Government spending reallocations and inequality: evidence from middle-income countries

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Government spending reallocations and inequality: evidence from middle-income countries

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Abstract
We assess the impact of spending reallocations on inequality in a fiscally neutral scenario for a sample of 51 middle-income countries over the period between 2005 and 2015. This is relevant given that developing countries that aim to address increasing inequalities cannot easily rely on either deficit and debts nor increased revenues to finance social spending sectors, such as education, health and social protection. We also look at the impact on different parts of the income distribution and at the role of the Global Financial Crisis of 2007–2009. Overall, we find that reallocations to the education sector are associated with a reduction in income inequality. These benefit all subgroups across the population, including the poor and the relatively rich within a country's income distribution. Reallocation of spending in favour of health, social protection and agriculture is more nuanced and less generalized across the sample of countries. We therefore conclude that greater consideration should be given to the redistributive effects of government budget reallocations than is typically the case.

Keywords Income inequality · Composition of government expenditure · Middle-income countries

JEL Classification E62 · H53 · O15

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1 Introduction

In this paper we assess the extent to which inequality in middle-income countries could be reduced through a neutral fiscal policy stance, whereby government spending is reallocated across sectors, rather than through an expansionary and deficit inducing fiscal policy.

The persistent and increasing divide between the "rich" and the "poor", although never completely out of the academic debate,[1] has become more prominent in the economic literature in more recent years (Piketty 2013; Atkinson 2015; Alvaredo et al. 2017). This divide has been especially acute within middle-income countries, the most unequal among all groups of countries. In particular, inequality is significantly higher within middle-income countries in sub-Saharan Africa compared to middle-income countries in Europe and Central Asia (United Nations 2015).

The reduction of inequality has, therefore, become an increasingly important focus of policymakers. For instance, while in the past the International Monetary Fund (IMF) was criticized for its strong focus on the so-called Washington consensus, according to which distributional considerations were of secondary relevance, more recently it has placed substantial effort to outline the negative consequences of inequality on both economic growth and macroeconomic stability (Clements et al. 2015). In those middle-income countries where poverty rates have decreased substantially with economic growth in the past three decades, there is an increased emphasis that further growth should be more inclusive and should benefit much larger sections of society.[2] Public support for redistribution has also increased since 2010, as shown by increasing numbers of people, in both advanced and developing countries, agreeing with the statement that "incomes should be made more equal" than with the statement that "we need larger income differences as incentives for individual effort" (Clements et al. 2015).

One way to achieve this objective is to fund inequality-reducing social spending sectors through public debts (see, for example, Furceri et al. 2016; Salotti and Trecroci 2018). However, funding income inequality reductions through public debt is not always an option, nor a particularly desirable one, for at least two reasons. First, many middle-income countries have limited fiscal space. Indeed, while not yet fully recovered from the 2007–2009 Global Financial Crisis (GFC), many countries in the world were unexpectedly hit by the COVID–19 pandemic in 2020, which sparked a severe global economic contraction (see, for example, O'Brien and Gilligan 2013; Gurría, 2020), and then by wars, since March 2022, first in Ukraine and then in the Middle East, which created huge uncertainty all over the world, with sky-rocketing prices of energy and food and a return to high inflation rates. Consequently, opportunities for loans are increasingly becoming unavailable as foreign lenders and investors reduce lending during periods of economic downturn (see, for example, Love 2013). For most middle-income countries, the sustainability of a high debt-to-GDP ratio is additionally threatened by a high share of short-term debt, currency depreciation pressures,

[1] See, for example, the famous Presidential address of Anthony Atkinson to the Royal Economic Society in 1996, titled: "Bringing Income Distribution in from the Cold" (Atkinson 1997).

[2] See also the extensive material and collection of research in the IMF website section on "The IMF and Income Inequality": https://www.imf.org/en/Topics/Inequality.

fall in the price of primary commodities in international markets and the rise in interest rates, which could heighten the cost of debt-servicing (United Nations 2015). Second, when loans are available, multilateral lending agencies and countries often award them alongside unfavourable conditions, the loan agreement permitting the lender to exhibit a huge influence on the policies of the borrowing country. It is not uncommon for loan contracts to be accompanied by clauses requiring the borrowing country to implement policies that turn out to affect the economy in ways that were not foreseen in the first instance. For instance, the adverse economic implications associated with the structural adjustment programmes, which the IMF and the World Bank stipulated as a condition for granting loans to low- and middle-income countries, are well documented (see, for example, Cavanagh and Mander 2003; Oberdabernig 2010). Moreover, the IMF (2017) observes that further delays in reducing the debt-to-GDP ratio could prevent growth-enhancing spending, crowd out investment by private firms and impact negatively on the foreign sector. Accordingly, policymakers in middle-income countries are faced with the task of adequately funding inequality-reducing social spending sectors while simultaneously ensuring debt sustainability.

Taxation and increased tax revenues could, of course, be another lever available to governments to finance public spending and reduce inequality while also reducing deficit and, therefore, ensuring debt sustainability. However, in this paper our aim is to study the impact of spending reallocation on inequality within a neutral fiscal policy stance, whereby total government spending does not change. This means that government spending reallocations cannot be financed, in our analysis, by increased revenues, as this would imply a non-neutral fiscal policy stance. We consider reallocating public spending from one sector to another, rather than attempting to raise tax revenues, as a more effective approach to addressing income inequality in middle-income countries. Due to widespread tax loopholes and inefficiencies in revenue collection, tax evasion and avoidance remain significant challenges in middle-income countries. Middle-income countries generally face difficulties in enforcing tax compliance due to weak administrative capacity, corruption and an underdeveloped legal frameworks, which hinder effective tax collection (Besley and Persson 2014). Therefore, overall, focusing on public spending reallocations, such as prioritizing healthcare, education and social programmes, appears to offer a more direct and realistic method to reduce inequality and improve overall social welfare.

Therefore, we ask whether, in a situation where the level of total government expenditure remains unchanged, government spending reallocations across sectors are equality-enhancing; more specifically, whether it is possible to identify some spending sectors that can be associated with a relatively more pronounced income-equalizing effect than other sectors.

To address this question, we use a panel of 51 middle-income countries and evaluate the inequality impact of financing social spending sectors through cuts in the remaining sectoral expenditures in the period between 2005 and 2015. The redistribution of spending across sectors ensures that there is no increase in the total amount of government spending and, therefore, no detrimental effect on deficit and debt. We employ the latest available Statistics on Public Expenditure for Economic Development (SPEED) Database and define the social spending sectors, following Oxfam/DFI (2017), as the

social protection, health, education and agriculture sectors.[3] The defence, transport and communication and "other" sectors are the three sectors that we consider for financing the social spending sectors.

We assess the impact of spending reallocation through a fixed effects panel data estimation procedure on both an index of inequality (the Atkinson index) as well as on three different parts of the distribution, representing three "ideal" income groups: the relatively poor (represented by the 10th percentile), the middle-income group (the 50th percentile) and the relatively rich (the 90th percentile). We also look at whether the results change when we split the whole sample of middle-income countries into upper and lower middle-income countries.

