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Keyword: growth, redistribution, inequality, European Union

JEL Cassification: H23, O47, D63

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The findings, interpretations and conclusions expressed in this paper are entirely those of the authors. Any mistakes and all interpretations are the authors and theirs only.
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## 1. Introduction

The relation between inequality and growth, as well as between redistribution and growth has been heavily analysed empirically in the recent decades. While there is more or less consensus in the empirical regularity that inequality is harmful for growth, at least in the medium term, the impact of redistribution on growth is more disputed in the literature.

While there is significant amount of evidence that inequality and growth are related and that redistribution affects growth, we still know fairly little about how the two variables are interrelated. As argued by Berg et al. (2018), *"the literature almost without exception does not examine the role of both redistribution and inequality in growth in a common empirical framework"*. Following this argument, we analyze the impact of both, inequality before taxes, and redistribution on economic growth in the short run in a cross-country set up of 25 European countries, over the period from 2007 until 2019.

So far, cross-country studies, such as Berg et al. (2018), have measured redistribution using the Redistributive Effect (RE), defined as the difference between the Gini coefficient of market income and the Gini coefficient on disposable income. However, data on these measures are often scarce and imperfect. As argued by Hammer et al. (2023), the RE might additionally mix up redistribution across age-groups, via pension benefits, and redistribution to low-income households, a property that might lead to wrong implications when analyzing the impact of redistribution on growth, especially when it comes to economic policy making.

For this reason, we introduce a new redistribution measure, which we call the Net Benefit Share (NBS), that is based on micro-data from the EU-SILC. The NBS measures the effective redistribution of a tax-benefit system to a specific sub-population. In this paper, we use the Q1 NBS, the share of total net benefits that are received by the poorest 25% of the population. This allows us to analyze the impact of effective redistribution specifically to people with low incomes, in a cross-country setup.

We show that the inequality of market income positively affects short-term economic growth - as suggested by some authors. However, contrary to most previous findings, we show that targeted redistribution to low-income households significantly increases economic growth in the short run. To be more precise, we show that an increase in the Q1 NBS (indicating more redistribution to low-income households, defined as the poorest 25% in the income distribution) from the level of Spain (18.1% in 2019) to the level of the Netherlands (39.3% in 2019) would increase economic growth by about 1.1pp in the short run.

Additionally, we analyse the transmission channels of inequality and redistribution to growth. Our results indicate that inequality impacts economic growth via the productivity channel. Higher inequality leads to higher productivity and therefore to higher growth in the short run. For the transmission channel of redistribution to growth, we find that redistribution to low-income households has a significant and positive impact on private investment and on consumption, indicating that a more targeted redistribution leads to a higher consumption growth, as well as to higher private investment, and therefore to higher economic growth. This result is not surprising, given that low-income households have a higher propensity to consume, therefore targeted redistribution potentially curbs consumption and therefore short-term growth. Additionally, more targeted redistribution goes along with lower public intervention and can therefore allow for more private investment, as the public money is used more effectively.

Our results are consistent across the variety of estimation methods and robustness checks. Our two main approaches (FE estimates and sGMM) lead to similar results, for both the impact of inequality and the impact of redistribution on economic growth. Additionally, we show that for countries that redistribute many resources to high-income households, economic growth is lower than in those countries that redistribute less. In sum, it seems unlikely that our results are driven by the techniques that we apply to the data.

The policy implications of our results are quite substantial. First, the results suggest that the

relationship between redistribution and growth is more complex than is usually discussed in policymaking. Many European countries redistribute large amounts of tax money to higher-income groups, for example through public pension entitlements or subsidies to specific industries such as agriculture. In order to promote growth, this type of redistribution should be reduced and replaced by measures that specifically target the poor. Second, looking at the Gini coefficient is not a good measure of the impact of redistribution. Third, and more profoundly, the trade-off between efficiency and equity may be much less pronounced than is sometimes believed - provided that equity is the result of targeted redistributive policies.

The rest of the paper is organised as follows: Section 2 describes the literature on the relationship between inequality and growth, the relationship between inequality and redistribution, and the relationship between redistribution and growth. Section 3 introduces our new measure of redistribution that we use for the analysis. In Section 4, the data and the methodology used in this paper are described. Section 5 presents the results of our analysis and Section 6 concludes.

## 2. Related Literature

There are two strands of literature most relevant for this paper: the relationship between inequality and growth, and the relationship between inequality and (preferences for) redistribution indirectly affecting growth.

The relationship between economic growth and inequality has long been debated. There are several theoretical channels, which are believed to link inequality to economic growth. A causal relationship from growth to inequality can be though of for several reasons. First, as argued by Kuznets (1955), sectoral transformation of the economy related to growth will first cause inequality to increase and subsequently decrease, due to changes to factor prices. When an economy undergoes a change from employment primarily in the agricultural sector, the per capita income of those individuals increases, as their skills are in demand in those sectors. Individuals who remain

in the agricultural sector keep earning a low income. Over time, shortage of labor in the agricultural sector will cause this factor price to increase and reduce inequality again. This view has also been supported by e.g., Robinson (1976).

The second channel is related to technological change. During the early stages of technological development, innovative ideas in the economic sector result in increases in income inequality. This is due to the fact that new technology requires highly skilled labor and training, which raises wages in these sectors compared to those sectors which use old technology. As the economy moves to the more mature stage of technological development, income inequality decreases, the reason being that as more labour shifts to the sector using new technology and equalization of factor prices. While this channel has long been discussed e.g., by Galor and Tsiddon (1997), it became more relevant in the context of the changes to labor rents related to digitization of the economy Acemoglu (2002) - "the skilled-biased technological change" (see also Card and DiNardo, 2002).

While there are reasons to believe that growth affects inequality, an opposite relation is also theoretically possible: in which the causality runs from inequality to growth. Galor and Zeira (1993) argue within a theoretical model framework that income and wealth inequality is harmful for growth, by harming investment in human capital. As they state, their theoretical results highlight "the importance of having a large middle class for the purpose of economic growth". A further direct channel resolves around political-economic issues: the rise of socio-political unrest, stemming from high income inequality, may dampen growth, because people to engage in strikes, criminality and other unproductive activities (Barro, 2000; Benhabib and Rustichini, 1996) or through the effect on savings (Venieris and Gupta, 1986), which would decrease in unstable political conditions. Furthermore, social polarization may reduce the security of property and contract rights (Keefer and Knack, 2002) or impede the social solidarity that is needed in times of crisis and sustain growth (Rodrik, 1999). Furthermore, high inequality could be related to abuse of political power through lobbying and rent-seeking, preventing efficient allocation of resources, and

harming growth (Banerjee and Duflo, 2003).

On the other hand, inequality can theoretically promote growth by increasing saving and investment, because rich people tend to save more Kaldor (1957). As income earned increases, so the savings rate rises, and vice versa. In the presence of high income inequality, rich people earn high incomes which help them to save more, because their marginal propensity to save is relatively high. This increases the aggregate savings, leading to a rise in capital accumulation, thereby enhancing economic growth in the long run (Aghion et al., 1999; Rebelo, 1991; Bourguignon, 1990). Further, it can create incentives for innovation and entrepreneurship Lazear and Rosen (1981), and by creating incentives to start businesses Barro (2000). It can also create positive incentives for innovation through price effects, as shown by Foellmi and Zweimüller (2006).

As for the empirical evidence, it is mixed. Early on, Persson and Tabellini (1994); Perotti (1996); Alesina and Rodrik (1994) find a negative relationship between inequality and growth, but generally disregard the endogeneity issues. Panizza (2002); Wan et al. (2006) look at single countries and similarly find negative relationships, for both the short and the long run. More recently, several cross-country studies looked at the nexus in a more nuanced manner. Knowles (2005); Royuela et al. (2019); Braun et al. (2019); Breunig and Majeed (2020); Berg et al. (2012) all found a negative relationship between inequality and economic growth for the full sample. When the countries were divided according to the income level, Knowles (2005) found a significant negative relationship in the low-income countries but an insignificant relationship in high- and middle-income countries. On the other hand, in Braun et al. (2019) the negative relationship between growth and inequality is stronger in the group of countries with more developed financial markets. Berg et al. (2012) looks at the duration of growth spells and concludes a positive relationship with the degree of equality of the income distribution. Finally, in Breunig and Majeed (2020) the negative impact of inequality on growth was concentrated on countries with high rates of poverty. Deininger and Squire (1998) also finds a strong negative relationship, but additionally shows that the effects are

heterogeneous with respect to different income groups within an economy. Similarly, Voitchovsky (2005) showed that income inequality at the upper decile of income distribution had a positive effect on growth, while inequality at the lower decile negatively affected growth. Positive relationship has been found among others in Partridge (1997); Li and Zou (1998); Forbes (2000); Scholl and Klasen (2019). Forbes (2000) notes, however, that the effect is driven by the subgroup of transition economies. Further literature can be found in a recent reviews by Neves and Silva (2014) and Mdingi and Ho (2021) and in a meta-analysis by Neves et al. (2016). In particular, Neves and Silva (2014) suggest that the disparities found in the results are due to differences in the type of countries and time periods included in the samples, the variable used to measure inequality, the structure of the data, and the estimation techniques. Neves et al. (2016) find a meta effect of about -0.0111/-0.0145 (FE, and RE, respectively), implying that an increase of 10 percentage points in the Gini coefficient reduces the average annual growth rate by 0.111/0.145 percentage points.

