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FUNCTIONAL INCOME DISTRIBUTION, INEQUALITY AND THE EFFECTIVENESS OF FISCAL REDISTRIBUTION: EVIDENCE FROM OECD COUNTRIES

BRUNO BISES, FRANCESCO BLOISE, ANTONIO SCIALÀ

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Bruno Bises, Francesco Bloise, Antonio Scialà

Roma Tre University, Department of Law

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FUNCTIONAL INCOME DISTRIBUTION, INEQUALITY AND THE EFFECTIVENESS OF FISCAL REDISTRIBUTION: EVIDENCE FROM OECD COUNTRIES

Abstract

Using panel data on 34 OECD countries followed from 2000 to 2015, we analyse the extent to which the labour share plays a role in mitigating the link between market and disposable income inequality in the non-comprehensive personal income tax hypothesis (i.e. when some or all capital income items are excluded from the personal income tax base). We find that one standard deviation increase of labour share is significantly related to a 9-percentage points reduction in the elasticity of disposable income inequality with respect to market income inequality. This important result obtained after controlling for country and year fixed effects, country-specific linear trends and several variables capturing the characteristics of the tax-benefit system in terms of overall progressivity, suggests that labour share could be considered as an "automatic stabilizer" of income inequality. Relevant implications for tax policy concern the role of the tax base of the personal income tax for the overall redistributive effect of the public budget.

Keywords: Labour share, personal income inequality, redistribution, personal income taxation.

JEL codes: D31, D33, H24

Introduction[1]

In the last decades many research works have documented a sizable increase in disposable income inequality in a large number of high-income countries (see, OECD, 2011; Morelli et al., 2015; Bourguignon, 2018) as a possible consequence of a simultaneous increase in market income inequality (see, Bozio et al., 2020).

A first strand of the literature has tried to explain the channels through which market income inequality has increased over time. Among all possible mechanisms behind the dynamic of market inequality, many contributions have focused on the effects of the long-run changes in the functional distribution of income, namely the labour share of income, on market income inequality (see, Daudey and García-Peñalosa, 2007; Glyn, 2009; Hoeller, et al., 2012; Francese and Mulas-Granados, 2015; Schlenker and Schmid, 2015; Bengtsson and Waldenström, 2018).

A second strand of the literature has instead focused on the effectiveness of redistribution in mitigating the direct link between market and disposable inequality. Specifically, many contributions have tried to determine which kind of fiscal instruments can be more effective in reducing the concentration of market income (Atkinson, 2000; Akgun et al., 2017; Bargain et al., 2015; Caminada et al., 2017; Causa and Hermansen, 2018; D'Agostino et al., 2020).

This article aims to bridge these two strands of literature. Specifically, we investigate the existence and the direction of a possible relationship between the level of the labour share and the effectiveness of the tax-benefit system in dampening the increase in market income inequality, especially through the personal income tax (hereafter, PIT). Thus, with respect to the existing literature, we suggest a novel channel through which the labour share of income may be associated to income inequality: that is, a lower (a higher) level of the labour share may be associated with a higher (lower) disposable income inequality not only by fostering an increase (a decrease) in market income inequality, but also by reducing (improving) the ability of the tax system to work as a sort of "automatic stabilizer" of market income inequality. We argue that this feature of the tax system is affected by the joint operation of two factors: on the one hand, the divergence of PIT base from a comprehensive definition; on the other hand, by the different levels of the labour share in a context in which labour income increasingly represents the prevalent item of the PIT base.

Much of the empirical evidence on the relationship between the personal and the functional distribution of income finds a significant negative correlation between labour share and income inequality. For example, Daudey and García-Peñalosa (2007) and Checchi and García-Peñalosa (2010) show that a larger labour share is generally associated with lower income inequality. One common explanation is that market inequality among labour

[1] We thank all participants at the Roma Tre - Department of Law seminar, and at the XXI AISSEC Scientific Conference. We are particularly grateful to Paolo Liberati, Salvatore Morelli, Antonio Pedone, and Alberto Pozzolo, for their valuable comments. Usual disclaimer applies.

earners is lower than capital income inequality so that as the labour share declines, personal income inequality mechanically increases (Glyn, 2009; Schlenker and Schmid, 2015; Milanovic, 2017).[2]

As previously stated, an unexplored reason why the labour share can be associated with income inequality is related to the capacity of the fiscal system to dampen an increase in market income inequality. A variety of taxes and tax treatments may act in such a direction. However, the main tool is the PIT, not only through its progressive structure (given by rising marginal tax rates applied to higher income brackets, deductions, tax credits, preferential tax treatments of labour income, allowances for labour expenses, etc.) but also through the characteristics and width of the tax base (see, Bises and Scialà, 2014; Figari and Paulus, 2015).

When the PIT base perfectly matches the comprehensive income definition, i.e. the S-H-S (Schanz-Haig-Simons) definition of income,[3] what determines the capacity of the PIT to react to higher market income inequality is that part of the PIT structure which affects the level of income and no role is played by the composition of the tax base. In this case, what matters for the analysis of the redistributive effect of the PIT is the personal distribution of total income, while the functional distribution is irrelevant. However, in the more realistic hypothesis of a non-comprehensive PIT, where one or more of the items of capital income (interest, dividends, property income, capital gains) are excluded from the PIT tax base and taxed with a flat rate (or even not taxed at all), the functional distribution of income could play an important role in determining the association between market and disposable income inequality, unless the income from any source shows the same distribution along the personal income scale.

We test the latter hypothesis on a balanced panel of 34 countries followed from 2000 to 2015, using information on market and disposable income inequality taken from the Standardized World Income Inequality Database (SWIID), detailed data on the characteristics of the tax-benefit system provided by the OECD tax database, and alternative measures of the labour share of income taken from the annual macro-economic database of the European Commission (AMECO) and from the International Labour Organization Department of Statistics (ILOSTAT).

After controlling for country and year fixed effects, country specific linear trends, and additional time-varying variables which capture the structure and redistributive capacity of the tax-benefit system, we show that the elasticity of disposable income inequality with respect to market income inequality (EDMI) is significantly and negatively related to the

[2] It is noteworthy that some contributions have found that the increasing income inequality is mainly related to the increase of inequality within labour income earners. See, Hoeller et al. (2012) and Francese and Mulas-Granados (2015).