For the sample of middle-income countries as a whole, we find that reallocation to the education sector is associated with a reduction in income inequality. Interestingly, all the three income groups, including the middle and the relatively rich groups, benefit from such reallocation. We further find that the equalizing impact of spending reallocations differ depending on the income level of the country. In the case of upper middle-income countries, spending reallocations towards the agricultural sector improve equality, while, for lower middle-income countries, it is spending reallocations towards the social protection and health sectors that is associated with increasing equality. In the long run, and most importantly for policymakers, reallocations towards the social spending sectors tend to reduce inequality, and this is the case for both the upper and the lower middle-income countries.

We check for internal validity by employing a more traditional estimation approach based on fixed effects; by using two other summary measures of inequality (the Gini coefficient and the Theil index) and, finally, by checking for possible reverse causality through the lag regressors. We also assess the role of the Great Financial Crisis that happened within our data period and the role of the various dependent variables inserted in our regressions.

The rest of the paper is organized as follows. Section 2 examines the related literature. Section 3 outlines the methodology and data. Section 4 discusses the results. Section 5 provides extensive robustness checks. Section 6 summarizes and concludes.

2 Related literature

Overall, the evidence on the channels for funding social spending sectors is rather scanty, only a handful of such papers exist (see, for example, López et al. 2010). More specifically, to the best of our knowledge, existing papers do not assess the relationship between government spending and inequality in middle-income countries in the context of a neutral fiscal policy. Doumbia and Kinda (2019) is arguably the closest to what we aim to do here. However, differently from Doumbia and Kinda (2019), our analysis assesses the impact of the spending reallocations across the whole of the

[3] While Oxfam/DFI (2017) notes that the social protection, health and education sectors traditionally provide the pillars for inequality-reducing spending, it also adds that spending on the agricultural sector is equally essential for reducing the income gap within developing countries, since a considerable percentage of the less privileged in these countries are employed by this sector. Accordingly, our work also considers the inequality impact of spending reallocations in favour of the agricultural sector.

income distribution, thereby allowing for the determination of the spending reallocations that are pro-poor, pro-middle-income and pro-rich. Moreover, our study focuses on middle-income countries, providing a detailed comparison between lower and upper middle-income countries while Doumbia and Kinda (2019)'s sample includes developed and developing countries.

In what follows, therefore, we summarize, for the four social spending sectors, both the theoretical and empirical literature on the relationship between the specific social sector spending and inequality. We identified 53 papers on the impact of public spending on inequality, which we have then narrowed to 22 that focused on one or more middle-income country and reported empirical findings suggesting equalizing or disequalizing public spending impacts. These empirical studies are fully reported in Tables A1-A4 in the online Annex.

Regarding the social protection sector, the theoretical evidence suggests that the ultimate impact of social contribution on inequality is ambiguous. On the one hand, some studies predict that expenditures on the social protection sector reduce inequality because they are customarily targeted at the poor (Whiteford 2008; Anderson et al. 2017; Bhorat et al. 2017; Olivier et al. 2013; World Bank 2016; AUC/OECD 2018; DESA 2018). On the other hand, other studies predict that expenditures on the social protection sector may be accompanied by some inequality-increasing effects, by encouraging the low-income recipients to decrease their work-hours relative to those of high-income earners (Niehues 2010). This ambiguity is confirmed empirically, with 3 out of 8 studies reported in the Annex, Table A1, which cover a period from 1970 to 2015, that show no significant equalizing effect from the social protection sector.

Regarding the health sector, some theories predict that expenditures on the health sector reduce inequality because they enable the low-income groups to save or gainfully invest expenditures they would have incurred on healthcare. Over time, this would result in higher earnings of the low-income groups, which may, ultimately, have an equalizing impact on the income distribution (Verbist et al. 2012, see also IMF 2014). However, other theories suggest that corruption may prevent the low-income groups from benefiting adequately from such expenditures, and inequality may in fact increase (Alesina 1998, see also IMF 2015, Castro-Leal et al. 2000). The empirical studies reported in Table A2 in the Annex, show, for those that focus on developing countries, both a positive impact of health spending on equality, as is the case of Ospina (2010) for 19 Latin America countries over two decades, and a negative one, as in Lustig (2016) for 28 low and middle-income countries.

Regarding the education sector, the theory on the impact of spending on education on inequality is not conclusive either. The link between expenditure on the education sector and the income distribution has often emphasized the positive impact on the acquisition of human capital and higher degrees and the associated likelihood to be gainfully employed. Ultimately, this would reduce the income gap between the high- and low-income groups (Becker 1964, see also AfDB 2018, Mayah et al. 2017). Other theories, however, show that expenditures on the education sector may be hijacked by the high-income groups or not properly targeted towards the low-income groups, and this may eventually increase inequality (see, for example, Tanzi 1974; Hausmann and Rigobón 1993; Schwartz and Ter-Minassian 2000; World Bank 1997; McMahon and

Table 1 Summary statistics

	All middle				Upper middle				Lower middle			
	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max
Atkinson index	57.73	13.22	30.43	84.46	54.90	13.28	30.43	84.46	61.19	12.31	40.18	81.49
10th percentile	1.36	0.61	0.25	2.82	1.49	0.59	0.25	2.82	1.21	0.59	0.35	2.34
50th percentile	5.46	1.09	2.56	8.13	5.72	1.16	2.56	8.13	5.14	0.91	3.71	6.74
90th percentile	15.44	0.88	11.59	18.92	15.52	1.01	11.59	18.92	15.35	0.69	14.16	17.44
SPS	14.34	13.44	0.00	55.22	16.91	12.72	0.12	48.17	10.14	13.57	0.00	55.22
HS	7.96	3.76	0.17	29.35	8.71	3.29	2.01	16.75	6.73	4.15	0.17	29.35
ES	14.02	6.54	1.44	42.82	13.87	6.56	3.12	42.82	14.27	6.50	1.44	33.93
TCS	5.90	6.66	0.07	60.74	6.12	7.46	0.24	60.74	5.56	5.12	0.07	26.21
DS	6.96	4.92	0.07	30.06	7.02	5.17	0.62	30.06	6.86	4.52	0.07	21.40
AS	3.14	2.50	0.23	14.44	2.73	2.06	0.23	9.82	3.81	2.99	0.28	14.44
OS	47.64	17.24	0.00	88.72	44.61	16.83	0.00	82.94	52.60	16.82	17.45	88.72

Table 2 Summary of main results

	(A) Spending reallocations towards the social protection sector											
	Atkinson			10th percentile			50th percentile			90th percentile		
	TCS	OS	DS	TCS	OS	DS	TCS	OS	DS	TCS	OS	DS
All middle-income	+ **	+	+ ***	− ***	−	− ***	− **	−	− ***	+ ***	+ ***	−
Upper middle-income	+ *	−	+ ***	− ***	+	− ***	−	−	− ***	+ **	+ **	− *
Lower middle-income	− *	+	+ *	+ **	−	−	+	−	− **	+	+	− *
	(B) Spending reallocations towards the health sector											
	Atkinson			10th percentile			50th percentile			90th percentile		
	TCS	OS	DS	TCS	OS	DS	TCS	OS	DS	TCS	OS	DS
All middle-income	+	−	+	−	+	− **	+	+	−	+	+	− *
Upper middle-income	−	−	+ *	+	−	−	+	+	−	+ ***	+ **	−
Lower middle-income	− *	− ***	+	+ **	+ ***	−	+	+ **	− *	− ***	− ***	− ***
	(C) Spending reallocations towards the education sector											
	Atkinson			10th percentile			50th percentile			90th percentile		
	TCS	OS	DS	TCS	OS	DS	TCS	OS	DS	TCS	OS	DS
All middle-income	− *	− ***	− *	+ *	+ ***	+ *	+ **	+ ***	+	+ ***	+ ***	+
Upper middle-income	− ***	− ***	−	+ ***	+ ***	+	+ **	+ ***	+	+ ***	+ ***	+

