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ORIGINAL RESEARCH

Impact of Equity in Social Protection Spending on Income Poverty and Inequality

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Abstract
This study aims to investigate whether higher equity in government social protection spending strongly predicts positive changes in income poverty and inequality. Our approach was to regress the measures of absolute poverty and inequality on the indicators of equity in social protection spending at the country level, controlling for the level of spending and the country wealth measured by per capita GDP. For that purpose, we have compiled a dataset of 535 observations from 101 countries over years 1998–2017, including 199 observations for 70 low- and middle-income countries from Europe, Asia, North and South America, and Africa. Our findings support the proposition that equity in social spending (measured by the share of social protection spending going to the bottom quintile) is a significant and strong predictor of improved distributional outcomes (poverty measured at Int$1.90 a day and inequality measured by the Gini index). Moreover, in low- and middle-income countries in our sample the poverty and inequality reducing impact of this equity measure is stronger than in the sample including all countries. The presence of a significant gap in equity of social protection spending between the high-income countries and the rest of countries included in the study signifies that there is a large potential in improving equity in social protection spending in low- and middle-income countries. Social protection reforms in these countries should be focused on extending the coverage of social protection programs and improving access to social protection for the poorest segments of the population.

Keywords Fiscal equity · Income distribution · Poverty · Low- and middle-income countries

1 Introduction

Many low- and middle-income countries continue to face a situation of high economic growth rates that barely impact on income poverty and inequality levels (Arndt et al., 2016). In the majority of advanced economies poverty and inequality is successfully reduced due to the existence of the welfare state, which ensures a fairer distribution of the

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gains from economic growth by means of progressive taxes, social transfers and in-kind services such as free or subsidised education and healthcare. For instance, in the EU-27 in 2021 direct taxes and social transfers reduced poverty headcount by 55%, and Gini index by 42% (Maier et al., 2022). The importance of investments in the welfare state programs in low- and middle-income has long been recognized by the international community. The Sustainable Development Goals (SDGs) adopted in 2015 articulate the importance of adequate investments in education, health, and social protection, measured as the proportion of total government spending on these services (indicator 1.a2[1]). The importance of achieving greater equality in the distribution of these services is highlighted by another SDG indicator that aims to measure the contribution of fiscal policies in inequality reduction (indicator 10.4.2[2]). The United Nations 2030 Agenda for Sustainable Development has equity of social spending at its core by aiming to monitor the proportion of government spending towards health, education and direct social transfers that benefit the poor (indicator 1.b.1[3]).

To this end, much of the increase in development assistance has been directed towards the social sectors such as education, healthcare and social protection (Addison et al., 2015). At the same time, a growing number of low- and middle-income countries have improved the effectiveness of their tax systems and developed new social transfer schemes in an effort to reduce the inequality and poverty levels. Despite the considerable effort in the cross-country literature geared towards assessing the impact of social spending on well-being outcomes such as poverty, inequality, life expectancy, literacy, etc., such analyses rarely account for the distribution of social spending across the population. Most studies measure the welfare state effort using an indicator of social spending as proportion of the Gross Domestic Product (GDP) or in per capita terms. An increase in per capita social spending or in their share in GDP, however, does not necessarily imply that the poor are on the receiving end of the benefits. Furthermore, the majority of studies focus exclusively on high-income countries such as the member states of the Organization for Economic Cooperation and Development (OECD) and the European Union (EU). The empirical literature that has attempted to address the questions of the equitable distribution of social spending in low- and middle-income countries is quite small due to the absence of quality data [for recent examples of such studies see Lustig (2016), Inchauste and Lustig (2017), Lustig (2018), Arancibia et al. (2019), Gasior et al. (2022)].

The present study aims to fill the gap in the existing literature on the distributional impacts of government social spending in low- and middle-income countries, by empirically testing the proposition that greater equity in social protection spending is strongly associated with better distributional outcomes. Due to the limitations related to the data and modelling approach we use, we focus on indicators of poverty and inequality in disposable income (i.e. income after direct taxes and cash transfers). These outcome measures reflect just one of the dimensions of well-being. Nevertheless, there is strong evidence to suggest that income poverty and inequality are negatively associated with other aspects of well-being, such as health, life expectancy, life satisfaction, both for adults and children (Cooper & Stewart, 2013; FitzRoy & Nolan, 2022; Pickett & Wilkinson, 2007; Truesdale & Jencks, 2016).