[3] The comprehensive income is defined as "the value of what" an individual "could have consumed during the year without … diminishing his capital wealth in the process". It constitutes "a true measure of the total economic opportunity accruing to him in the year in question" (Meade, 1978, p. 31). See Schanz (1896), Haig (1921), and Simons (1938) for the seminal definition of comprehensive income.

level of the labour share of income. Specifically, we find that a one standard deviation increase in the labour share is associated with a 9.1 percentage points reduction of the EDMI.

Our result, which is robust to many alternative specifications and empirical strategies, suggests that the labour share of income can be considered as an "automatic stabilizer" of income inequality. Therefore, a possible policy implication of our evidence is that a more comprehensive PIT base able to redistribute income within capital owners might reduce the impact of increases in market income inequality on disposable income inequality in low-labour share countries.

The paper is structured as follows. Section 2 describes the theoretical reasons why the functional distribution of income can influence the link between market and disposable income inequality. Section 3 presents our empirical strategy. Section 4 describes the main features of our dataset. Section 5 shows the main results of our econometric analysis. Section 6 provides some robustness check to verify the stability of our results, and Section 7 concludes.

1. Theoretical insight

1.1. General framework

In order to provide some theoretical insight about the relationship between personal and functional distribution of income, consider the following equation describing the link between the personal income inequality of disposable income and the personal income inequality of market income:

$$G_d = b \cdot t \cdot G_m \qquad (1),$$

where G_m is the Gini coefficient computed on market income distribution, G_d is the Gini coefficient computed on disposable income distribution, and b and t are parameters that quantify the ability of the benefit (b) and tax (t) system to reduce personal income inequality when moving from market income to disposable income: the higher $b \cdot t$, the lower the ability of the tax-benefit system to reduce income inequality. In the extreme case of $b \cdot t = 1$ we obtain $G_d = G_m$, and then the tax-benefit system is perfectly proportional, i.e. it has no redistributive effect. The antipodean case of $b \cdot t = 0$ implies that $G_d = 0$ whatever the value of G_m, that is public policies are able to fully offset any market inequality. In general, in an overall progressive system we can assume $0 \leq b \cdot t < 1$, since market income inequality is reduced through the tax-benefit system.

To introduce the role of the functional distribution of income into the analysis, let us make use of the Shorrocks (1982) "natural" decomposition of personal income inequality:

$$G_m = s_l \cdot \bar{G_l} + s_k \cdot \bar{G_k} = s_l \cdot \bar{G_l} + (1 - s_l) \cdot \bar{G_k} \qquad (2),$$

where s_l is the labour share, $s_k = 1 - s_l$ is the share of non-labour income, $\bar{G}_l$ the pseudo-Gini on labour income, and $\bar{G}_k$ the pseudo-Gini on non-labour income.
From equation (2), we can derive the effect of a change in labour share on market income inequality. If we assume that pseudo-Gini coefficients are not affected by the labour share, we have:

$$\frac{dG_m}{ds_l} = \bar{G}_l - \bar{G}_k \qquad (3).$$

Notice that the sign of equation (3) depends on the comparison between the inequality within labour income earners and the inequality of non-labour income earners: a decrease in labour share implies an increase in market income inequality if and only if the distribution of non-labour income is relatively more uneven than the distribution of labour income.
Since it is widely documented that the distribution of non-labour income is more unequal than the distribution of labour income (see, OECD, 2011), hereafter we will assume that $\bar{G}_l < \bar{G}_k$.

1.2. The case of the comprehensive personal income tax base

In tax-benefit systems based on a comprehensive definition of taxable personal income – i.e. all income items, whether from labour or from capital, are included in the PIT base and then subject, for any individual, to the same tax structure – the effects of fiscal policy on income inequality can be described as follows:

$$G_d = b \cdot t \cdot [s_l \cdot \bar{G}_l + (1 - s_l) \cdot \bar{G}_k] \quad (4).$$

From equation (1) it is possible to assess the effect of a change in the market income inequality on disposable income inequality, that is:

$$\frac{dG_d}{dG_m} = b \cdot t \qquad (5).$$

Equation (5) shows that if b and t are assumed to be exogenous parameters, the size of the dampening of market income inequality is independent from the labour share; that is, the redistributive power of the tax-benefit system is independent from the dynamics of the labour share, and therefore, from the functional distribution of income.

Comprehensive PIT base hypothesis.
In the case of a comprehensive definition of the PIT base, a change in the labour share does not affect the relationship between market income inequality and disposable income

inequality.

1.3. The case of the personal income tax base excluding all non-labour income

Let us now analyse the case in which the tax system is based on a definition of income that deviates from the comprehensive one in the sense that all non-labour income is excluded from the progressivity of the PIT, while the benefit system is supposed to take account of the whole individual income and not to discriminate between capital income and labour income earners.[4] Under this scenario, we have that equation (4) turns out to take the following expression:

$$G_d = b \cdot [t \cdot s_l \cdot \bar{G}_l + (1 - s_l) \cdot \bar{G}_k] = \theta \cdot G_m \qquad (6),$$

where:

$$\theta = \frac{b \cdot [s_l \cdot t \cdot \bar{G}_l + (1 - s_l) \cdot \bar{G}_k]}{s_l \cdot \bar{G}_l + (1 - s_l) \cdot \bar{G}_k} \qquad (7).$$

According to equation (6), while the whole tax-benefit system deploys its redistributive effects on labour income inequality, only the benefit system can reduce that part of income inequality that is related to the distribution of non-labour income. Therefore, the parameter θ represents a measure of the redistributive effect of the public budget as a whole, in the case of the interplay of the two public budget tools (the larger θ, the smaller the overall effect).

The effect on disposable income inequality of a change in the market income inequality is now given by:

$$\frac{dG_d}{dG_m} = \theta \qquad (8).$$

Since θ depends on the labour share, so that now it affects the effect of a change in market income inequality on disposable income inequality.