Table 2 (continued)

	(C) Spending reallocations towards the education sector											
	Atkinson			10th percentile			50th percentile			90th percentile		
	TCS	OS	DS	TCS	OS	DS	TCS	OS	DS	TCS	OS	DS
Lower middle-income	+	+ ***	+ **	–	– ***	– **	– ***	– ***	– ***	– ***	– ***	– ***
	(D) Spending reallocations towards the agricultural sector											
	Atkinson			10th percentile			50th percentile			90th percentile		
	TCS	OS	DS	TCS	OS	DS	TCS	OS	DS	TCS	OS	DS
All middle-income	+ **	+	+ **	– *	–	– *	– **	– *	– ***	–	–	– **
Upper middle-income	– *	– **	–	+	+ *	+	+ **	+ ***	+	+	+	– **
Lower middle-income	+ ***	+ ***	+ ***	– ***	– ***	– ***	– ***	– ***	– ***	– ***	– ***	– ***

*$p < 0.10$. **$p < 0.05$. ***$p < 0.01$.

Oketch 2013). Empirically, of the six studies summarized in the Annex, four find no significant equalizing effect.

Finally, for the agriculture sector, an increase in spending on the agricultural sector within a developing country is expected to reduce income inequality on the basis that a considerable percentage of those employed in the sector often belong to the low-income group. (Oxfam/DFI 2017). Nonetheless, government spending on the agricultural sector may have disequalizing impacts if they get appropriated by the politically connected. For example, Beegle and Christiaensen (2019) show how social contributions aimed at subsidizing farm inputs are often captured by the wealthy. Empirically, the evidence we report in Table A4 shows the findings of four relevant studies, which are, unfortunately, about four specific countries and a rather limited time period, two of them suggesting an equalizing impact.

In summary, the literature on the equalizing impact of spending reallocations in a fiscally neutral scenario in developing countries is very sparse. The evidence we have assessed above is also inconclusive as to the possible channels through which, theoretically, more general public spending affects inequality. There is no consensus on the empirical evidence either. All this points to two main gaps, which underline and inform our contribution. First, the review of the evidence shows that there is no study that assesses the impact of spending reallocations on inequality in a context of fiscally neutral policy, whereby total government spending is fixed and spending reallocations cannot be financed by debt nor by increased revenues. Our study aims to fill this gap. Second, the evidence also shows that there is no consensus regarding the redistributive impact of social spending sectors. Therefore, our study aims to test the null hypothesis that financing social spending sectors through cuts in the remaining sectoral expenditures has no significant impact on inequality.

3 Methodology and data

3.1 Model specification

Equation (1) specifies our modelling approach:

$$I_{it} = \alpha + \sum_{j=1}^{n} \beta P_{i,j,t-1} + \rho T_{i,t-1} + \phi Z_{i,t-1} + \chi_i + \theta_t + \varepsilon_{it} \quad (1)$$

For each country i observed at time t, the dependent variable I_{it} is an index of income inequality. $P_{i,j,t-1}$ denotes the share of total government spending on sector j. $T_{i,t-1}$ stands for the share of total government expenditure in GDP. Total government expenditure is the sum of the expenditures incurred on all sectors j ranging from 1 to n. $Z_{i,t-1}$ collects the control variables. χ_i represents the country fixed effects and θ_t

the time fixed effects; β, ρ and ϕ are vectors that collect the parameter estimates, and ε_{it} captures the error term.

Notice that each of the sectoral expenditures is expressed as a share of the sum of all sectoral expenditures.

(i.e. total government expenditure), and since $\sum^{n}\beta\ P_{i,j,t-1} = 1$, perfect multicollinearity would arise if each of them is included in a regression model (see, for example, Devarajan et al. 1996; Gupta et al. 2005; Bose et al. 2007;

Acosta-Ormaechea and Morozumi 2017; Doumbia and Kinda 2019; Chu et al. 2020). Accordingly, the share of total spending for one sector is always excluded from the regressions. Subsequently, the expenditure incurred on each sector would be measured in relative terms, specifically, in terms of their share within total expenditure. The exclusion of a given sector—let's say sector f—due to perfect multicollinearity, implies that this omitted sectoral expenditure for f would instead be measured by the sectoral expenditures that are left in the model, and this is how the impact of the reallocation from sector f to sector j is measured. In such a scenario, the resulting coefficients of the remaining sectors (following the exclusion of f) thus tell us what happens to the left-hand side variable (i.e. income inequality), when the expenditure that would have been allocated to f is redirected towards the remaining sectors. When sector f is omitted from Eq. (1), the resulting equation becomes:

$$I_{it} = \alpha + \sum_{j=1}^{n-1} \beta_j - \beta_f P_{i,j,t-1} + \rho T_{i,t-1} + \phi Z_{i,t-1} + \chi_i + \theta_t + \varepsilon_{it} \tag{2}$$

Notice that ∂

$\partial I_{it} \frac{}{P_{i,j,t-1}} = \beta_j - \beta_f$ represents the difference between the marginal effect of j and f. Accordingly,

$\beta_j - \beta_f$ captures the marginal effect[4] on inequality of reallocating spending from sector f towards sector j. Put differently, $\beta_j - \beta_f$ captures the coefficient of j when financed by cuts in the expenditures allocated to f. In the analysis, we devote special attention to the redistributive effect of reallocating spending towards the social protection sector, the health sector, the education sector and the agricultural sector. In evaluating the impact of government spending reallocations on the different income groups, we also replace the inequality index with three distinct percentile income shares, capturing three different income groups.

We use the fixed effect panel data estimator where Driscoll and Kraay (1998) standard errors are employed in adjusting for potential heteroscedasticity and autocorrelation within the residuals.