The second relevant strand of literature concerns the effect of inequality on (the public support for) redistribution. If high inequality (postively or negatively) affects support for redistribution, it can be expected that it affects growth as well.

Theoretically higher inequality should lead to preferences for more redistribution (Meltzer and Richard, 1981). Further, also Alesina and Rodrik (1994) argues that higher inequality leads to more redistribution. In his view, this further dampens growth through the introduction of distortions. When the mean income is higher than that of the median voter, people support the redistribution of income and resources (from the rich to the poor). Redistribution takes place through a transfer of payments and public expenditure but it might reduce growth in the long run by discouraging innovation and investment (Alesina and Rodrik, 1994; Perotti, 1993).

As for the empirical evidence, Kerr (2014) finds that growth in inequality is indeed met with greater support for government-led redistribution. Magni (2021) also finds that when inequality is high, people grow more supportive of redistribution, however, as long as it is targeted towards

native citizens. These works would suggest that inequality could dampen growth through the introduction of distortions associated with the need to finance a larger welfare state.

However, theories of preferences for redistribution imply that informing people that they are relatively poorer than they thought would lead to greater concern about inequality and support for redistribution (Meltzer and Richard, 1981; Benabou and Ok, 2001; Piketty, 1995). Yet, empirical evidence does not point in this direction. (Hoy and Mager, 2021) finds that informing people about their relative position in the income distribution does not lead to more preference for redistributive politics. For the latter question, there is some contrary evidence, however, e.g., by Hvidberg et al. (2023). Furthermore, (Roth and Wohlfart, 2018) find that people who have experienced more inequality while growing up are *less* in favor of redistribution. Similarly, Sands (2017) finds that exposure to inequality in form of observing homelessness reduces support for redistribution in affluent population. Several other works have also stressed the role of social beliefs about the sources of inequality shaping their redistribution preferences (Almås et al., 2020; Buser et al., 2020). A more detailed overview of the related literature is given in a recent survey by Mengel and Weidenholzer (2022).

On the other hand, there are several reasons that would suggest that redistribution is growth-enhancing, especially when taxes are spent efficiently and increase the consumption of the poor (Paul and Verdier, 1997; Benabou, 2000). Moreover, redistribution can also directly improve on the efficiency of the economy, by allowing low-income individuals to invest in their human capital and thus contributing to the overall productivity growth.

One group of studies, which should be mentioned separately, are those considering wealth instead of income inequality, such as Castelló and Doménech (2002); Deininger and Squire (1998). These more recent studies argue that inequality in wealth distribution should be used instead of inequality in income distribution, given that wealth distribution, proxied by land or human capital distribution, is associated with fewer measurement errors and is the relevant distribution in many

theoretical analyses. In general, these studies find that land and human-capital inequality have a more significant negative impact on growth than income inequality (Neves et al., 2016).

## 3. Measuring public redistribution

Previous studies tried to measure the extent of redistribution by various proxies such as social spending, tax revenues or tax rates (Benabou, 1996; Perotti, 1996; Bassett et al., 1999). However, these measures are not necessarily measuring redistribution, as already criticised by (Berg et al., 2018). In their paper, they therefore decided to use a micro-data-based measure to account for redistribution - the so called Redistribution Effect (RE). The RE measures the difference of the Gini Index of market incomes and disposable income. They find that lower net inequality is correlated with faster and more durable growth, and at the same time, redistribution appears benign in terms of its impact on growth.

However, as argued and empirically shown by Hammer et al. (2023), the Redistributive Effect (RE) strongly correlates with the redistribution across age-groups, and with the generosity of the pension system, especially to richer households in European countries. In the literature, it has been argued that pensions aim to redistribute income over the lifetime-cycle. Consequently, pensions often redistribute comparatively little between different individuals. As argued by Paul and Verdier (1997); Benabou (2000), targeted redistribution from rich to poor households will be able to curb household consumption, and therefore economic growth. Additionally, as highlighted by O'Reilly (2018), policies that reduce the share of pension spending (particularly when this spending is targeted at the top of the income distribution) would increase the growth-enhancing effects of public spending.

To construct a redistribution measure that precisely measures redistribution to low-income households, we follow (Hammer et al., 2023), who use the micro-data concept of *net benefit ratios (NBR)*. We follow a similar approach but since we are interested in the targeted redistribution of

a country, we introduce a new measure, namely the *net benefit shares (NBS)*, which are defined as total net benefits targeted to a specific sub-population in relation to the disposable income in the economy. Net benefits are defined as the sum of all benefits received by a household minus all taxes paid by a household. By measuring net benefits to certain sub-populations relative to total net benefits, the NBS can be interpreted as the share of effective redistribution to the specific subgroup that we are looking at, in our case low-income (and high-income) households. A country could have a high general redistribution, but protect low-income households only partially, as shown by (Hammer et al., 2023). Therefore, to account for the specific type of redistribution can potentially be very important when assessing the impact of redistribution on economic growth.

We are specifically interested in the sub-population of low-income households, therefore we look at households in the lowest quartile of the income distribution ($Q1 - NBS$)[1].

$$\text{Q1-NBS} = \frac{\sum_{j \in Q1, b_j \geq t_j} (b_j - t_j)}{\sum_{j \in N, b_j \geq t_j} (b_j - t_j)} \tag{1}$$

With $N$ we refer to the total size of the population, with $Q1$ to the number of individuals in $Q1$ receiving net benefits ($b_j \geq t_j$).

Tax-benefit systems redistribute resources not only to low-income households, but also to high-income households (via family benefits, pensions, and similar). NBS can account specifically for this fact. Our measure helps to proxy the amount of redistribution within a tax system to a certain subgroup. For our analysis, we are specifically interested in whether the targeted redistribution to low-income households has an impact on growth in the short run. The use of the NBS allows us to test this hypothesis empirically.

Figure 1 shows the evolution of the Q1-NBS and the redistributive effect over our sample period

[1] For robustness checks, we also estimate the NBS for the lowest two quartiles of the income distribution ($Q1Q2 - NBS$).

from 2007 until 2019. Q1-NBS differ substantially across countries, from very low levels of redistribution to Q1 in countries such as Greece (13.7%), Italy (16.1%), Hungary (16.5%), Romania (17.1%) or Spain (17.9%), to levels of more than 50% of redistribution to Q1 in countries such as Denmark or the Netherlands.

