economic Growth*, *11*(3), 187-228.

Venieris, Y. P., & Gupta, D. K. (1986). Income distribution and sociopolitical instability as determinants of savings: a cross-sectional model. *Journal of Political Economy*, *94*(4), 873-883.

World Development Indicators. (2017). World Bank, Washington, D.C. Available at < http://data.worldbank.org/data-catalog/world-development-indicators>, accessed on 24th February 2017.

Zivot, E. & Andrews, D. W. K. (1992). Further Evidence on the Great Crash, the Oil-Price Shock, and the Unit-Root Hypothesis. *Journal of Business and Economic Statistics* 10(3), 251-270.

Appendix

Figure A.1: Plot of Cumulative Sum of Recursive Residuals (CUSUM)

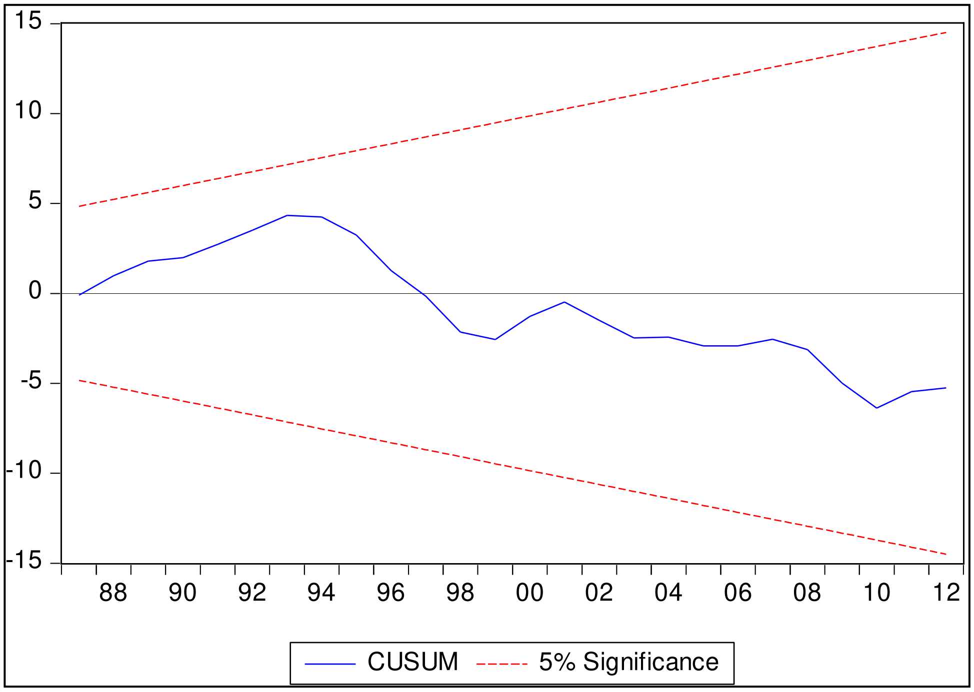

Figure A.2: Plot of Cumulative Sum of Squares of Recursive Residuals (CUSUMSQ)