An important methodological issue is related to endogeneity bias arising from potential reverse causality. In other words, the estimated coefficients could be biased

[4] Online Appendix B.1 shows that the resulting coefficients of the sectors that are left in the model actually represent the difference between their marginal effect (when sector f is left in the model) and the marginal effect that would be obtained for sector f if it were left out of the model.

because of the possibility that it is government's concern for inequality (the dependent variable) to affect decisions on spending reallocations, and not the other way around. Public sector spending may indeed be motivated at least partially by concerns for inequality. This issue has two aspects. On the one hand, the traditional technical approach to address endogeneity bias arising from potential reverse causality is to work with the lag structure of the regressors, as, for instance, in Acosta-Ormaechea and Morozumi (2017) or Doumbia and Kinda (2019). Before we discuss this, however, it is important to point out that the endogeneity problem (i.e. extent of inequality affecting spending allocations) would arise only if governments were indeed *concerned* about inequality. In fact, even large degrees of inequality may not translate into changes in spending allocations if governments did not care about inequality at all. This aspect is not captured by working with the lag structure of regressors, which relates the *extent* of inequality in the past to spending reallocation, but does not tell us anything about governments' concern about inequality; the extent of inequality may not translate into any fiscal policy or specific spending reallocation if governments do not care about inequality. In order to account for how government's concern for inequality actually influences spending reallocations, we would need to have an inequality measure that incorporates this concern. And the only measure that directly incorporates government's concern for inequality is the Atkinson measure, while all other measures do so indirectly, implicitly. In our analysis, we do employ the Atkinson measure, the most popular welfare-based measure of inequality, which we fully describe in Sect. 3. This measure depends on the degree of society aversion to inequality. The related parameter is defined between 0 and infinity, where higher values entail greater concern for inequality and higher willingness to achieve a more equal distribution, while values tending to zero entail no concern for inequality. In our analysis we employ an inequality aversion parameter of 2, which is the only available option in the given dataset. This empirically implies no reverse causality.

Further to the economic argument just presented, there is a purely statistical point linked to the relationship between a dependent variable Y (our inequality measures) and an explanatory variable X (sectoral Government spending). And this is indeed dealt with the lag structure of the regressors. In this respect, we have regressed our dependent variable (the Atkinson inequality index) on up to 5 lags of the explanatory variables. The short t-dimension of our sample did not allow for a higher number of lags. However, we also consider 3-year centred moving averages.[5] Finally, we employed the system GMM estimation as another way to deal with endogeneity, but we have found surprising instability.[6]

4 Sample selection and measurement of variables

To examine the redistributive effect of financing social spending sectors through cuts in the remaining sectoral expenditures, we employ the Statistics on Public Expenditure

[5] We are very grateful to an anonymous reviewer for this suggestion. Indeed, in real life, governments usually change every 2–3 years.

[6] See Sect. 5.

for Economic Development (SPEED) Database for 51 middle-income countries over the period 2005–2015. This sample comprises 28 upper and 23 lower middle-income countries, based on the classification of the World Bank in 2019.[7] We employ panel data analysis in annual frequency. Through the inclusion of time and country fixed effects, panel data analysis makes it possible to account for the redistributive impacts of existing policy changes over time and across countries.

5 Dependent variables

In examining the redistributive effects of reallocating government spending towards social spending sectors, we start with the Atkinson inequality measure.[8] As pointed out by Atkinson (1970), and later on demonstrated by Weymark (1981) and Yaari (1987), underlying any measure of income inequality is some concept of social welfare; more specifically, the family of rank-dependent measures of inequality reflects an underlying social welfare value. However, while for the other measures it remains implicit, the Atkinson index explicitly reveals this value.[9] This is done through the parameter ε in the Atkinson index, which is defined as:

$$\begin{aligned} &A_{\varepsilon}(y_1, \ldots, y_n) = 1 - \mu\left(\prod_{i=1}^{N} y_i\right)N \text{ for } \varepsilon = 1 \\ &1 - \frac{1}{\mu}\left(\frac{1}{N}\sum_{i=1}^{N} y_i^{1-\varepsilon}\right)^{\frac{1}{1-\varepsilon}} \quad \text{for } 0 \leq \varepsilon \neq 1 \end{aligned} \tag{3}$$

where y_i is individual income and μ is mean income. ε is referred to as the inequality aversion parameter, because it regulates the sensitivity of the implied social welfare losses arising from inequality. For $\varepsilon = 0$, there is no aversion to inequality and the marginal increases in income produce the same social welfare whether they go to a poor or rich individual. For $\varepsilon = \infty$, there is infinite aversion to inequality and the marginal social welfare of income of the poorest individual is infinitely larger than that of any richer individual. We believe this property of the Atkinson index to be particularly important in a welfare analysis such as the one undertaken here, where we aim to assess the equalizing effect of government's spending reallocations. Indeed, this goes back to the point of Dalton (1920), which inspired Atkinson's work on the

[7] The upper middle-income countries (with per capita income between $3,996 and $12,375 per year) include Algeria, Argentina, Armenia, Azerbaijan, Belarus, Botswana, Brazil, Bulgaria, Colombia, Dominican Republic, Fiji, Guatemala, Iran, Jamaica, Jordan, Kazakhstan, Malaysia, Maldives, Mauritius, Mexico, Namibia, Peru, Russia, Serbia, South Africa, Thailand, Turkey and Venezuela. The lower middle-income countries (with per capita income between $1,026 and $3,995 per year) are: Angola, Bangladesh, Bhutan, Bolivia, Cape Verde, The Republic of Congo, Egypt, El-Salvador, Eswatini, Ghana, Indonesia, Kenya, Lesotho, Morocco, Myanmar, Nigeria, Pakistan, Papua New Guinea, Philippines, Tunisia, Ukraine, Zambia and Kyrgyz Republic.

[8] In the Appendix D online we replace the Atkinson index with the Gini coefficient and the Theil index.

[9] For instance, the Gini coefficient is particularly sensitive to transfers that take place in the central part of the income distribution, while the Theil index is particularly sensitive to transfers that take place in the lower end of the income distribution (Atkinson 2008).

measurement of inequality, according to which it is not the distribution of income as such that matters, but its effects on the distribution of, and the total, economic welfare. As indices of inequality are not purely statistical objective devices but are intrinsically linked to normative views, the Atkinson index, making explicit the different views about social justice, is particularly appropriate to our analysis on the equality effect of government welfare spending reallocations. Data on the Atkinson index are retrieved from the Global Consumption and Income Project Database. The database computes the Atkinson index with an inequality aversion parameter (ε) of 2.

To understand the impact of government spending reallocations in favour of social spending sectors on different parts of the income distribution, rather than on an overall measure of inequality of the distribution, we replace the Atkinson index with three different percentile income shares. The tenth percentile (10th percentile$_{it}$) represents the relatively poor, low-income individuals, the fiftieth percentile (50th percentile$_{it}$) represents the middle-income individuals, and the ninetieth percentile (90th percentile$_{it}$) represents the relatively rich, high-income individuals. Data are obtained from the Global Consumption and Income Project Database.[10]

6 Independent variables

The government sectoral expenditures we focus on include seven sectors: social protection (SPS_{it}), health (HS_{it}), education (ES_{it}), transport and communication (TCS_{it}), defence (DS_{it}), agricultural (AS_{it}) and other sectors (OS_{it}). The data for these sectoral expenditures are sourced from the Statistics on Public Expenditure for Economic Development (SPEED) Database, which provides unique information on the composition of total government spending.[11]

Each sectoral expenditure is expressed as a share of the sum of all the sectoral expenditures considered. Each sector comprises capital and recurrent expenditures. For instance, spending on education sector will include building of primary, secondary and tertiary institutions but also salaries for teachers employed in public sector schools, scholarships and other supports to pupils. Spending in the health sector will include construction of hospitals and spending to buy medical appliances but also salaries paid to health workers, health insurance, and so on.[12] As such, it is impossible to obtain the sum of all the sectoral expenditures when data are missing for one or more sectoral expenditures in any one year. By extension, it becomes impossible to obtain the budget share for each sector. Accordingly, we record missing data for all sectors in any year in which data are missing for one or more sectors.