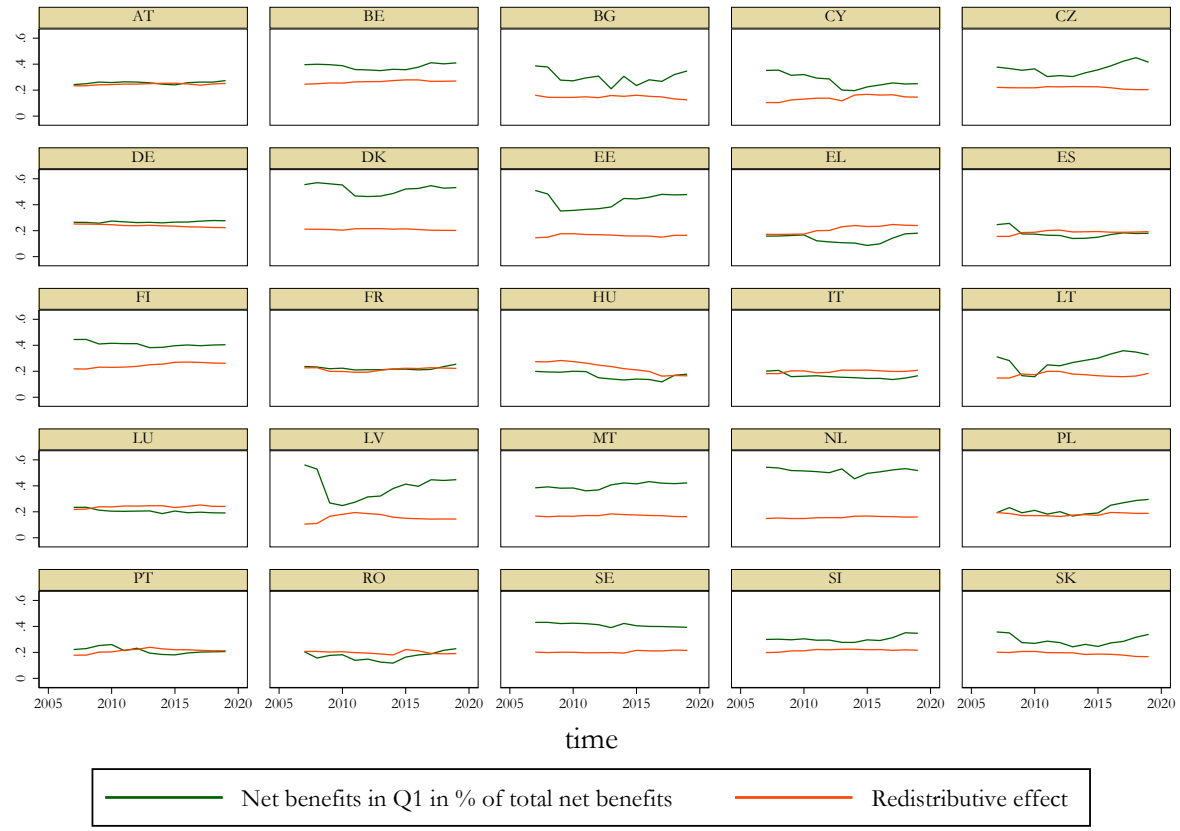
Comparing the Q1-NBS (green line) with the redistibutive effect (red line), we do not find any substantial differences between the measures across countries. The Q1-NBS is not only more volatile over time, we can also see substantial differences in the trends in specific countries. While for example in Germany the Q1-NBS is slightly increasing over time, the redistributive effect suggests a slight reduction in redistribution. The opposite holds true in Finland, where the RE is indicating an increase in redistribution, while the Q1-NBS suggests a decrease in the share of redistribution received by low income households.

## 4. Data and Methodology

Early studies that estimated growth determinants used a simple OLS regression setting to estimate correlations between growth and inequality and redistribution Alesina and Rodrik (1994); Persson and Tabellini (1994); Deininger and Squire (1998). Since we are interested in the impact of inequality and redistribution in Europe using new micro data estimates for redistribution, where the data used is limited to observations after 2007, such an approach is problematic. In such a setting, the dynamic panel bias that is especially pronounced because the low number of points in time $t$ and a high number of countries $n$. Therefore, similar to Berg et al. (2018), Ferreira et al. (2018) and Marrero et al. (2019), we estimate growth regressions using System GMM (Blundell and Bond, 1998).

System GMM overcomes the issue of the dynamic panel bias, but faces some other issues. The model estimates both, the equation in levels using as instruments the lagged first-difference variables and the equation in first-differences using the lagged dependent variable as instrument. Sys-

Figure 1: Net Benefit Share of Q1 (Q1-NBS), 2007 – 2019



tem GMM is currently the most used method to estimate the effect of inequality on economic growth. However, given that the lagged variables are used as instruments in this methodology, system GMM might result in a large number of instruments, leading to an over-fit of the model. If the model is over-fitted, the results will not be more reliable than the biased OLS results. To not overfit the model, Roodman (2009) suggested to restrict the number of the instruments at most to the number of countries used in the sample. He suggests to either cut the number of lags used, or to only use the first difference of each variable as an instrument. Both approaches bear the risk of losing important information. Therefore, Bontempi and Mammi (2015) suggested the principal component approach (PCA) that tries to minimize the loss of information when reducing the number of instruments. This is the approach which we follow here.

Consistent with the empirical literature on cross-country comparisons of economic growth (Caselli et al., 1996; Mankiw et al., 1992), our specification models the level of economic growth per capita as a function of initial income per capita ($log(Y_{i,t-1})$), inequality ($I_{i,t}$), redistribution $R_{i,t}$ and other controls ($Z_{i,t}$) for example the stock of human capital, the stock of physical capital and trade openness. The empirical model can therefore be formally written as:

$$g_{i,t} = \lambda_1 log(Y_{i,t-1}) + \lambda_2 I_{i,t} + \lambda_3 R_{i,t} + \lambda_4 Z_{i,t} + \alpha_i + \beta_t + \epsilon_{i,t} \tag{2}$$

Our dependent variable $g_{i,t}$ is the growth rate of per capita GDP (from year t-1 to year t). We are interested in both the effect of inequality, and of redistribution on the per capita GDP growth rate.

Therefore, we follow the approach of Berg et al. (2018) to include both, the inequality variable $I_{i,t}$ and the redistribution variable $R_{i,t}$ in the growth equation. We use the Gini coefficient of market incomes as the inequality measure. Instead of using a standard redistribution variable as by Berg et al. (2018), we use our indicator that measures the extend of redistribution to low income households, the Q1-NBR (see Section 3). Additionally, we use several other control variables $Z_{i,t}$

that are usually related to economic growth. To account for stock of physical capital, we use the investment by sectors (private and governmental) measured as the investment share of GDP by institutional sectors. Additionally, we add a measure for human capital, a measure of trade openess, and we also control for the initial level of development by including the lagged logarithm of GDP per capita.

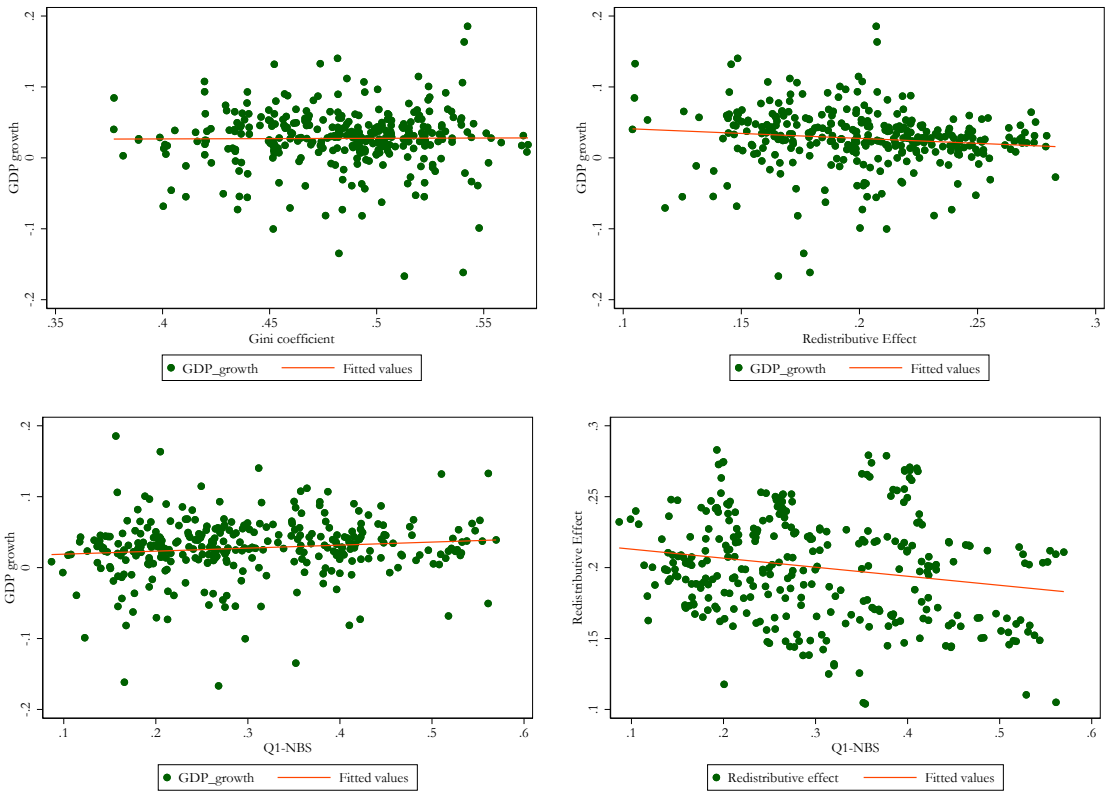
We use an unbalanced panel of 25 EU countries for 2007 to 2019. We exclude the COVID-19 years because of several problems in the data collection. Due to data issues, we dropped Ireland and Croatia from our sample.[2] Table A1 in the Appendix highlights the summary statistics for all the variables included in our analysis. We use the GDP per capita as well as its growth rate from Eurostat. The Gini Index on both market income and disposable income are calculated based on EUROMOD, which is based on micro data from EU-SILC. The same holds true for our redistributional measures, the RE and the Q1-NBR. Additionally, we include private (businesses and households) and government investment of Eurostat, measured as the investment share of GDP by institutional sectors. To account for changes in the skills of the workforce of a country, we include the share of population with high education from Eurostat (the share of the population above 25 with an education of ISCED 3 or higher). To account for the openness of the economy, we include a standard Trade Openness Indicator of the WTO, namely merchandise trade as a share of GDP, which is defined as the sum of merchandise exports and imports divided by the value of GDP, all in current U.S. dollars.