Let us therefore focus on the effect of a change in the labour share on the redistributive

[4] It should be noted, however, that if some benefits (in cash or in-kind) are provided on the basis of the individual income situation resulting from the PIT return – without adjusting the latter for the capital income items excluded from the PIT base – a non-comprehensive PIT base also affects the degree of progressivity of the expenditure side of the public budget. Since in our empirical analysis disposable income is given by income earned after taxes and in-cash benefits only, the above effect would be limited to the latter component.

power of the tax-benefit system in the fiscal setting, which is described by the first term in (8). It is informative to assess what happens in the two extreme cases in which $s_l = 0$ and $s_l = 1$, respectively. If $s_l = 0$, we get the case in which, because of the exclusion of non-labour income from the PIT base, the tax system does not redistribute at all, i.e. $\theta = b$. When $s_l = 1$, we get the same redistributive result that we would obtain under a tax-benefit system based on a comprehensive definition of taxable income, i.e. $\theta = b \cdot t$. Finally, in the case in which $0 < s_l < 1$, we have that $b \cdot t < \theta < b$. In general, the impact of a change in labour share on the redistributive power of the tax-benefit system is now given by:

$$\frac{dG_d}{dG_m ds_l}\frac{d\theta}{ds_l} = \frac{b \cdot G_m \cdot (t \cdot \bar{G}_l - \bar{G}_k) - G_d(\bar{G}_l - \bar{G}_k)}{G_m^2} \qquad (9).$$

With $\bar{G}_l < \bar{G}_k$, we have that, under mild assumptions,[5] $d\theta/ds_l < 0$, i.e.:

Non-comprehensive PIT base hypothesis.

In the case of a non-comprehensive definition of the PIT base, – specifically excluding all income from capital – the relationship between market income inequality and disposable income inequality is negatively related to the labour share.

In other words, the capacity of a given structure of the tax-benefit system to reduce income inequality is now affected by the functional distribution of income.

2. Econometric analysis

This section presents the empirical strategy implemented to estimate the effect of the labour share on the link between market income inequality and disposable income inequality, so that it will be possible to verify which one of the two hypotheses presented in the previous section is confirmed with reference to a sample of OECD countries. Our empirical strategy is performed in three steps.

First, using a balanced panel of 34 countries followed from 2000 to 2015, we simply estimate the EDMI as follows:

$$log\ ginidisp_{it} = \alpha + \beta\ log\ ginimark_{it} + \varepsilon_{it} \qquad (10),$$

[5] It can be shown that (see the Appendix) a sufficient condition for $d\theta/ds_l < 0$ is that $b \cdot G_m > G_d$. The violation of the latter condition would imply that the benefit system alone is more redistributive than the whole tax-benefit system; this could happen if the tax system were so much regressive to over-compensate the redistribution operated by the benefit system, in fact a very peculiar case.

where $log\ ginidisp_{it}$ is the log Gini calculated on disposable income for country i at time t, $log\ ginimark_{it}$ is the corresponding Gini computed on market income, and ε_{it} is the usual disturbance. The estimated β is the EDMI, i.e. the percentage increase of disposable income inequality for a one percent increase of market income inequality; symmetrically, $1-\beta$ is a measure of the overall redistributive capacity of the tax-benefit system.

By estimating Equation (10) using pooled OLS (POLS), the error term ε_{it} includes all factors related to the overall redistributive capacity of the fiscal system which vary across countries and over time. It is noteworthy that, the higher the redistributive capacity of the fiscal system, the higher ε_{it} and the lower the estimated EDMI. Specifically, in the unrealistic hypothesis of no redistribution, we should have that $\beta = 1$, while if the overall amount of market income inequality is reduced due to the role of and the tax-benefit system, we should have that $\beta = 0$. In the more realistic case in which market income inequality is just partially reduced by the redistributive effect of the fiscal system, we have that $0 < \beta < 1$.

The parameters b and t, which capture the redistributive effect of benefits and taxes, respectively, are assumed in Section 2 to be uncorrelated to the labour share of income. However, from an econometric point of view, it is necessary to relax the assumption that the labour share of income is uncorrelated to the overall degree of progressivity of the tax-benefit system (i.e. the parameter θ in Section 2). Such an assuption would imply that we could estimate the influence of labour share on the link between market and disposable income inequality by simply adding labour share and its interaction with $log\ ginimark_{it}$ as further explanatory variables in Equation (10). In this case, the interaction term coefficient would capture the effect of labour share on the EDMI. That is, the strength of the link between market and disposable income inequality is allowed to change according to the level of the labour share of income.

However – and this is the second step of our empirical strategy – if we relax this strong exogeneity assumption, before including the previously mentioned interaction term, we can enrich Equation (10) taking into account the differences in the degree of progressivity across countries and over time as follows:

$$log\ ginidisp_{it} = \alpha + \beta\ log\ ginimark_{it} + \omega X_{it} + c_i + \tau_t + year * c_i + v_{it} \qquad (11).$$

The vector X_{it} in Equation (11) includes the Kakwani index of progressivity for personal taxation; the overall amount of social expenditure and the amount of tax revenues as a share of GDP; the share of total revenues from taxes on property, the share of revenues from indirect taxes; the tax wedge calculated at mean income, and the log GDP per capita.[6] We also include c_i , τ_t , and $year * c_i$ which represent country fixed effects, year fixed effects, and country specific linear trends, respectively.

[6] All control variables in the vector X_{it} are standardized to obtain comparable coefficients.

Once these additional control variables are included in Equation (11), we can indirectly estimate the extent to which all potential factors that might influence the overall redistributive capacity of the fiscal system are incorporated, by focusing on the estimated coefficient β. Specifically, if cross-country differences in the degree of progressivity, which can be related to differences in the labour share of income, are completely taken into account, we should have an estimated β of 1 in Equation (11). In the latter case – and this is the final step of our empirical strategy –we can thus analyse the influence of the labour share of income on the EDMI by estimating the following regression:

$$log\ ginidisp_{it} = \alpha + \beta\ log\ ginimark_{it} + \rho\ LS_{it} + \gamma\ (LS_{it} * log\ ginimark_{it}) + \omega X_{it} + c_i + \tau_t + t * c_i + e_{it} \quad (12),$$

where LS_{it} is the standardized labour share of income and the parameter γ captures the influence of a one standard deviation increase of the labour share on the elasticity of disposable income inequality with respect to market income inequality. According to the theoretical framework proposed in Section 2, we expect the parameter γ to be either negative (in the non-comprehensive tax base hypothesis), or not statistically significant (in the comprehensive tax case).