Particular mention is needed for the residual category Other sectors (OS), which accounts for 45–53% of total government expenditure and is, therefore, quite a large

[10] Sensitivity analysis in the Appendix of the discussion paper version, Isiaka et al. (2022), looks at the 20th, 40th and 80th percentiles.

[11] Due to limited data for some countries, our analysis covers the period between 2005 and 2015 and focuses on seven key sectors that are commonly discussed in the literature. We cannot extend the analysis beyond 2015 as, at the time of analysis and writing, data collection by the relevant organization has been paused.

[12] See Appendix B.2 online for details on what is included in each of the sectoral spending.

component. This captures a variety of capital and recurrent expenditures with a crucial component of these expenditures comprising the budgetary allocations made for the construction of civil service buildings as well as the remuneration of the personnel working within the service. Given its relevance and the lack of detailed breakdown of its component shares, we assess its correlation vis-à-vis all our three inequality measures.[13] Appendix B.3 shows that, for all middle-income countries in our sample, this correlation is very similar and statistically significant. This reassures us that our results are not affected differently by considering OS as a residual category.

Our analysis also includes controls for various other factors that the literature has found to be associated with the possible impact of spending reallocations on income inequality. Population density has been found to be both positively (Midlarsky 1982; Midlarsky and Roberts 1985) and negatively (Campante and Do 2007; Milanovic 2018) associated with inequality. Political stability, for which the evidence generally predicts that it aids a more equitable distribution of income, while political instability does the opposite (Bircan et al. 2010). Although the exact impact of unemployment on inequality is unclear, the hypothesis that unemployment is disequalizing is consistently reported in the literature (Parker 1998). The basis of this hypothesis is that low-income households often represent a considerable percentage of those who get retrenched during periods of high unemployment. The resulting decline in their earnings may increase income inequality (Blank et al. 1993). The relationship between GDP per capita and income inequality has a long tradition in economics, dating back to the seminal analysis by Kuznets (Kuznets 1955). Also, empirical findings built out of micro- and macro-level datasets reveal that financial crises may be accompanied by a rise in income inequality (Baldacci et al. 2002; Kaltenbrunner et al. 2015). We equally include the consumer price index to capture the role of inflation, which is associated with widening income gaps (Fischer 1993; Braun 1994) but also with increased earnings for low-income households (Akyol 2004; Doepke and Schneider 2006; Camera and Chien 2014; Adam and Tzamourani 2016). Finally, we consider revenue from taxation, whose redistributive effect has been found to depend largely on the relative importance of the equalizing direct, and disequalizing indirect, taxes (Jakobsson 1976; Fellman 1976; Wang and Piesse 2010).[14]

7 Summary statistics

Table 1 shows that the income share held increases as the percentile increases, with the 90th percentile accounting for the highest income share. In the estimation sample, it can be seen that lower middle-income countries have a higher average Atkinson index than upper middle-income countries. Also, the maximum Atkinson index among the upper middle-income countries is higher than that of the lower middle-income countries. Meanwhile, the minimum Atkinson index among the lower middle-income countries is considerably greater than that of the upper middle-income countries.

[13] We thank to an anonymous referee for suggesting this robustness exercise to us.

[14] Further details regarding each of the variables are provided in the online Appendix B.2.

Table 1 is created using the Global Consumption and Income Project Database and Statistics on Public Expenditure for Economic Development (SPEED) Database. SD represents the standard deviation. Min and Max respectively represent the minimum and maximum observation in the relevant sample. SPS, HS, ES, TCS, DS, AS and OS, represent the respective shares within total expenditure of the social protection sector, health sector, education sector, transport and communication sector, defence sector, agricultural sector and other sectors.

Table 1 also shows that the average spending on social protection and health sectors is higher in upper middle-income countries compared to lower middle-income countries, while the latter have a substantially larger proportion of spending on other sectors.

8 Results and interpretations

Given the enormous amount of data and information, we structure the presentation of the results by focusing on the impact on income inequality from a particular type of sector reallocation, looking also at the three different parts of the income distribution and any potential difference between upper and lower middle-income countries.

We start with overall results from our baseline regression, shown in Table 2, and we then discuss findings in relation to the inclusion of additional control variable and the role of the GFC.

9 Baseline regression findings

Table 2 reports the impact of spending reallocations from the transport and communication sector (TCS), the defence sector (DS) and the other sectors (OS) to the social protection sector (top panel A) the health sector (second panel B), the education sector (third panel C) and the agriculture sector (bottom panel D), for the whole sample of middle-income countries as well as for the two subsamples of lower middle-income and upper middle-income countries (the three lines in each panel). The table focuses on the Atkinson index and the 10th, 50th and 90th percentiles of the income distribution.[15]

The analysis shows that, within the entire set of middle-income countries, inequality reduces unambiguously only in cases of spending reallocation towards the education sector (panel C) from all the sectors: the transport and communication sector (TCS), defence sector (DS) and other sectors (OS). The same cannot be said for spending Reallocation towards the social protection (panel A), health (panel B) and agriculture sector (panel D), where, when significant, the results suggest that inequality increases. Moreover, the equalizing result of spending reallocations towards the education sector does not hold for the subsample of lower middle-income countries. Similarly,

[15] A positive (negative) sign under the Atkinson index columns means that overall inequality increases (decreases) as a result of the specific spending reallocation. A positive (negative) sign under the income percentiles columns means that the income share held by the respective percentile increases (decreases) as a result of the specific spending reallocation. The detailed results are all in the Online Appendix Tables C1-C12.

while spending reallocations towards the agriculture sector tend to be associated with increases in inequality, particularly significant if from the transport and communication sector and the defence sector, this is the case for the lower middle-income and not for the upper middle-income countries.

In the subsample of upper middle-income countries and the full sample, spending reallocations towards social protection and health sectors neither reduce inequality nor benefit the low and middle-income groups. However, in lower middle-income countries, reallocations towards the social protection and health sectors have the potential to be equalizing, especially when they come from the transport and communication sector as well as other sectors.

We now turn to the results for the three social groups. Beginning with the full sample, our results reveal the 10th percentile benefits from reallocations towards the education sector from the transport and communication sector, defence sector and other sectors. Moving on to the income share held by the 50th percentile, the middle-class equally benefits from reallocations to the education sector from the transport and communication sector as well as other sectors. Moreover, the 10th and 50th percentiles lose out in the case of transfers to the social protection and health sectors that are funded from the transport and communication sector and from the defence sector. However, the income share held by the 90th percentile increases with reallocations towards the social protection sector from the transport and communication sector as well as other sectors. For example, reallocations from the transport and communication sector as well as other sectors towards the social protection sector benefit the 90th percentile without any detectable impact on the 10th and 50th percentiles. Also, the 90th percentile benefits from reallocations towards the education sector from the transport and communication sector as well as other sectors. The redistributive impact of other spending reallocations is either ambiguous or reduces the income share held by the 90th percentile.