Looking at our variables of interest, Figure 2 identifies the correlation between the GDP per capita growth rate, and the inequality and redistribution measures. We can see a weak and positive relationship between inequality measured as the Gini coefficient of market income and the per capita GDP growth rate. When looking at the relationship between redistribution measured by

[2]Growth rates of Ireland are strongly driven by multinationals, that makes a comparison with other EU Member States very complicated. For Croatia, the number of observations was simply to small, so we decided to not include the country.

the Redistributive Effect (RE, the difference between the Gini coefficients of market incomes and of disposable income) and the per capita GDP growth rate, we see a weak negative correlation. However, when we use our newly introduced measure of redistribution, the Q1-NBS, the negative relation of redistribution and GDP per capita growth disappears, and we see an indication of a positive relation between redistribution and subsequent growth. Consequently, the Q1-NBS is negatively correlated with the redistributive effect. This might seem surprising since both measures suppose to measure redistribution. However, one has to keep in mind the Q1-NBS has the intention to measure specifically the redistribution to low income households, while the RE measures the general redistribution within a tax-system - which as explained above more often than not targets higher income population.

Figure 2: Correlation between GDP growth and inequality/redistribution



## 5. Results

### *5.1. Short-term growth and the redistributive effect*

In a first step, we set up a similar model to Berg et al. (2018) to estimate the effect of both inequality and redistribution on the short-term growth rate in our set of countries. It is worth mentioning that our results might differ because of the different country focus (Europe instead of a set of developed and developing countries) but also because of the focus of short-term growth instead of long-term growth (5-year growth spells) .

Table 1 shows various specifications of our model using the redistributive effect as the redistribution measure. First, we estimate the very simple model including only the initial GDP level, inequality and redistribution as explanatory variables (Column 1). Then we add step by step a number of additional standard growth determinants such as private and government investment (Column 2), an estimate for human capital (Column 3) and trade openness (Column 4), using the lagged values of the endogenous variables as instruments. Columns 5-8 are the same models, using the principal component approach (PCA) to minimize the loss of information when reducing the number of instruments.

We can see that across all models, the Gini coefficient has a positive effect on the economic growth, which would indicate that more unequal countries tend to have higher growth rates. However, these result is only significant in Specifications 4 and 8. Looking at the coefficient of the RE, we can see that the results indicate a negative relation between redistribution and economic growth. However, again the results are only significant in Models 4 and 8. In line with previous literature, private investment is positively and mostly significantly related with economic growth, and public investment affects growth negatively. The higher the share of highly educated population in a country, the higher the growth, and also the coefficients for the trade openness indicate that higher openness is correlated with higher growth.

A concern with system GMM estimation is that the sensitivity of the results depends crucially

Table 1: Growth Regression, standard model

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| L.log(GDP) | -0.010 | -0.037 | -0.025* | 0.00066 | 0.0033 | -0.027 | -0.014 | 0.015 |
| | (0.0083) | (0.023) | (0.015) | (0.016) | (0.017) | (0.037) | (0.021) | (0.016) |
| Gini coefficient | 0.048 | 0.0099 | 0.093 | 0.25*** | 0.11 | 0.033 | 0.12 | 0.34** |
| | (0.082) | (0.14) | (0.13) | (0.094) | (0.12) | (0.20) | (0.15) | (0.15) |
| Redistributive effect | -0.074 | -0.067 | -0.14 | -0.27*** | -0.14 | 0.0046 | -0.096 | -0.28** |
| | (0.080) | (0.15) | (0.10) | (0.097) | (0.11) | (0.20) | (0.13) | (0.12) |
| private investment | | 0.086*** | 0.035 | 0.023 | | 0.040** | 0.038*** | 0.033* |
| | | (0.034) | (0.023) | (0.024) | | (0.016) | (0.015) | (0.018) |
| public investment | | -0.072*** | -0.054*** | -0.039*** | | -0.0090 | -0.012 | -0.0057 |
| | | (0.021) | (0.015) | (0.011) | | (0.013) | (0.011) | (0.011) |
| high education | | | 0.089*** | 0.050 | | | 0.034** | 0.018 |
| | | | (0.032) | (0.033) | | | (0.017) | (0.015) |
| open | | | | 0.024** | | | | 0.029*** |
| | | | | (0.010) | | | | (0.0059) |
| Constant | 0.12 | 0.32 | 0.17 | -0.23 | -0.032 | 0.32 | 0.16 | -0.32* |
| | (0.084) | (0.24) | (0.15) | (0.20) | (0.19) | (0.38) | (0.22) | (0.19) |
| Observations | 300 | 298 | 298 | 298 | 300 | 298 | 298 | 298 |
| No. of instruments | 80 | 35 | 80 | 81 | 27 | 26 | 30 | 31 |
| AR1 (p-value) | 0.00032 | 0.00054 | 0.00040 | 0.00044 | 0.00021 | 0.00017 | 0.00027 | 0.00044 |
| AR2 (p-value) | 0.068 | 0.0076 | 0.020 | 0.037 | 0.064 | 0.049 | 0.047 | 0.068 |
| Hansen-J (p-value) | 1.00 | 0.79 | 1.00 | 1.00 | 0.41 | 0.25 | 0.47 | 0.45 |
| PCR | No | No | No | No | Yes | Yes | Yes | Yes |

Standard errors in parentheses
* $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$

on the selection of instrumental variables. A proliferation of instruments may reflect problems of weak or invalid instruments. Therefore, we present Hansen tests of joint instrument validity. Additionally, the first and second-order residual autocorrelation tests are presented. By using the PCA approach in specifications 5 to 8, the number of instruments used is substantially reduced, the Hansen Test is still not significant, and the number of instruments is about the same as the number of countries we have in our sample.

*5.2. Short-term growth and the Q1 Net Benefit Share*

Given the fact that we do not observe any significant results when using the standard measure of the RE, in the next step we analyse the impact of our specific redistribution measure, the Q1-NBS, that measures the share of benefits targeted to households in the first quartile of the income distribution. Table 2 highlights various specifications of our model.

We find again that the Gini coefficient positively affects economic growth in the short run, and the effect is now significant in most specifications. The coefficient is between 0.14 an 0.24, indicating that a 1pp increase in the Gini coefficent leads to a 0.2pp higher growth rate. The coefficient of our variable of interest, the redistribution to low income households measured as the Q1-NBS, is positive and significant across all model specifications except of Specification 8. This indicates that more redistribution to the poor has a significant and positive impact on economic growth. The coefficient lies between 0.087 and 0.029, indicating that a increase in the share of redistribution to households in Q1 by 1pp increases the growth rate by about 0.05pp, keeping the market Gini constant. That is, under the assumption that the redistributive measures do not affect the market Gini, an additional growth effect can be expected from targeted redistribution. This assumption seems more likely for the case of targeted redistribution, which would be associated with lower distortions, as it is associated with the lower volume of public spending than untargeted redistribution.

We do not see an indication that the additional controls are driving the impacts of either inequality or redistribution on growth. In line with the literature, private investment is positively and mostly significantly related with GDP growth, as well as the share of highly-educated population and trade openness. The level of GDP per capita is mostly negatively but not significantly correlated with GDP growth, indicating that less developed countries are growing faster, consistently with the convergence hypothesis.