3. Data and descriptive evidence

We estimate Equations (10) to (12) using detailed data from different sources. To maximize the degree of comparability across countries and over time, and the number of observations on market and disposable income inequality indices, we take information on Gini coefficients from the 8.3 version of the SWIID released in May 2020 (Solt, 2019). The SWIID is the most comprehensive dataset on market and disposable income inequality and it provides standardized inequality indices taken from different sources (e.g. OECD Income Distribution Database, the Socio-Economic Database for Latin America and the Caribbean generated by CEDLAS and the World Bank, Eurostat, the World Bank's PovcalNet, the UN Economic Commission for Latin America and the Caribbean, national statistical offices around the world, and academic studies). This is why it has been widely used in empirical research on income inequality in recent years (see, for example, Kotschy and Sunde, 2017; De Haan and Sturm, 2017; Berg et al., 2018; Darvas, 2019; Filippin and Nunziata, 2019; Jaumotte and Osorio, 2020; Matsubayashi and Sakaiya, 2020).

Although the SWIID has been sometimes criticized in the past because of the multiple-imputations procedures adopted to increase the number of countries covered and manage the trade-off between comparability and data coverage (Jenkins, 2015), using inequality

measures taken from the Luxembourg Income Study (LIS) as the high-quality benchmark, Solt (2020) shows that, in the revised versions of the SWIID, the imputation procedures adopted does not prevent the SWIID to predict income inequality indices reported in the LIS database.[7]

It is noteworthy that the SWIID incorporates uncertainty deriving from multiple-imputation methods by providing a distribution of 100 Gini coefficients for each country-year pair. As it is standard in the literature, we incorporate the amount of uncertainty introduced by multiple-imputation procedures by simply averaging the 100 inequality indices of disposable and market income inequality for each country-year combination.

As regards data on the labour share of income, we take information provided by AMECO. In our baseline analysis we define the labour share of income as the compensation of employees as percentage of GDP at factor cost. Additionally, alternative definitions of the labour share are adopted to test the robustness of the results. Specifically, in further robustness checks, we define labour share as the compensation of employees as percentage of GDP at market prices, or as the adjusted labour share taken from ILOSTAT, which also incorporates the labour part of self-employment income.

All other information on the characteristics of the fiscal systems are taken from the OECD revenue statistics database, that provides a rich set of information on tax rates, tax brackets and many other features of the tax-benefit system from 2000 onwards. As a baseline measure of overall progressivity of the PIT, we compute the Kakwani index of progressivity following the procedure adopted by Gerber et al., (2020). Specifically, for each country-year pair, we use information on tax rates and tax brackets provided by the OECD Taxing Wage annual publications to compute the Kakwani index of progressivity, using an independent before-tax income distribution calculated over a fixed range of incomes (i.e. 0%-500% of per capita GDP). This procedure allows us to consider a measure of progressivity of PIT which is exogenous with respect to the actual before-tax distribution of income and highly informative on the potential redistributive power of PIT, independently from changes in inequality occurred in labour and capital markets.

To test the robustness of our baseline results to our measure of PIT progressivity, we provide an additional estimate in which we control for three alternative measures of progressivity of PIT computed along the distribution (the top tax rate, the difference between tax rates at 167% and 100% of the individual average wage, and the difference between tax rates at 100% and 67% of the individual average wage).

The other variables which capture the characteristics of the tax-benefit system included in our econometric specifications are the total amount of social expenditure as percentage of GDP; the amount of tax revenues as percentage of GDP; the percentage of revenues from property taxes; the percentage of revenues from indirect taxes; the tax wedge calculated at 100% of average labour income.

[7] See Solt (2015) for a detailed answer to Jenkins' criticism.

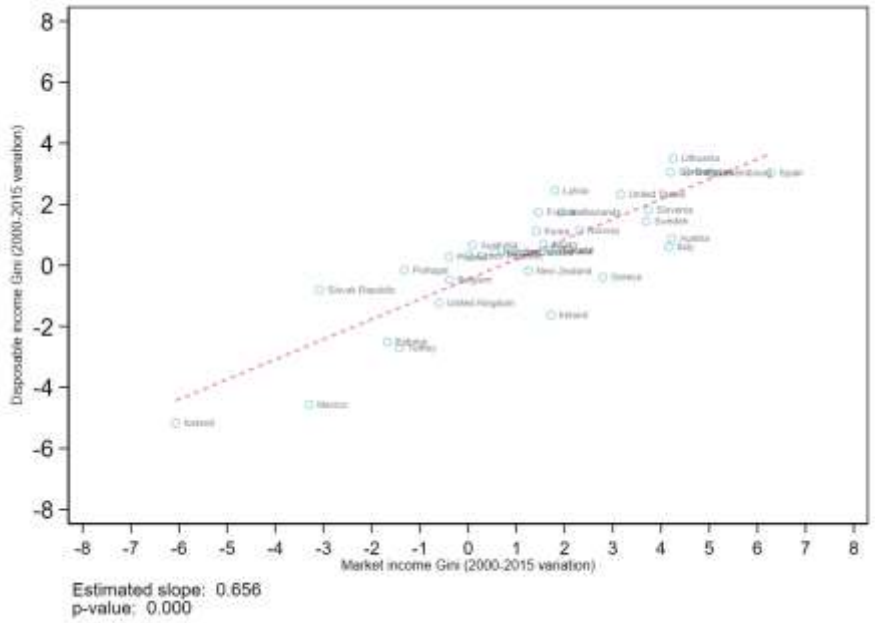
Using inequality measures taken from the SWIID dataset and all other variables taken from the publicly available OECD tax database and AMECO, we are able to obtain a balanced panel including 34 OECD countries followed from 2000 to 2015.[8]

Figure 1 shows that changes in market and disposable income inequality are strongly related in the considered period. Specifically, the regression coefficient of the variation in disposable income inequality on market income inequality occurred between 2000 and 2015 is 0.656 and statistically significant at 99%. This result suggests that, on average, for a 10 percentage points increase in market inequality, disposable income inequality is 6.56 percentage points higher. It is noteworthy, that most of the countries included in our sample have experienced relevant increases in market income inequality in the period considered and, as a consequence, also disposable income inequality is generally higher in 2015 as compared to 2000 in most cases.