Within the subsample of the upper middle-income countries, we find that inequality decreases in those countries that finance the education sector with cuts in the expenditures allocated to the transport and communication sector as well as other sectors. Unsurprisingly, these inequality-reducing reallocations increase the income share held by the 10th and 50th percentiles. Also, both the 10th and 50th percentiles benefit from reallocations towards the agricultural sector from other sectors. Additionally, the 50th percentile equally gains from reallocations towards the agricultural sector from the transport and communication sector. Similar to the results for the combined sample, we find that spending reallocations towards the social protection and health sectors neither reduce inequality nor benefit the 10th and 50th percentiles in the subsample of upper middle-income countries. Instead, such reallocations have the tendency to benefit the 90th percentile without reducing inequality. For example, reallocations from the transport and communication sector, as well as those from other sectors, towards the social protection and health sectors do not reduce inequality but positively benefit the 90th percentile without any noticeable effect on the low- and middle-income groups.

In the case of lower middle-income countries, we find that reallocations towards the social protection and health sectors increase the income share held by the 10th percentile. More specifically, this share increases when the social protection sector and the health sector are financed by cuts in the transport and communication sector. The income share held by the 50th percentile increases when the health sector is funded

by cuts in other sectors, while the redistributive impact of the spending reallocations on the 90th percentile is either ambiguous or associated with a reduction in its income share.

10 Controlling for relevant additional regressors

Our specification also includes controls for a set of factors the literature has found to be relevant. In most cases, the control variables that are overall inequality-reducing are found to also benefit the 10th percentile. By contrast, the control variables that are inequality-increasing often reduce the income share held by the 10th percentile and/or benefit the 90th percentile.[16]

Overall, our empirical findings on the income inequality effects of the control variables are consistent with many related studies. Total government expenditure generally reduces inequality and this is consistent with the findings of Claus et al. (2012), which suggest that inequality reduction may fall if a huge share of total government spending is allocated towards raising the incomes of the poor. Further, the findings for population density are in tandem with those of Campante and Do (2007) and Milanovic (2018), which explain the exceptional circumstances under which inequality reduces as population density increases. Additionally, most of the findings for per capita income provide support for Kuznets (1955) inverted-U hypothesis, which predicts a nonlinear relationship between the level of income and inequality. Likewise, the results for unemployment are similar to those of Blank et al. (1993), which predict that unemployment increases inequality. Similarly, the findings for inflation are consistent with those of Camera and Chien (2014), which indicate that inflation reduces inequality if a moderate increase in the general price level is occasioned by a rise in the prices of goods and services produced by low-income groups. Also, the results obtained for taxation revenue are analogous to those of Jakobsson (1976), which indicates that inequality may fall if progressive taxes make up a substantial percentage of taxation. Finally, the results for political stability are in agreement with those of Bircan et al. (2010), which suggest that political stability aids equitable distribution of income.

11 Impact of the global financial crisis

Given the time frame of the data at hand, from 2005 to 2015, it is important to consider how the global financial crisis (GFC) affects our analysis. Indeed, this period encompasses significant economic disruptions that could have profound implications on the dynamics we are studying. The main results are shown in Appendix C.

The GFC exerted varying effects on inequality and the income distribution across different income groups in middle-income countries, significantly influenced by the sector from which government spending was reallocated. For both all and upper middle-income countries, the GFC generally exacerbated inequality and diminished incomes across all percentiles, with the most pronounced impacts stemming from

[16] The results for the control variables have been provided within the same tables containing the results for the spending variables, as presented in Online Appendix C.

reallocations from the defence sector.[17] This might be due to the economic structure of these countries, where defence-related spending is tied to public services, broader infrastructure and industries that support economic stability. Thus, defence spending cuts could worsen the disequalizing impacts of the GFC. Nonetheless, it is noteworthy that the increase in inequality due to the GFC tends to be comparatively less severe with spending reallocations from the defence sector to the education sector. Meanwhile, the rise in inequality owing to GFC can be explained by the fact that the GFC directly affects inequality and the income distribution through mechanisms such as the widespread failure of mortgage loans which disproportionately affected a number of high and upper middle-income countries (Otker-Robe and Podpiera 2013). This failure led to significant job losses and decreased incomes, disproportionately impacting low-income households that rely on stable employment. Meanwhile, the policy response to the GFC was largely focused on stabilizing the financial sector through bank bailouts, while social safety nets received less immediate attention (Laeven et al. 2010).

Conversely, in lower middle-income countries, the GFC appeared to be associated with a reduction in inequality as well as a rise in incomes across all percentiles, with the most significant effects observed when reallocating funds from the defence sector. In these countries, defence budgets may not be as integral to income generation across the population compared to other sectors which have more direct impacts on employment and public services. Thus, in lower middle-income countries, the GFC could have a more equalizing effect if it occurs alongside a spending reallocation from a sector such as defence towards other sectors that reduce inequality. Interestingly, reallocations from the defence sector to the education sector yielded the highest reductions in inequality, in contrast to reallocations towards other social spending sectors. This gives credence to the highly effective impact of reallocations to education spending, not only within our sample of all middle-income and upper middle-income countries but also in lower middle-income countries. This is unsurprising since spending reallocations towards education lowers structural inequalities and supports social mobility by enabling individuals from lower socioeconomic backgrounds to compete more effectively in the labour market. Specifically, spending reallocations towards the education sector enhances access to quality education for lower-income households. This equips them with the skills necessary for better-paying jobs and employment prospects, which may in turn reduce income disparities (Sylwester 2002). Meanwhile, the fall in inequality occasioned by the GFC within lower middle-income countries may be due to the fact that many of these countries were relatively less affected by the GFC, being less deeply integrated into global financial markets and mortgage-related financial systems and, consequently, being less being exposed direct economic shocks (IMF 2009). Additionally, these countries (along with many low-income countries) benefited from the positive spillover effects of the GFC recovery efforts in high-income countries, with global financial aid and investment playing pivotal roles in stabilizing many lower middle-income countries during the crisis (OECD/World 2009).

[17] Additionally, the findings for the GFC are consistent with those of Baldacci et al. (2002) and Kaltenbrunner et al. (2015), predicting that a financial crisis can be associated with an increase in inequality.

12 Robustness checks

We run a series of robustness checks to assess the internal validity of our results.

We start by assessing changes to the dependent variable side. This is important in order to understand the extent to which the results depend on the measure of inequality adopted, being well known that different measures of income inequality could provide different rankings of distributions. We therefore replace the Atkinson index with the Gini coefficient and the Theil index. The detailed regression coefficients are shown in the online Appendix D. Generally, the findings for the middle-income countries as a whole remain unchanged, with inequality reducing following spending reallocations in favour of the education sector.

In order to assess the impact of the lag structure in our baseline specification, we replace the spending component regressors with their respective 3-year centred moving average.[18] The results are shown in Table 3, which, using the same approach as in Table 2 for ease of comparisons, shows the sign and significance of the respective coefficients. The results appear very consistent, with only 4 out of 144 occasions in the table where a statistically significant sign switches from positive to negative or vice versa. Most of the signs of the respective statistically significant coefficients are also preserved.