Table 2: Growth Regression, Q1 Net Benefit Share

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| L.log(GDP) | -0.028*** | -0.033*** | -0.031*** | -0.019* | -0.011 | -0.030 | -0.032 | 0.0022 |
| | (0.0099) | (0.011) | (0.011) | (0.011) | (0.018) | (0.029) | (0.025) | (0.021) |
| Gini coefficient | 0.15** | 0.14** | 0.16** | 0.21*** | 0.17* | 0.14 | 0.15 | 0.24** |
| | (0.078) | (0.071) | (0.070) | (0.075) | (0.093) | (0.096) | (0.092) | (0.099) |
| Q1-NBS | 0.087*** | 0.071** | 0.067** | 0.051* | 0.075** | 0.063* | 0.062* | 0.029 |
| | (0.032) | (0.034) | (0.033) | (0.029) | (0.034) | (0.036) | (0.033) | (0.034) |
| private investment | | 0.030** | 0.028** | 0.023 | | 0.032** | 0.029* | 0.027 |
| | | (0.013) | (0.014) | (0.015) | | (0.015) | (0.015) | (0.017) |
| public investment | | -0.0093 | -0.015 | -0.0096 | | -0.0087 | -0.015 | -0.0025 |
| | | (0.010) | (0.010) | (0.011) | | (0.014) | (0.013) | (0.014) |
| high education | | | 0.029** | 0.015 | | | 0.029** | 0.013 |
| | | | (0.013) | (0.013) | | | (0.013) | (0.016) |
| open | | | | 0.019*** | | | | 0.023*** |
| | | | | (0.0066) | | | | (0.0087) |
| Constant | 0.20** | 0.29*** | 0.24** | 0.031 | 0.032 | 0.27 | 0.27 | -0.18 |
| | (0.10) | (0.100) | (0.10) | (0.15) | (0.20) | (0.28) | (0.24) | (0.25) |
| Observations | 300 | 298 | 298 | 298 | 300 | 298 | 298 | 298 |
| No. of instruments | 80 | 82 | 83 | 84 | 27 | 29 | 30 | 31 |
| AR1 (p-value) | 0.00034 | 0.00033 | 0.00033 | 0.00044 | 0.00021 | 0.00014 | 0.00017 | 0.00030 |
| AR2 (p-value) | 0.071 | 0.055 | 0.052 | 0.069 | 0.071 | 0.058 | 0.054 | 0.088 |
| Hansen-J (p-value) | 1.00 | 1.00 | 1.00 | 1.00 | 0.41 | 0.46 | 0.46 | 0.45 |
| PCR | No | No | No | No | Yes | Yes | Yes | Yes |

Standard errors in parentheses
* $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$

### *5.3. Robustness checks*

To check the robustness of our results about the effect of our key variable of interest, the redistribution to poor households (measured as the Net benefit share that is going to low -income households in Q1), on economic growth, in a first step we report the results of the standard FE model, adding time and country-fixed effects.

Table 3 reports the results. We can see that in the specifications where we use the Redistributive Effect as our redistribution variable (Specifications 1 to 4), we see a negative and significant relation between the Gini coefficient and economic growth. Additionally, the Redistributive Effect

is also negatively correlated with economic growth, however, only significant in Specification 4. This is in line with our findings of the sGMM model.

Table 3: Growth Regression, FE model

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| L.log(GDP) | -0.63*** | -0.87*** | -0.87*** | -0.74*** | -0.29*** | -0.86*** | -0.86*** | -0.73*** |
| | (0.088) | (0.078) | (0.074) | (0.057) | (0.060) | (0.077) | (0.071) | (0.059) |
| Gini coefficient | -0.92* | -0.54** | -0.53** | -0.49** | 0.050 | -0.40** | -0.38** | -0.35* |
| | (0.47) | (0.21) | (0.22) | (0.20) | (0.21) | (0.17) | (0.17) | (0.20) |
| Redistributive effect | -0.55 | -0.26 | -0.30 | -0.40* | | | | |
| | (0.43) | (0.26) | (0.26) | (0.23) | | | | |
| NBS Q1 | | | | | 0.48*** | 0.27*** | 0.29*** | 0.33*** |
| | | | | | (0.074) | (0.080) | (0.085) | (0.074) |
| private investment | | 0.22*** | 0.22*** | 0.19*** | | 0.19*** | 0.19*** | 0.15*** |
| | | (0.018) | (0.018) | (0.018) | | (0.019) | (0.017) | (0.016) |
| public investment | | 0.046*** | 0.046*** | 0.044*** | | 0.045*** | 0.046*** | 0.043** |
| | | (0.015) | (0.015) | (0.015) | | (0.016) | (0.015) | (0.016) |
| low education | | | -0.048 | -0.023 | | | -0.081 | -0.054 |
| | | | (0.065) | (0.066) | | | (0.073) | (0.067) |
| open | | | | 0.11*** | | | | 0.12*** |
| | | | | (0.040) | | | | (0.037) |
| Constant | -28.4*** | -40.3*** | -37.8*** | -32.8*** | -14.8*** | -38.9*** | -34.5*** | -28.9*** |
| | (3.01) | (2.89) | (5.23) | (4.22) | (2.78) | (2.84) | (5.39) | (4.33) |
| Observations | 300 | 298 | 298 | 298 | 300 | 298 | 298 | 298 |
| $R^2$ | 0.415 | 0.661 | 0.663 | 0.701 | 0.322 | 0.684 | 0.688 | 0.731 |
| Adjusted $R^2$ | 0.355 | 0.623 | 0.624 | 0.665 | 0.312 | 0.648 | 0.652 | 0.698 |

Standard errors in parentheses
* $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$

When turning to our redistributive measure of interest, the Net benefit share of Q1 (NBS Q1, Specifications 5-8), we can see that the results change. While the significantly negative effect of the income inequality (measured by the market Gini coefficient) prevails, our redistributive measure is now positively correlated with economic growth, indicating that an increase in the NBS Q1 of 1pp leads to an increase of economic growth of about 0.3pps. We conclude that the effect of an increase in redistribution is even higher when using the FE model, when compared to the sGMM results.

As a second robustness check, we widen our definition of low-income households: we allow for less targeted redistribution, by estimating the model with the net benefit share that considers households in the first and second quartile of the income distribution. Ex ante, we would expect the effect of redistribution to be weaker, since the redistribution concept is now widened towards the middle of the income distribution.

Table 4 highlights the results when using the widened concept of redistribution. The results highlight that the impact of an increase in the NBS Q1+Q2 on economic growth is again significant, but substantially lower. The model suggests that an increase in the NBS Q1+Q2 of 1pp, implies an increase in economic growth of about 0.058pp to 0.010pp. This is lower than the effect that we have seen when using the NBS Q1 (see Table 1). The coefficients for other variables are similar, and in line with what was reported when using the NBS Q1.

As a third robustness check, we change from our definition of redistribution of low-income households to one that measures the redistribution to high-income households, by estimating the model with the net benefit share that considers households in the fourth quartile of the income distribution. Ex ante, we would expect the effect of redistribution to be even negative, since the redistribution concept is now reversed, measuring redistribution to high incomes.

Table 5 highlights our standard specifications of the model, but changing from the Q1 NBS to the Q4 NBS. We can identify a positive relation between income inequality (before taxes) and economic growth, in line with the findings of the models using different redistribution measures. When looking at the coefficients of our variable of interest, we can see that the results indicate a negative relation between growth and the strength of redistribution to rich households. The effect is significant in most of the specifications and indicate that a 1pp increase in the Q4 net redistribution to households in Q4 will lead to a decrease in economic growth between 0.08pp and 0.01pp.