As already mentioned in the previous sections, the association between the functional and the personal distribution of income has been widely analysed in many above mentioned empirical works. Figure 2 partially confirms that the labour share and income inequality are negatively associated given that, as market and disposable income inequality have been increased over time (see Figure 1), the labour share of income decreases in the majority of countries included in our sample between 2000 and 2015. However, this kind of empirical evidence, even if useful to confirm that the functional and the personal distribution of income are possibly associated, does not give us any information on the possible influence of the labour share on the link between market and disposable income inequality.

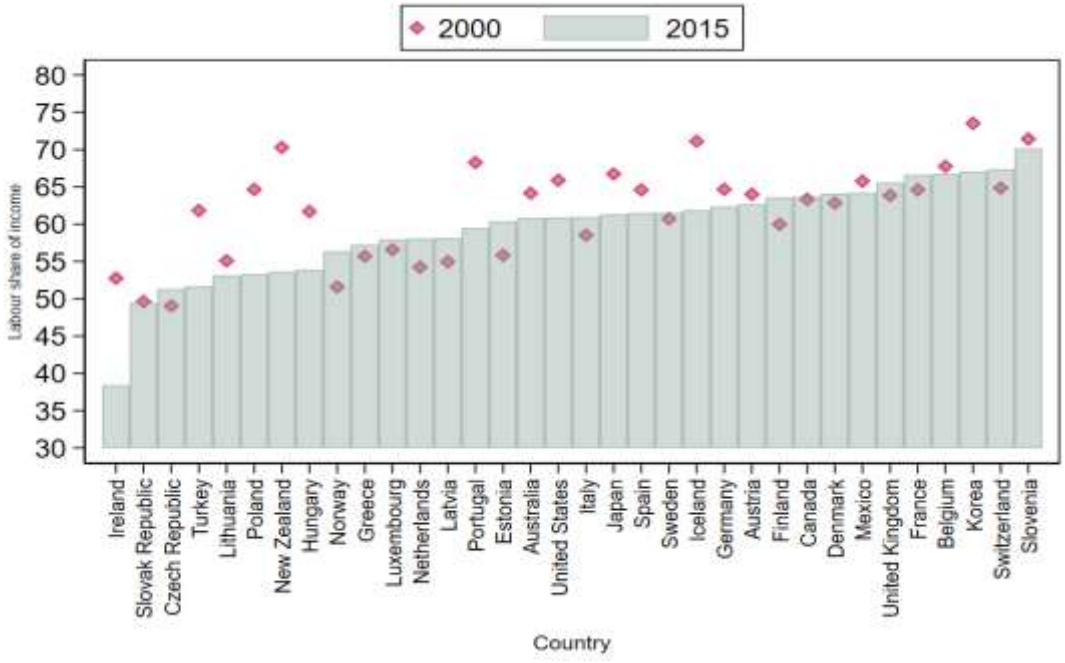
[8] The countries included in our sample are: Australia, Austria, Belgium , Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Latvia, Lithuania, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak, Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom, and the United States.

Figure 1: Estimated association between changes in market inequality and changes in disposable income inequality



Source: SWIID 8.3

Figure 2: Changes in the labour share of income occurred between 2000 and 2015



Source: Ameco

Table 1 presents the median and the standard deviation of all variables used in our empirical analysis. The Gini coefficient of disposable income inequality, which is our outcome variable in all econometric specifications, is 30.16 at the median, while the corresponding parameter on market income inequality is 17.33 percentage points higher.
With respect to the median labour share of income at factor prices, we have a value of 61.16 in our sample, while the standard deviation is 6.02. That is, our main estimated parameter of interest γ in Equation (12) gives us information on the extent to which the link between market and disposable income inequality changes for about 6 percentage points increase in labour share.
Finally, with regards to the tax-benefit control variables, it is worth mentioning that the median Kakwani index and its dispersion are very close to the ones calculated by Gerber et al. (2020) on a different sample of OECD countries.

Table 1: Descriptive statistics

	Median	S.D.
Inequality measures:		
Gini of disposable income	30.16	4.78
Gini of market income	47.49	4.04
Labour share of income	61.16	6.02
Fiscal variables:		
Kakwani index of progressivity	0.07	0.03
Social Expenditure (% GDP)	19.75	5.66
Revenues from indirect taxes (% of total revenues)	31.62	6.91
Revenues from property taxes (% of total revenues)	4.30	3.43
Tax revenues (% GDP)	32.95	7.22
Tax wedge at mean income	38.69	9.61
Additional control variables:		
Log GDP per capita	10.47	0.40
Countries	34	34
Observations	544	544

Source: SWIID 8.3, Ameco, and OECD tax database

4. Estimation results

This section presents the results obtained from Equations (10) to (12). First, Table 2 shows all coefficients estimated from Equations (10) and (11), where the EMDI is obtained with or without controlling for time-invariant unobservables, yearly specific shocks common to all countries, country specific linear trends, and all other information of the tax-benefit system described in Section 4, which can influence the overall degree of redistribution.

Table 2: Estimates of the link between disposable income inequality and market income inequality

	[1]	[2]	[3]	[4]	[5]	[6]
Log ginimark	0.409***	0.924***	0.983***	0.994***	0.994***	1.002***
	(0.064)	(0.099)	(0.098)	(0.104)	(0.097)	(0.096)
Kakwani index					-0.004*	
					(0.002)	
Social expenditure					-0.010*	-0.011*
					(0.006)	(0.006)
Property tax					-0.001	-0.001
					(0.006)	(0.005)
Indirect tax					0.010**	0.009**
					(0.004)	(0.004)
Tax revenues					-0.003	-0.002
					(0.007)	(0.006)
Tax wedge					0.005	0.008
					(0.011)	(0.012)
Log GDP per capita					-0.011	-0.01
					(0.031)	(0.032)
Progressivity (100%-67% of avg. income)						-0.005
						(0.003)
Progressivity (167%-100% of avg. income)						-0.001
						(0.002)
Top tax rate						-0.002
						(0.003)
Country fixed effects		Yes	Yes	Yes	Yes	Yes
Year fixed effects			Yes	Yes	Yes	Yes
Country specific linear trends				Yes	Yes	Yes
Observations	544	544	544	544	544	544
Nr. of countries	34	34	34	34	34	34
R-squared	0.063	0.722	0.741	0.896	0.907	0.909

Source: Authors' elaborations. ***Notes:*** Standard errors are clustered at the country level. All controls variables in the vector X_{it} and the labour share of income are standardized.