Furthermore, we employ a different estimation method, based on a system generalized method of moments (SGMM) approach, which considers fixed effects as part of the error terms. In this case, the results are not always consistent with our baseline findings. This could be due to weak instruments, as also found in Doumbia and Kinda (2019). Moreover, we found that the SGMM results are unstable and extremely sensitive to minimal changes we imposed on the lag structure, about which there is no theoretical clarity. This effect is clearly shown in Table 4. Changing just one single feature of the lag structure in the SGMM specification, with everything else kept the same, leads to the breakdown of the statistical significance for the main coefficient of interest. For instance, moving the lag structure from 2 to 6 (in the first line of the table) to 1–5 (in its second line), just a lag period earlier, causes the disappearance of the significance of the coefficient of interest. The third line illustrates that, when using as many instruments as possible, the estimated coefficient remains insignificant.

Furthermore, the GMM estimation method presents a limitation in studies utilizing unbalanced panel data, such as ours, due to the phenomenon that when observations are missing, the differencing process exacerbates data loss. Specifically, the method results in the loss of both the current observation and the lagged observations.

We also run additional robustness tests by using 1-, 3- and 5-year lagged values of the independent variables in order to examine the long run impact of the spending reallocations. Generally, reallocations towards the education sector remain equalizing for the sample of the middle-income countries as a whole. Additionally, with the use of medium-term lead values of the Atkinson index, reallocations from the defence sector towards the social protection sector, health sector, education sector and agricultural sector are associated with a reduction in inequality for the whole sample of middle-income countries. Similarly, reallocations towards the social protection sector,

[18] We thank to an anonymous referee for suggesting this robustness exercise to us.

Table 3 Summary of robustness results using 3-year centred moving averages of the spending components

	(A) Spending reallocations towards the social protection sector											
	Atkinson			10th percentile			50th percentile			90th percentile		
	TCS	OS	DS	TCS	OS	DS	TCS	OS	DS	TCS	OS	DS
All middle-income	+ **	– *	+ ***	– ***	–	– ***	– **	+	– ***	+ ***	+ ***	– ***
Upper middle-income	+ *	– ***	+	– ***	+ ***	–	–	+ ***	–	+ ***	+ ***	– ***
Lower middle-income	– ***	+ **	+ ***	+ ***	– **	– ***	+ ***	–	– ***	+ ***	+ ***	– ***
	(B) Spending reallocations towards the health sector											
	Atkinson			10th percentile			50th percentile			90th percentile		
	TCS	OS	DS	TCS	OS	DS	TCS	OS	DS	TCS	OS	DS
All middle-income	- *	– *	+	+	+	–	+ *	+ **	–	+ ***	+ ***	– *
Upper middle-income	– **	– **	- **	+	+ *	+ **	+ *	+ **	–	+ *	+ ***	–
Lower middle-income	– ***	– ***	+ ***	+ ***	+ ***	– ***	+ ***	+ ***	– ***	+ *	–	– ***
	(c) Spending reallocations towards the education sector											
	Atkinson			10th percentile			50th percentile			90th percentile		
	TCS	OS	DS	TCS	OS	DS	TCS	OS	DS	TCS	OS	DS
All middle-income	– ***	– ***	–	+ ***	+ ***	+	+ ***	+ ***	+	+ ***	+ ***	-
Upper middle-income	– *	– ***	– ***	+ **	+ ***	+ ***	+ *	+ ***	+ ***	+ ***	+ ***	+

Table 3 (continued)

	(c) Spending reallocations towards the education sector											
	Atkinson			10th percentile			50th percentile			90th percentile		
	TCS	OS	DS	TCS	OS	DS	TCS	OS	DS	TCS	OS	DS
Lower middle-income	- **	+ *	+ ***	+	– **	– ***	+ ***	–	– ***	+	–	– ***
	(D) Spending reallocations towards the agricultural sector											
	Atkinson			10th percentile			50th percentile			90th percentile		
	TCS	OS	DS	TCS	OS	DS	TCS	OS	DS	TCS	OS	DS
All middle-income	+ ***	+ ***	+ ***	– ***	– ***	– ***	– ***	– ***	– ***	–	–	– ***
Upper middle-income	–	– *	–	+	+ *	+	+	+ *	+ *	+ **	+ ***	–
Lower middle-income	+ ***	+ ***	+ ***	– ***	– ***	– ***	– ***	– ***	– ***	– **	– ***	– ***

*$p < 0.10$. **$p < 0.05$. ***$p < 0.01$

Table 4 Illustrating instability of system GMM estimation results to lag structure

	Coefficient	*p*-value	Instruments	Observations
Lags 2–6	− 0.0153	0.011	73	308
Lags 1–5	− 0.0061	0.308	73	308
Max lags	− 0.0060	0.394	308	308

health sector and education sector are inequality reducing within the sample of upper middle-income countries. Likewise, within the sample of lower middle-income countries, when 4-year lead values of the Atkinson measure of inequality are introduced in the specification, inequality reduces when reallocations are made from other sectors towards the social protection sector, health sector and the education sector. These results suggest that, within the full sample, inequality may also reduce with reallocations towards the social protection sector, health sector and agricultural sector; however, the impact of these reallocations may be delayed. On the contrary, reallocations towards the education sector has a more immediate effect. A similar remark can be observed concerning reallocations towards the social protection and health sectors within the upper middle-income countries. Within the lower middle-income countries, inequality may also reduce with reallocations towards the education sector; however, the equalizing impact of such reallocations may be delayed compared to reallocations towards the social protection and health sectors. Although our baseline results show a short-term impact of government spending reallocations on inequality, the inclusion of medium-term lead values reveals the existence of a more prolonged effect.

Finally, we look at the impact of changes to the right-hand side of the model specification. First, we include trade openness, corruption and incumbent government's party orientation as additional control variables.[19] The results, shown in Appendix E online, suggest that, with the inclusion of these variables, the impact of the spending reallocations on inequality, and on the different income groups, largely remains unchanged.

Furthermore, we consider the role of institutional variables, such as government effectiveness, regulatory quality, adherence to the rule of law, control of corruption and political stability. For this purpose, we include interaction terms between the sectoral expenditures and each of the institutional variables.[20] The complete results for the regressions are provided in Appendix F and G, online. The figures in Online Appendix F show, across different levels of government effectiveness, the marginal effect of spending reallocations to the education sector from the transport and communication sector, defence sector and other sectors, at 90% confidence intervals. For all these reallocations, the marginal effects are significantly negative across a reasonable range of the levels of government effectiveness. For example, the left subfigure in the second row of Online Appendix Figure F1 shows that, when financed by the defence

[19] Data on these variables are respectively retrieved from the Our World in Data database, the Worldwide Governance Indicators (WGI) and the Database of Political Institutions (DPI).