Additionally to the checks above, we apply the leave-one-out cross validation for panel data, meaning that we rerun all regressions on a smaller data set (eliminating a country at random). This

Table 4: Growth Regression, Q1+Q2 NBS

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| L.log(GDP) | -0.022** | -0.028*** | -0.025** | -0.015 | 0.00013 | -0.017 | -0.019 | 0.013 |
| | (0.0099) | (0.010) | (0.0099) | (0.011) | (0.018) | (0.028) | (0.024) | (0.020) |
| Gini coefficient | 0.14** | 0.13** | 0.14** | 0.18** | 0.18** | 0.15 | 0.15 | 0.25** |
| | (0.068) | (0.063) | (0.062) | (0.072) | (0.086) | (0.10) | (0.098) | (0.11) |
| Q1+Q2 NBS | 0.060*** | 0.046** | 0.042* | 0.023 | 0.058** | 0.041* | 0.037* | 0.0098 |
| | (0.021) | (0.022) | (0.022) | (0.022) | (0.023) | (0.022) | (0.022) | (0.025) |
| private investment | | 0.031** | 0.029** | 0.025* | | 0.034** | 0.032** | 0.029 |
| | | (0.014) | (0.014) | (0.015) | | (0.015) | (0.015) | (0.018) |
| public investment | | -0.0085 | -0.014 | -0.0090 | | -0.0052 | -0.011 | 0.00060 |
| | | (0.0099) | (0.010) | (0.011) | | (0.014) | (0.013) | (0.015) |
| high education | | | 0.029** | 0.015 | | | 0.029** | 0.012 |
| | | | (0.013) | (0.012) | | | (0.014) | (0.017) |
| open | | | | 0.019*** | | | | 0.026*** |
| | | | | (0.0065) | | | | (0.0085) |
| Constant | 0.14 | 0.24** | 0.20** | 0.013 | -0.098 | 0.14 | 0.15 | -0.28 |
| | (0.100) | (0.093) | (0.097) | (0.14) | (0.20) | (0.28) | (0.24) | (0.24) |
| Observations | 300 | 298 | 298 | 298 | 300 | 298 | 298 | 298 |
| No. of instruments | 80 | 82 | 83 | 84 | 27 | 29 | 30 | 31 |
| AR1 (p-value) | 0.00036 | 0.00036 | 0.00036 | 0.00046 | 0.00021 | 0.00015 | 0.00019 | 0.00032 |
| AR2 (p-value) | 0.075 | 0.058 | 0.055 | 0.071 | 0.075 | 0.063 | 0.060 | 0.095 |
| Hansen-J (p-value) | 1.00 | 1.00 | 1.00 | 1.00 | 0.39 | 0.44 | 0.48 | 0.46 |
| PCR | No | No | No | No | Yes | Yes | Yes | Yes |

Standard errors in parentheses
* $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$

allows us to identify whether our results are driven by a single country in the data set. The results can be found in Table A2 for the standard model and in Table A3 for the model where the instruments are chosen via the principal component approach. Overall, we find that the coefficients of our inequality measure is very robust across the different data sets, and also the significance level of the coefficient is stable across different data set choices.

To conclude, our results are stable across the model choices, as well as across the concepts of redistribution that we use. We can see that the effect of redistribution on economic growth seems to be stronger, when redistribution focuses more on low-income households. And it also turns

Table 5: Growth Regression, Q4 NBS

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| L.log(GDP) | -0.020** | -0.027*** | -0.025** | -0.014 | 0.0051 | -0.014 | -0.016 | 0.015 |
| | (0.0100) | (0.010) | (0.0100) | (0.011) | (0.018) | (0.027) | (0.024) | (0.019) |
| Gini coefficient | 0.12* | 0.12* | 0.13** | 0.17** | 0.17** | 0.14 | 0.14 | 0.25** |
| | (0.069) | (0.064) | (0.062) | (0.073) | (0.083) | (0.10) | (0.100) | (0.11) |
| Q4 NBS | -0.079*** | -0.066*** | -0.058** | -0.027 | -0.082*** | -0.063** | -0.055** | -0.012 |
| | (0.023) | (0.025) | (0.025) | (0.029) | (0.027) | (0.025) | (0.025) | (0.030) |
| private investment | | 0.032** | 0.030** | 0.027* | | 0.034** | 0.033** | 0.030* |
| | | (0.013) | (0.014) | (0.015) | | (0.015) | (0.015) | (0.018) |
| public investment | | -0.011 | -0.015 | -0.0094 | | -0.0065 | -0.012 | 0.00096 |
| | | (0.010) | (0.010) | (0.011) | | (0.014) | (0.014) | (0.014) |
| high education | | | 0.027** | 0.014 | | | 0.027* | 0.011 |
| | | | (0.013) | (0.012) | | | (0.015) | (0.017) |
| open | | | | 0.019*** | | | | 0.026*** |
| | | | | (0.0069) | | | | (0.0085) |
| Constant | 0.18* | 0.27*** | 0.24** | 0.029 | -0.094 | 0.15 | 0.16 | -0.30 |
| | (0.096) | (0.097) | (0.097) | (0.14) | (0.19) | (0.27) | (0.24) | (0.23) |
| Observations | 300 | 298 | 298 | 298 | 300 | 298 | 298 | 298 |
| No. of inst | 80 | 82 | 83 | 84 | 27 | 29 | 30 | 31 |
| AR1 (p-value) | 0.00037 | 0.00038 | 0.00038 | 0.00047 | 0.00022 | 0.00016 | 0.00020 | 0.00033 |
| AR2 (p-value) | 0.075 | 0.056 | 0.052 | 0.067 | 0.076 | 0.063 | 0.059 | 0.094 |
| Hansen-J (p-value) | 1.00 | 1.00 | 1.00 | 1.00 | 0.40 | 0.46 | 0.46 | 0.48 |
| PCR | No | No | No | No | Yes | Yes | Yes | Yes |

Standard errors in parentheses
* $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$

out that a strong redistribution to high-income households lead to detrimental effects on economic growth, findings that are in line with economic theory.

### *5.4. Transmission channels in the growth regressions*

As shown in the previous subsection, we find a positive effect of redistribution on short-term economic growth, and of inequality before taxes and transfers and short-term economic growth. We want to investigate the transmission channels behind these relations. We formally look at the potential channels through which inequality and redistribution could potentially be influencing the short-term growth. More specifically, we want to investigate the role of private and public in-

vestment, private consumption (measured as private consumption growth) as well as productivity (measured as growth in real labour productivity). To explore the transmission channels, we estimate the effect of inequality and redistribution not on economic growth, but on the channels directly with the following model:

$$Z_{i,t} = \lambda_1 log(Y_{i,t}) + \lambda_2 I_{i,t} + \lambda_3 R_{i,t} + \alpha_i + \beta_t + \epsilon_{i,t} \tag{3}$$

where our dependent variable $Z_{i,t}$ is the potential transmission variable, $log(Y_{i,t})$ the logarithm of GDP, which should reflect the different economic development of countries, $I_{i,t}$ our inequality variable, namely the pre-tax Gini coefficent, an $R_{i,t}$ our redistribution variable, namely the Net Benefit Share (NBS) of country $i$ at time $t$. We use sGMM to estimate the model to overcome a potential dynamic panel bias given the nature of our data.

Table 6: Growth channels

| | (1) pub inv | (2) priv inv | (3) cons | (4) prod | (5) pub inv | (6) priv inv | (7) cons | (8) prod |
|---|---|---|---|---|---|---|---|---|
| L.log(GDP) | -0.34* | 0.16 | -0.012 | 0.045** | -0.38** | -0.11 | -0.019 | 0.14*** |
| | (0.18) | (0.15) | (0.0096) | (0.020) | (0.18) | (0.086) | (0.028) | (0.048) |
| Gini coefficient | -1.73 | -0.38 | -0.023 | 0.25** | -2.08* | -0.59 | -0.059 | 0.37* |
| | (1.12) | (0.79) | (0.10) | (0.13) | (1.17) | (0.86) | (0.10) | (0.21) |
| Q1 NBS | 0.29 | 0.52* | 0.082** | 0.050 | 0.15 | 0.67*** | 0.083** | -0.0021 |
| | (0.46) | (0.31) | (0.038) | (0.057) | (0.46) | (0.24) | (0.042) | (0.11) |
| Constant | 0.87 | -3.40** | 0.14 | 4.00*** | 1.43 | -0.55 | 0.23 | 3.00*** |
| | (1.94) | (1.33) | (0.098) | (0.21) | (1.98) | (1.00) | (0.29) | (0.45) |
| Observations | 298 | 298 | 300 | 300 | 298 | 298 | 300 | 300 |
| No. of instruments | 80 | 80 | 80 | 80 | 24 | 24 | 29 | 24 |
| AR1 (p-value) | 0.13 | 0.031 | 0.0067 | 0.24 | 0.12 | 0.017 | 0.0057 | 0.47 |
| AR2 (p-value) | 0.0030 | 0.061 | 0.14 | 0.044 | 0.0028 | 0.038 | 0.14 | 0.21 |
| Hansen-J (p-value) | 1.00 | 1.00 | 1.00 | 1.00 | 0.30 | 0.21 | 0.58 | 0.24 |
| PCR | No | No | No | No | Yes | Yes | Yes | Yes |

Standard errors in parentheses
* $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$

Table 6 reports the results of our panel regressions for the growth channels. We can see that income inequality seems to have a negative but insignificant effect on our short-term channels, however

we can see that pre-tax inequality has a positive and significant impact on productivity.