When no control variables are included in the specification, the estimated EMDI is 0.409 (Table 2, column 2). That is, the percentage increase of the Gini of disposable income inequality is 4.09% for a 10 percent increase in the Gini of market income inequality. As already mentioned in previous sections, when $0 < \beta < 1$, on average, a fraction of market

income inequality is redistributed thanks to progressive taxes and benefits, while an estimated $\beta = 1$ means that no additional factors related to the redistributive capacity of the fiscal system influence the estimated difference between market and disposable income inequality.

As we include country fixed effects in the specification (Table 2, column 2), country and year fixed effects (Table 2, column 3), country and year fixed effects, country specific linear trends (Table 2, column 4), and all other control variables (Table 2, columns 5 and 6), the estimated EDMI gets closer to 1. Specifically, starting from the 4th column of Table 2, the estimated β is very close to 1. This result suggests that all potential variables which might be simultaneously associated with the labour share and with the redistributive effectiveness of the fiscal system are controlled for. It is noteworthy that, as expected, the Kakwani index of progressivity and the amount of social expenditure as a percentage of GDP are negatively associated with our outcome variable, while the amount of indirect taxes as a percentage of total revenues is positively correlated to the Gini coefficient of disposable income inequality (Table 2, column 5).

Table 3 presents the results of the estimated coefficients in Equation (12). In this case, we are interested in the estimated interaction term which gives us information on the extent to which the labour share of income might influence the link between market and disposable income inequality.

When no control variables are included (Table 3, column 1), the estimated parameter γ of equation (12) is negative and equal to -0.242. Therefore, a 1 standard deviation increase of labour share (i.e. 6.02 percentage points) is associated with a 24.2 percentage points reduction of the EDMI. However, it is noteworthy, that the estimated γ presented in Table 3 (column 1) is very likely to be downward biased if the labour share of income is positively associated to the overall redistributive capacity of the fiscal system. The latter assumption is confirmed when time-invariant unobservables, yearly specific shocks common to all countries, country specific linear trends, and all other available information on the tax-benefit system are controlled for. Specifically, as we incorporate in our regression all factors which can be simultaneously correlated to the difference between market and disposable income inequality and to the labour share of income, the estimated γ is between -0.091 and -0.089 (Table 3, columns 5 and 6, respectively). That is, a 1 standard deviation increase in the labour share is associated with a reduction of the EDMI of about 9-percentage points.

According to the theoretical framework proposed in Section 2, this result suggests that the non-comprehensive tax base hypothesis is strongly confirmed in our sample. Therefore, as the link between market and disposable income inequality is estimated to be lower in higher-labour share countries, we can refer to the labour share as an “automatic stabilizer” of income inequality. Therefore, our result suggests that beside its possible association with market income inequality, labour share might influence personal income inequality according to additional theoretical channels related to the redistributive capacity of the

fiscal system.

Table 3: Estimates of the influence of the labour share of income on the link between disposable income inequality and market income inequality

	[1]	[2]	[3]	[4]	[5]	[6]
Log ginimark	0.592***	0.924***	0.981***	0.982***	0.978***	0.983***
	(0.068)	(0.089)	(0.089)	(0.093)	(0.090)	(0.089)
Log ginimark*Labour share (γ)	-0.242***	-0.065**	-0.057**	-0.108***	-0.091***	-0.089***
	(0.044)	(0.026)	(0.026)	(0.024)	(0.024)	(0.024)
Labour share	0.924***	0.250**	0.216**	0.410***	0.351***	0.341***
	(0.170)	(0.099)	(0.102)	(0.090)	(0.091)	(0.090)
Kakwani index					-0.004	
					(0.002)	
Social expenditure					-0.009	-0.009*
					(0.005)	(0.005)
Property tax					-0.001	-0.001
					(0.005)	(0.005)
Indirect tax					0.008**	0.007*
					(0.003)	(0.004)
Tax revenues					-0.007	-0.006
					(0.005)	(0.006)
Tax wedge					0.005	0.006
					(0.010)	(0.011)
Log GDP per capita					-0.013	-0.013
					(0.029)	(0.031)
Progressivity (100%-67% of avg. income)						-0.003
						(0.003)
Progressivity (167%-100% of avg. income)						-0.001
						(0.002)
Top tax rate						-0.002
						(0.003)
Country fixed effects		Yes	Yes	Yes	Yes	Yes
Year fixed effects			Yes	Yes	Yes	Yes
Country specific linear trends				Yes	Yes	Yes
Observations	544	544	544	544	544	544
Nr. of countries	34	34	34	34	34	34
R-squared	0.089	0.737	0.751	0.908	0.915	0.916

Source: Authors' elaborations. ***Notes:*** Standard errors are clustered at the country level. All controls variables in the vector X_{it} and the labour share of income are standardized.

5. Robustness checks

This section presents three main robustness checks. In the first one, we test the robustness of our baseline result obtained from Equation (12) to the definition of the labour share of income (Table, 4). As a first alternative definition, we use the compensation of employees

as percentage of GDP at market prices, rather than at factor prices. In the second, we take the adjusted labour share provided by ILOSTAT which also incorporates the labour part of self-employment income. In both cases, the size of the estimated γ is higly comparable to the one obtained in the baseline specification. It is noteworthy, however, that the significance level is slightly lower when we use the adjusted labour share provided by ILOSTAT.