[20] Data on these institutional variables are obtained from the Worldwide Governance Indicators (WGI). A larger value represents a better quality of the institutional variables.

sector, the marginal effects of the education sector are significantly negative when the level of government effectiveness is roughly between −0.38 and 1.27. Also, for these spending reallocations, the marginal effects exhibit a negative slope (supported by the significantly negative coefficients on the interaction terms as provided in Table G1) and this suggests that the absolute value of the marginal effects increases, as government effectiveness rises. Hence, as the level of government effectiveness increases, the equalizing impact of the spending reallocations increases as well. Put differently, at low levels of government effectiveness, the inequality-reducing impact of the relevant spending reallocation is low; however, the impact becomes higher at high levels of government effectiveness. The results from Online Appendix F and G suggest that a similar comment can be made concerning the inequality impact of these spending reallocations across different levels of regulatory quality, adherence to the rule of law, control of corruption and political stability.

Taken as a whole, we believe that our baseline results based on the fixed effects estimator approach are robust to answer the question as to the extent to which spending reallocation between sectors reduce inequality.

13 Concluding discussion

This paper investigated the redistributive impact of financing social spending sectors through cuts in the other sectoral expenditures, within a panel of 51 middle-income countries over the period 2005–2015. In particular, we examined empirically the important reallocation issue as to how middle-income countries can increase funding towards social spending sectors without undermining debt sustainability, therefore within a neutral fiscal policy stance. Consequently, this study assumes government spending to be fixed. Given that most of the existing evidence on the impact of fiscal policy on inequality assumes increases in government spending, our focus on reallocation of spending between sectors contributes to a very sparse literature. Our baseline results were shown to remain robust after an extensive battery of internal validity checks.

Moreover, with regard to high public debt burdens and fiscal sustainability concerns that are currently widespread not only across middle-income countries but also across high-income countries, a central policy issue is to limit and control government debt. In this sense our conclusions regarding the equalizing income effects of spending reallocations provide guidance to policymakers, especially in middle-income countries on which our empirical results are estimated and especially those of them faced with tight fiscal space.

Along these lines and notably for policymakers in middle-income countries, a deliberate shift of funds towards education, social protection and health could address income disparities more effectively than uniform increases in sectoral spending. For instance, increasing education funding by redirecting resources from sectors such as defence and transport may yield considerable equalizing benefits, as our results highlight. Furthermore, our findings reveal more nuanced policy recommendations for different subgroups of middle-income countries; namely, in upper middle-income countries directing resources towards agriculture can have a stabilizing impact on

the income distribution, while in lower middle-income countries prioritizing social protection and health yields clearer inequality-reducing outcomes.

We found a number of interesting novel results of immediate policy relevance. Overall, these results suggest that consideration of the redistributive impacts of spending reallocations is important in middle-income countries. Given the data we have access to, it is difficult to provide more detailed insights that reflect the heterogeneous experiences of countries—even within the sub-regional categories we employ here—and, consequently, outline more specific policy implications from our findings. However, while lower-income countries are constrained in their fiscal capacity, the combination and design of fiscal policies can be optimized to improve income inequality even within fixed budgets. This point is not to be underestimated, as it is often assumed that fiscal redistribution to reduce inequality is not possible in developing countries. Although developing countries 'room for manoeuvre' is certainly more limited than in developed countries, our findings do indicate that policymakers should be able to achieve inequality-reducing spending reallocations by financing social spending sectors though cuts in other sectors, while keeping an overall neutral fiscal stance.

More specifically, we outline three main findings. First, the income gap within the full sample of middle-income countries can be reduced if the education sector is financed by cuts in the expenditures allocated to the transport and communication sector, defence sector and the other sectors. Second, we revealed empirically that all three income groups we focused on benefit if the education sector is financed by cuts in the expenditures allocated to the other sectors. Third, the equalizing role of reallocations in favour of the agricultural sector becomes particularly evident in the case of upper middle-income countries. Similarly, the inequality-reducing impact of reallocations towards the social protection and health sectors is particularly present in lower middle-income countries. For upper middle-income countries, instead, that reallocation benefit the relatively richer group. Therefore, in funding sectors that have a more immediate impact on reducing inequality, the specific social spending sector to be prioritized differs for the upper and the lower middle-income countries. Our analysis suggests that upper middle-income countries should prioritize reallocations particularly in favour of the education sector, while lower middle-income countries should give greater emphasis to reallocations towards the social protection and health sectors.

Our findings on the role of education sector appear to be particularly significant in thinking about policies. We found that government spending on the education sector is equalizing across the full sample of middle-income countries. This could well be a reflection of the role that education still has in this set of countries, given their overall development, as exemplified by the so-called educational Kuznets curve (Morrisson and Murtin 2013) based on human capital theory (Becker 1964), which emphasizes how increased education could result in more people subsequently becoming gainfully employed, thereby reducing the income gap between the high- and low-income groups. Likewise, our results are in line with the empirical findings of Odedokun and Round (2004) and Coady and Dizioli (2018), which report that public expenditure on education has an equalizing impact on income distribution. Moreover, the findings suggest, as education spending is key to reducing income inequality, countries must allocate adequate resources to the education sector. Given that the education variable

includes both capital and recurring spending, increasing budgets for building schools, perhaps more so in rural and remote areas or where gaps in access to education may be relatively more salient, for instance on the basis of gender, ethnicity, economic status as well as geography, could reap important benefits in terms of inequality reduction.

It is difficult to speculate on the reasons for some of these results, particularly those where an equalizing effects in lower middle-income countries is not found in upper middle-income countries. For instance, why is the case that transfers to social protection and health sectors are equalizing in lower middle-income countries while they benefit the rich in upper middle-income countries? This appears to be consistent with some theoretical evidence we revised in Sect. 2, which points out how corruption may result in increasing inequality even when spending on health increases (Alesina 1998; Castro-Leal et al. 2000). Unfortunately, we cannot delve into these details with the data we have available here. An analysis of the governance around spending allocations is also beyond the scope of this paper. However, the composition of health spending, alongside the different equalizing impact on lower and upper middle-income countries, may help to shed some light on what countries could do could. Indeed, the way in which spending is effectively allocated and ultimately carried out, for example in the relative proportions of spending that goes to capital as opposed to recurrent items, to build hospitals and improve health infrastructure as opposed to increase salaries of doctors, may result in more or less equalizing effects.

The analysis provided suggests that when we look at the three social groups, identified by the three different parts of the income distribution, again the most significant results appear in the case of spending reallocations towards the education sector. In fact, all the three percentiles experience an increase in their share of income as a result of spending reallocations from the transport and communication sector, defence sector and other sectors to the education sector with some interesting provisos. For example, on the one side, reallocations from the transport and communication sector, as well as other sectors, towards the education sector, tend to reduce inequality as well as impact positively on the 10th, 50th and 90th percentile income shares in the case of the upper middle-income countries and the full sample, while the share of income of the three social groups decreases in the case of lower middle-income countries. This is interesting for two reasons. One is because the reduction in the overall measure of inequality in the income distribution applies to the upper middle-income countries but not to the lower middle countries. Second, it is associated with increases in the income held by the relatively poor, the middle income, but also the relatively rich group. Therefore, the decrease in income inequality overall must have come at the expense of other parts of the income distribution. On the other side, reallocating spending away from the defence sector to the education sector is also equalizing but, this time, only the 10th percentile benefits from such a reallocation.

Due to data constraints, the time frame covered in this study was restricted to the period between 2005 and 2015. Future research may, therefore, examine the redistributive impact of the spending reallocations over a longer time-span, when the relevant data become available.

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