Looking at redistribution, we find that redistribution to low-income households, measured as the share of net benefits received by households in the Q1, has a significant and positive impact on two of the four channels analyzed, namely on private investment, as well as on consumption, indicating that a more targeted redistribution leads to a higher consumption growth, as well as to higher private investment, and therefore to higher economic growth.

From an theoretical point of view, these results are not surprising. A higher pre-tax inequality, leads to higher productivity in the short run. This is in line with the findings of Lloyd-Ellis (2003), who argues that *"that although reduced inequality and higher productivity need not be conflicting objectives, a balance must be struck between the short-run disincentive effects and long-run average investment effects of reduced inequality"*.

Focusing on redistribution, economic theory suggests that low-income households have a higher propensity to consume, therefore a more targeted redistribution potentially curbs consumption and therefore short-term growth. Additionally, more targeted redistribution goes along with lower public intervention and can therefore allow for more private investment, as the public money is used more effectively.

To confirm our result, we can also have a look at the growth channel assuming significant redistribution to high-income households, such as the Q4 NBS. Table 7 highlights that if the redistribution to high-income households in a country is higher, growth rates are significantly lower. And again, we can see that both channels, the public investment, as well as the private consumption channel are responsible for this effect. The productivity channel, that suggests a positive impact of pre-tax inequality on economic growth, stays visible also when we change our definition of redistribution in the model.

Table 7: Growth channels for redistribution to high incomes

| | (1) pub inv | (2) priv inv | (3) cons | (4) prod | (5) pub inv | (6) priv inv | (7) cons | (8) prod |
|---|---|---|---|---|---|---|---|---|
| L.log(GDP) | -0.28* | 0.19 | -0.0078 | 0.049** | -0.36** | -0.023 | -0.0082 | 0.15*** |
| | (0.16) | (0.16) | (0.0076) | (0.021) | (0.16) | (0.085) | (0.025) | (0.045) |
| Gini coefficient | -1.34 | -0.57 | -0.070 | 0.18 | -1.73* | -1.00 | -0.091 | 0.42** |
| | (0.88) | (0.78) | (0.10) | (0.13) | (0.95) | (1.01) | (0.12) | (0.20) |
| Q4 NBS | -0.57 | -0.51** | -0.072** | -0.0035 | -0.44 | -0.48** | -0.072** | -0.019 |
| | (0.38) | (0.25) | (0.029) | (0.043) | (0.37) | (0.19) | (0.028) | (0.075) |
| Constant | 0.32 | -3.35** | 0.16** | 4.02*** | 1.24 | -0.96 | 0.17 | 2.90*** |
| | (1.85) | (1.46) | (0.077) | (0.24) | (1.92) | (1.04) | (0.28) | (0.49) |
| Observations | 298 | 298 | 300 | 300 | 298 | 298 | 300 | 300 |
| No. of instruments | 80 | 80 | 80 | 80 | 24 | 24 | 29 | 24 |
| AR1 (p-value) | 0.13 | 0.042 | 0.0066 | 0.29 | 0.12 | 0.024 | 0.0055 | 0.40 |
| AR2 (p-value) | 0.0034 | 0.077 | 0.13 | 0.048 | 0.0032 | 0.051 | 0.13 | 0.23 |
| Hansen-J (p-value) | 1.00 | 1.00 | 1.00 | 1.00 | 0.27 | 0.21 | 0.57 | 0.26 |
| PCR | No | No | No | No | Yes | Yes | Yes | Yes |

Standard errors in parentheses
* $p \leq 0.10$, ** $p \leq 0.05$, *** $p \leq 0.01$

## 6. Conclusion

In this paper, we set up a new comprehensive data set for 25 European countries from 2007 until 2019, which includes new micro-data based redistribution measure, Net Benefit Shares (NBS), that allow us to estimate the amount of targeted redistribution to low-income households, as well as untargeted redistribution to high-income households. In this cross-country setting, we focus on the impact of both, inequality and (targeted and untargeted) redistribution on economic growth in the short run.

We show that market-income inequality is a driver of economic growth: developed countries with higher market inequality show higher economic growth in the short term. We show that this higher growth is driven by the productivity channel, implying that countries with higher inequality are more productive. However, and contrary to other studies, we show that targeted redistribution is also a positive driver of economic growth. For example, an increase in the targeted redistribution (measured by the Q1 NBS) from the level of Spain (18,1% in 2019) to the level of the Nether-

lands (39,3% in 2019) would increase economic growth by about 1.1pp in the short run. This higher growth can be attributed to two main channels, the consumption channel and the private investment channel. We show that these results are very robust across different estimation methods used (sGMM and FE), and different instrumental variables used in our sGMM estimations. Additionally, we also show that decreasing the targeting reduces the positive growth impact of redistribution.

The policy implications of our findings are quite substantial. First, the results suggest the redistribution-growth nexus is more complex than usually discussed when forming policies and in the most of the literature. Many European countries redistribute vast amount of tax money towards higher-income groups e.g., through public pension entitlements or subsidies to specific industries such as agriculture. In order to foster growth, this sort of redistribution should be scaled down and replaced with measures specifically targeted at the poor. Secondly, a mere reduction of Gini coefficients is not a good proxy to apply, when considering the effects of redistribution. Thirdly, and more profoundly, the efficiency-equity trade off might be much less pronounced as it is sometimes believed - provided equity is a result of targeted redistribution measures.

However, we need to be cautious about over-interpreting these results. Drawing firm conclusions about causality from such results can be challenging. Still, our empirical analysis underscores an important observation. Within European countries, independent of the level of market-income inequality, targeted redistribution is a growth-enhancing policy in the short-run. And in the same line, our results highlight that untargeted redistribution harms short term growth. This is an important conclusion that indicates that by refocusing on targeted policies for the poor, policy makers are able to increase economic growth in the short run.

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## Appendix A. Additional Tables

Table A1: Summary Statistics

| Variable | Panel | Mean | Sd | Min | Max | Observations |
|---|---|---|---|---|---|---|
| GDP growth | Overall | 0.03 | 0.04 | -0.17 | 0.19 | N = 325 |
| | Between | | 0.02 | -0.01 | 0.07 | n = 25 |
| | Within | | 0.04 | -0.19 | 0.15 | T = 13 |
| log(GDP) | Overall | 10.12 | 0.38 | 9.21 | 11.29 | N = 325 |
| | Between | | 0.37 | 9.44 | 11.20 | n = 25 |
| | Within | | 0.11 | 9.79 | 10.49 | T = 13 |
| private investment | Overall | 17.74 | 3.53 | 6.91 | 30.81 | N = 323 |
| | Between | | 2.52 | 10.76 | 22.29 | n = 25 |
| | Within | | 2.51 | 12.32 | 28.87 | T = 12.92 |
| public investment | Overall | 3.78 | 1.09 | 1.54 | 6.64 | N = 323 |
| | Between | | 0.83 | 2.23 | 5.44 | n = 25 |
| | Within | | 0.73 | 1.67 | 6.38 | T = 12.92 |
| high education | Overall | 0.72 | 0.12 | 0.29 | 0.89 | N = 325 |
| | Between | | 0.12 | 0.40 | 0.86 | n = 25 |
| | Within | | 0.04 | 0.58 | 0.87 | T = 13 |
| Gini coefficient | Overall | 0.48 | 0.04 | 0.38 | 0.57 | N = 325 |
| | Between | | 0.04 | 0.41 | 0.54 | n = 25 |
| | Within | | 0.02 | 0.42 | 0.53 | T = 13 |
| Redistributive Effect (RE) | Overall | 0.20 | 0.04 | 0.10 | 0.28 | N = 325 |
| | Between | | 0.03 | 0.14 | 0.26 | n = 25 |
| | Within | | 0.02 | 0.13 | 0.25 | T = 13 |
| Net benefit share in Q1 | Overall | 0.30 | 0.11 | 0.09 | 0.57 | N = 325 |
| | Between | | 0.11 | 0.14 | 0.52 | n = 25 |
| | Within | | 0.04 | 0.16 | 0.47 | T = 13 |
| Net benefit share in Q1 and Q2 | Overall | 0.58 | 0.15 | 0.32 | 0.88 | N = 325 |
| | Between | | 0.14 | 0.40 | 0.86 | n = 25 |
| | Within | | 0.04 | 0.44 | 0.71 | T = 13 |
| Net benefit share in Q4 | Overall | 0.20 | 0.11 | 0.02 | 0.52 | N = 325 |
| | Between | | 0.11 | 0.04 | 0.41 | n = 25 |
| | Within | | 0.03 | 0.10 | 0.35 | T = 13 |
| openess | Overall | 90.38 | 41.29 | 29.97 | 181.34 | N = 325 |
| | Between | | 40.82 | 39.10 | 170.35 | n = 25 |
| | Within | | 10.02 | 54.08 | 117.27 | T = 13 |
| productivity growth | Overall | 0.01 | 0.02 | -0.08 | 0.10 | N = 325 |
| | Between | | 0.01 | -0.02 | 0.04 | n = 25 |
| | Within | | 0.02 | -0.10 | 0.08 | T = 13 |
| consumption growth | Overall | 0.03 | 0.05 | -0.21 | 0.25 | N = 325 |
| | Between | | 0.01 | -0.00 | 0.06 | n = 25 |
| | Within | | 0.05 | -0.21 | 0.23 | T = 13 |