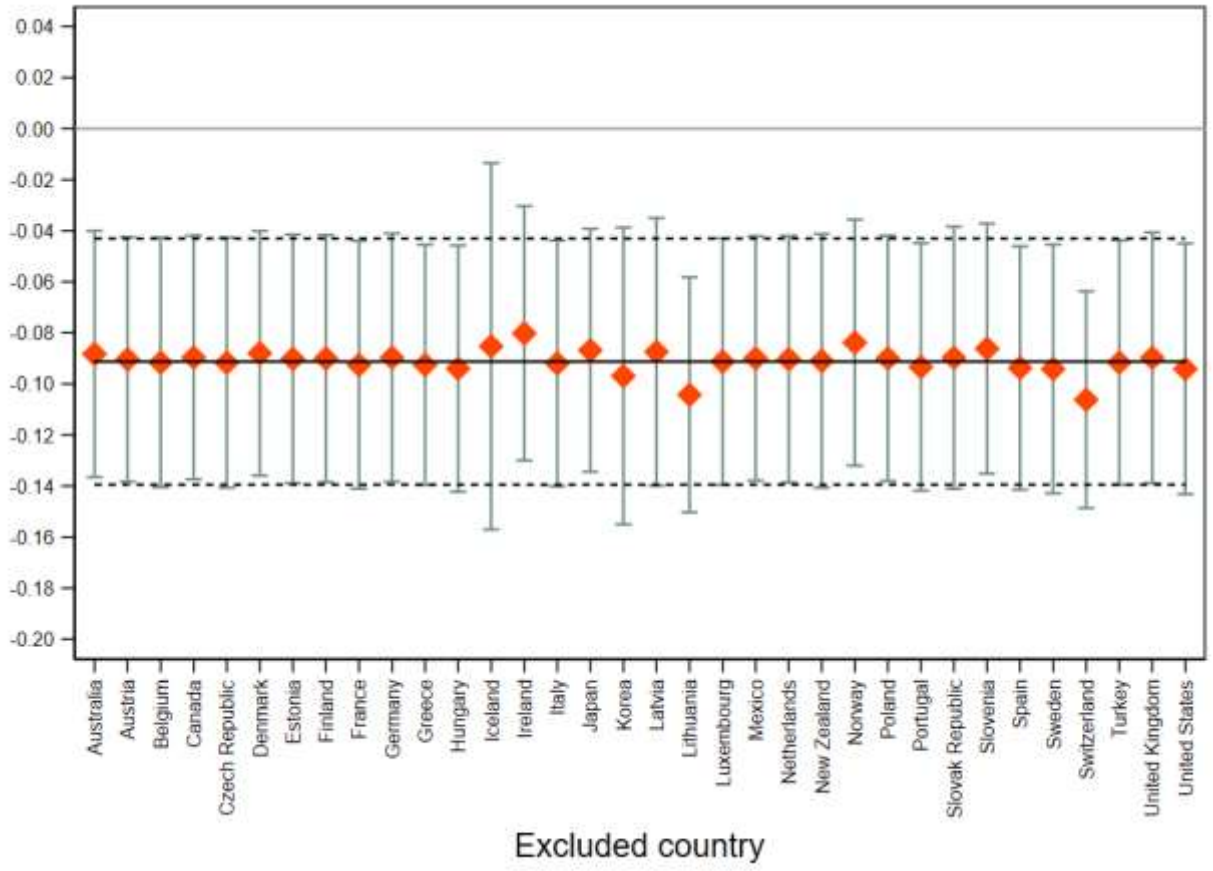
Table 4: Robustness check: alternative definitions of the labour share

	Wage share at factor prices	Wage share at market prices	Adjusted labour share
Log ginimark	0.978***	0.986***	1.006***
	(0.090)	(0.092)	(0.092)
Log ginimark*Labour share (γ)	-0.091***	-0.085**	-0.083*
	(0.024)	(0.033)	(0.043)
Labour share	0.351***	0.328**	0.324*
	(0.091)	(0.126)	(0.164)
Kakwani index	-0.004	-0.004	-0.005*
	(0.002)	(0.002)	(0.002)
Social expenditure	-0.009	-0.009*	-0.012**
	(0.005)	(0.005)	(0.005)
Property tax	-0.001	-0.002	-0.002
	(0.005)	(0.006)	(0.006)
Indirect tax	0.008**	0.009**	0.008**
	(0.003)	(0.004)	(0.003)
Tax revenues	-0.007	-0.007	-0.008
	(0.005)	(0.006)	(0.006)
Tax wedge	0.005	0.006	0.006
	(0.010)	(0.010)	(0.010)
Log GDP per capita	-0.013	-0.014	-0.022
	(0.029)	(0.029)	(0.027)
Country fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Country specific linear trends	Yes	Yes	Yes
Observations	544	544	544
Nr. of countries	34	34	34
R-squared	0.915	0.912	0.911

Source: Authors' elaborations. ***Notes:*** Standard errors are clustered at the country level.

In the second robustness check, we evaluate the extent to which our main result is driven by one specific country in our dataset. Reassuringly, Figure 3 shows that the estimated γ is statistically different from zero, and highly comparable in size with respect to the baseline result, in each estimate which iteratively exclude one single country included in our sample at a time.

Figure 3: Robustness check: country-specific effect



Source: Authors' elaborations. The horizontal solid line indicates the baseline estimated γ from Equation (12), while the horizontal dashed lines the corresponding 95% confidence intervals. The dots identify all 34 estimated coefficients obtained by excluding one single country each time from our sample. The vertical lines show the corresponding 95% confidence intervals for each estimated γ.

Additionally, in a further estimation, we replace the standardized labour share of income included in Equation (12) with a dummy which assumes the value of one when the labour share of income is above the median labour share (i.e., greater than 61.16), and zero when the labour share is below its median value in the sample. Specifically, this transformation allows us to divide our data in two equally sized groups: i) the high-labour share group which includes all countries above the median labour share; ii) the low-labour share countries where the compensation of employees as percentage of GDP is below 61.16. Moreover, by including in our specification the pairwise interaction between the high

labour share dummy and year fixed effects, we can further control for all potential time shocks which are specific to the two previously defined groups.

Results presented in Table 5 confirm that a high labour share could mitigate the association between market and disposable income inequality, even when group specific year fixed effects, which can differently affect high- and low-labour share countries, are taken into consideration. Specifically, the EDMI is 6.8 percentage points lower in the high-labour share group of countries (i.e. those where the labour share is greater than 61.16) with respect to the low-labour share group.

Table 5: Robustness check: high- vs. low-labour share group

	Baseline	High v.s. Low labour share
Log ginimark	0.978***	1.006***
	(0.090)	(0.091)
Log ginimark*Labour share (γ)	-0.091***	
	(0.024)	
Labour share	0.351***	
	(0.091)	
Log ginimark*High labour share		-0.068***
		(0.023)
High labour share		0.267***
		(0.091)
Kakwani index	-0.004	-0.004
	(0.002)	(0.002)
Social expenditure	-0.009	-0.009
	(0.005)	(0.006)
Property tax	-0.001	-0.001
	(0.005)	(0.005)
Indirect tax	0.008**	0.011**
	(0.003)	(0.004)
Tax revenues	-0.007	-0.007
	(0.005)	(0.006)
Tax wedge	0.005	0.006
	(0.010)	(0.010)
Log GDP per capita	-0.013	-0.004
	(0.029)	(0.031)
Country fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Country specific linear trends	Yes	Yes
Group specific year fixed effects	No	Yes
Observations	544	544
Nr. of countries	34	34
R-squared	0.915	0.915

Source: Authors' elaborations. ***Notes:*** Standard errors are clustered at the country level.

Finally, in the last robustness analysis presented in Table 6, we include iteratively one single tax-benefit control variable to account for potential multicollinearity among regressors. Results shows that the size of the estimated coefficient for the interaction term is extremely stable across specifications. It is noteworthy that, among all control variables iteratively considered in the specifications, and similarly to the baseline results presented in Table 3 (column 6), only the coefficients of social expenditure (with a negative sign) and that of the share of indirect taxation (with a positive sign) are statistically significant.

Table 6: Robustness check: accounting for potential multicollinearity among tax-benefit control variables.

	[1]	[2]	[3]	[4]	[5]	[6]
Log ginimark	0.976***	1.001***	0.981***	0.974***	0.978***	0.982***
	[0.093]	[0.089]	[0.093]	[0.091]	[0.092]	[0.095]
Log ginimark*Labour share (γ)	-0.103***	-0.099***	-0.108***	-0.101***	-0.110***	-0.108***
	[0.024]	[0.023]	[0.024]	[0.024]	[0.025]	[0.024]
Labour share	0.391***	0.379***	0.410***	0.385***	0.422***	0.410***
	[0.090]	[0.090]	[0.090]	[0.090]	[0.096]	[0.090]
Kakwani index	-0.004					
	[0.003]					
Social expenditure		-0.008**				
		[0.004]				
Property tax			-0.001			
			[0.005]			
Indirect tax				0.009**		
				[0.004]		
Tax revenues					-0.008	
					[0.005]	
Tax wedge						-0.002
						[0.011]
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country specific linear trends	Yes	Yes	Yes	Yes	Yes	Yes
Observations	544	544	544	544	544	544
Nr. of countries	34	34	34	34	34	34
R-squared	0.91	0.91	0.908	0.911	0.909	0.908

Source: Authors' elaborations. ***Notes:*** Standard errors are clustered at the country level. All controls variables iteratively included in the specifications and the labour share of income are standardized.

6. Concluding remarks

This paper provides new evidence on the association between the functional and the personal distribution of income. Apart from the possible negative association between

labour share and inequality of market income documented by many earlier research works, labour share can also play a role in mitigating the connection between market and disposable income inequality. We argue that this role is related to the comprehensiveness of the PIT base. Specifically, we assumed that in the non-comprehensive tax base hypothesis, i.e. when one or more items of capital income are excluded from the tax base of the PIT, tax progressivity reduces that part of inequality which characterizes the labour market, but it is far less able to mitigate capital income inequality. Therefore, as the labour share declines, the tax-benefit system becomes less effective in reducing overall market inequality.

Using data on a balanced panel of 34 OECD countries followed between 2000 and 2015, we show that, in line with the non-comprehensive tax hypothesis, one standard deviation increase in labour share reduces the elasticity of disposable income inequality with respect to market income inequality of about 9-percentage points. This finding, which is robust to the inclusion of country and year fixed effects, country specific linear trends and many other controls related to the tax-benefit system in the econometric specifications, suggests that the labour share of income acts as an "automatic stabilizer" of changes in market income inequality, when the PIT base is non-comprehensive.

The above results point out that, given the structure of the PIT (i.e. tax rates, tax credits, etc.), the definition of the tax base per se may act as a progressivity factor.

To conclude, our results suggest two possible strategies to mitigate the overall incidence of market income inequality on disposable income inequality. The first strategy is that of adopting pre-distributive policies, which can directly mitigate the gap between rich and poor workers, among capital owners, or between capital owners and employees (see, Bozio et al., 2020).

A second possible strategy is that of reducing the link between market and disposable income inequality. In this respect, the usual suggested solution is that of increasing the overall degree of progressivity of the tax system. However, as labour share falls, a predetermined degree of progressivity of personal income taxes might be less effective in reducing market income inequality. Therefore, the adoption of a more comprehensive PIT base could be an increasingly required tool aimed at reducing the link between market and disposable income inequality.

As a final remark, the results obtained here have a clear relevance for tax policy in itself as they testify on the role of the definition and implementation of the tax base of the personal income tax – in the sense of the inclusion of all capital incomes – for the overall redistributive effect of that tax (and of the public budget as a whole), beyond the degree of progressivity of its structure (given by tax rates, tax credits, allowances, and so on).

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Appendix

Under the assumption that $\bar{G}_l < \bar{G}_k$ and reminding that $T \leq 1$, we have that:

$$(\bar{G}_l - \bar{G}_k) < 0 \Longrightarrow (T \cdot \bar{G}_l - \bar{G}_k) < 0$$

moreover,

$$|T \cdot \bar{G}_l - \bar{G}_k| > |\bar{G}_l - \bar{G}_k| \qquad \text{(A1)}$$

Equation (7) will be negative if the following condition is satisfied:

$$b \cdot |t \cdot \bar{G}_l - \bar{G}_k| > \frac{G_d}{G_m} \cdot |t \cdot \bar{G}_l - \bar{G}_k| \quad \text{(A2)}$$

Given (A1), a sufficient condition for (A2) is that:

$$b > \frac{G_d}{G_m} \Leftrightarrow b \cdot G_m > G_d$$