Table A2: Leave-one-out regression results - coefficients for Q1-NBS

| | model (1) | | model (2) | | model (3) | | model (4) | |
|---|---|---|---|---|---|---|---|---|
| | coefficient | p-value | coefficient | p-value | coefficient | p-value | coefficient | p-value |
| AT | 0.088 | (0.01) | 0.066 | (0.06) | 0.058 | (0.08) | 0.049 | (0.12) |
| BE | 0.090 | (0.01) | 0.072 | (0.04) | 0.067 | (0.04) | 0.062 | (0.05) |
| BG | 0.076 | (0.01) | 0.056 | (0.08) | 0.052 | (0.09) | 0.043 | (0.14) |
| CY | 0.081 | (0.02) | 0.061 | (0.08) | 0.057 | (0.09) | 0.053 | (0.10) |
| CZ | 0.087 | (0.01) | 0.065 | (0.06) | 0.059 | (0.07) | 0.049 | (0.12) |
| DE | 0.087 | (0.01) | 0.066 | (0.05) | 0.060 | (0.07) | 0.051 | (0.10) |
| DK | 0.091 | (0.01) | 0.066 | (0.07) | 0.059 | (0.11) | 0.043 | (0.20) |
| EE | 0.091 | (0.01) | 0.073 | (0.03) | 0.068 | (0.04) | 0.060 | (0.05) |
| EL | 0.071 | (0.01) | 0.056 | (0.08) | 0.052 | (0.09) | 0.043 | (0.14) |
| ES | 0.083 | (0.01) | 0.060 | (0.08) | 0.059 | (0.08) | 0.050 | (0.10) |
| HU | 0.097 | (0.00) | 0.077 | (0.04) | 0.071 | (0.05) | 0.057 | (0.10) |
| IE | 0.087 | (0.01) | 0.067 | (0.05) | 0.062 | (0.06) | 0.052 | (0.09) |
| IT | 0.086 | (0.01) | 0.065 | (0.07) | 0.062 | (0.07) | 0.053 | (0.09) |
| LT | 0.079 | (0.01) | 0.055 | (0.11) | 0.054 | (0.11) | 0.048 | (0.13) |
| LU | 0.107 | (0.00) | 0.093 | (0.01) | 0.087 | (0.01) | 0.073 | (0.01) |
| LV | 0.082 | (0.02) | 0.060 | (0.09) | 0.057 | (0.10) | 0.046 | (0.14) |
| MT | 0.083 | (0.01) | 0.063 | (0.07) | 0.047 | (0.14) | 0.039 | (0.21) |
| NL | 0.088 | (0.01) | 0.066 | (0.06) | 0.059 | (0.09) | 0.054 | (0.11) |
| PL | 0.097 | (0.00) | 0.080 | (0.03) | 0.075 | (0.03) | 0.068 | (0.04) |
| PT | 0.089 | (0.00) | 0.068 | (0.04) | 0.060 | (0.07) | 0.052 | (0.09) |
| RO | 0.089 | (0.01) | 0.071 | (0.04) | 0.066 | (0.04) | 0.057 | (0.07) |
| SE | 0.087 | (0.01) | 0.067 | (0.05) | 0.062 | (0.06) | 0.052 | (0.09) |
| SI | 0.088 | (0.01) | 0.066 | (0.05) | 0.061 | (0.07) | 0.052 | (0.09) |
| SK | 0.096 | (0.01) | 0.075 | (0.04) | 0.066 | (0.06) | 0.052 | (0.12) |
| FR | 0.087 | (0.01) | 0.066 | (0.07) | 0.061 | (0.08) | 0.054 | (0.10) |
| FI | 0.096 | (0.00) | 0.076 | (0.02) | 0.072 | (0.02) | 0.061 | (0.04) |

Table A3: Leave-one-out regression results - coefficients for Q1-NBS (PCA)

| | model (5) | | model (6) | | model (7) | | model (8) | |
|---|---|---|---|---|---|---|---|---|
| | coefficient | p-value | coefficient | p-value | coefficient | p-value | coefficient | p-value |
| AT | 0.083 | (0.00) | 0.055 | (0.05) | 0.049 | (0.08) | 0.044 | (0.12) |
| BE | 0.084 | (0.00) | 0.062 | (0.03) | 0.058 | (0.04) | 0.057 | (0.04) |
| BG | 0.069 | (0.01) | 0.043 | (0.12) | 0.040 | (0.15) | 0.034 | (0.22) |
| CY | 0.075 | (0.01) | 0.049 | (0.09) | 0.046 | (0.12) | 0.046 | (0.11) |
| CZ | 0.081 | (0.00) | 0.054 | (0.05) | 0.050 | (0.08) | 0.044 | (0.12) |
| DE | 0.081 | (0.00) | 0.055 | (0.05) | 0.051 | (0.07) | 0.045 | (0.11) |
| DK | 0.085 | (0.00) | 0.052 | (0.09) | 0.045 | (0.14) | 0.031 | (0.32) |
| EE | 0.084 | (0.00) | 0.060 | (0.03) | 0.057 | (0.04) | 0.052 | (0.06) |
| EL | 0.067 | (0.01) | 0.046 | (0.11) | 0.044 | (0.13) | 0.039 | (0.17) |
| ES | 0.078 | (0.00) | 0.049 | (0.09) | 0.049 | (0.09) | 0.044 | (0.12) |
| HU | 0.091 | (0.00) | 0.065 | (0.03) | 0.060 | (0.04) | 0.049 | (0.10) |
| IE | 0.082 | (0.00) | 0.055 | (0.05) | 0.052 | (0.06) | 0.046 | (0.10) |
| IT | 0.081 | (0.00) | 0.054 | (0.06) | 0.052 | (0.07) | 0.047 | (0.10) |
| LT | 0.077 | (0.00) | 0.048 | (0.07) | 0.048 | (0.07) | 0.044 | (0.10) |
| LU | 0.111 | (0.00) | 0.094 | (0.00) | 0.091 | (0.00) | 0.082 | (0.01) |
| LV | 0.079 | (0.00) | 0.051 | (0.07) | 0.049 | (0.08) | 0.042 | (0.14) |
| MT | 0.075 | (0.01) | 0.049 | (0.08) | 0.038 | (0.19) | 0.032 | (0.26) |
| NL | 0.082 | (0.00) | 0.054 | (0.06) | 0.048 | (0.10) | 0.046 | (0.11) |
| PL | 0.092 | (0.00) | 0.066 | (0.02) | 0.061 | (0.03) | 0.056 | (0.05) |
| PT | 0.085 | (0.00) | 0.058 | (0.04) | 0.052 | (0.07) | 0.047 | (0.10) |
| RO | 0.087 | (0.00) | 0.066 | (0.02) | 0.064 | (0.02) | 0.059 | (0.04) |
| SE | 0.082 | (0.00) | 0.055 | (0.05) | 0.052 | (0.07) | 0.045 | (0.11) |
| SI | 0.082 | (0.00) | 0.055 | (0.05) | 0.051 | (0.07) | 0.045 | (0.11) |
| SK | 0.086 | (0.00) | 0.059 | (0.05) | 0.051 | (0.09) | 0.037 | (0.21) |
| FR | 0.081 | (0.00) | 0.053 | (0.07) | 0.049 | (0.09) | 0.045 | (0.11) |
| FI | 0.091 | (0.00) | 0.064 | (0.03) | 0.062 | (0.03) | 0.053 | (0.07) |