Government spending on social protection and their distribution is the key focus of this paper because it affects household disposable income directly through cash or near-cash

[1] See: https://unstats.un.org/sdgs/metadata/files/Metadata-01-0a-01.pdf.
[2] See: https://unstats.un.org/sdgs/metadata/.
[3] See: https://unstats.un.org/sdgs/metadata/files/Metadata-01-0b-01.pdf.

transfers that households receive. Spending on education and healthcare may also affect household disposable incomes through indirect channels, e.g. via increasing human capital. Unfortunately we do not have data for a sufficiently high number of countries to include these types of social spending in the analysis. Social protection is provided via government policies and programs designed to reduce and prevent poverty and vulnerability across the life-course. Social protection systems in rich countries, often referred to as the welfare states, provide a range of cash or near-cash transfers, such as child and family benefits, maternity protection, unemployment support, employment injury benefits, sickness benefits, health protection, old-age, disability and survivors' benefits. Typically, they address all these policy areas by a mix of contributory schemes (social insurance) and non-contributory tax financed social assistance. Only 29% of the global population, however, is covered by comprehensive social protection systems that include the full range of benefits, from child and family benefits to old-age pensions (ILO, 2017).

The question we seek to answer is whether social protection spending has a stronger (positive) impact on income inequality and poverty outcomes in countries with higher equity in social protection spending. Equity in the distribution of social protection spending is assessed by comparing the concentration shares of spending across the subgroups with different income levels. We use two indicators of equity in spending that are available for a large number of low- and middle-income countries: (1) the share of social protection spending going to the bottom quintile, and (2) the ratio of the shares of social protection spending going to the top and bottom quintiles. The higher the first indicator is, the higher the equity. The higher the second indicator is, the lower the equity. Our approach in this study is to regress the poverty and inequality outcomes on the two indicators of equity in social protection spending, controlling for the level of social protection spending relative to the GDP and the country wealth measured by per capita GDP.

For that purpose, we have compiled a dataset which consists of 535 observations from 101 countries over the years 1998–2017. The unique feature of this dataset is that it includes a large sample of observations for low- and middle-income countries, which typically remain beyond the scope of the existing studies on equity in social protection. Specifically, we included 199 observations for 70 low- and middle-income countries from Europe, Asia, North and South America, and Africa. To test the validity of the findings we have performed the analysis for all countries in our sample and for low- and middle-income countries only, having excluded high-income countries.

The remainder of this paper is organized as follows: Sect. 2 provides an overview of the literature on the association between social spending, their distribution across the population, and various well-being outcomes. Section 3 presents our data and methodological approach. Section 4 discusses the findings of our analysis of the impact of equity in social protection spending on income poverty and inequality, using a regression analysis on the cross-country dataset we have compiled. Section 5 concludes with reflections on policy.

2 Review of Cross-Country Studies on the Effectiveness and Equity of Social Protection Spending

Government social spending is a powerful instrument at the disposal of the state for reducing material deprivation and narrowing the gap between the rich and the poor. They can also help to equalize opportunities, through public education for example, and thus increase social mobility, foster social cohesion and economic growth. Development and

democratization in the advanced economies, such as the OECD and EU member states, have led to a large-scale expansion in social protection, which proved to be the most effective method of poverty and inequality reduction. For instance, in the EU-27 in 2021 direct taxes and social transfers reduced poverty headcount by 55%, and Gini index by 42% (Maier et al., 2022). General government expenditure on social protection in the EU-27 stood at 20.5% of GDP in 2021, ranging from 8.7 to 24.8% of total public spending (Eurostat, 2023). Large literature originating in the works of Esping-Andersen (1990) aims to explain the differences in the social spending levels and institutional design of welfare systems in advanced economies.

Experience with social protection in developing countries is more ambiguous, since overall spending and transfer volumes are much smaller than in developed economies. Although social protection programs of one kind or another have been established in the majority of developing countries, only 29% of the global population are covered by comprehensive social protection systems that include the full range of benefits, from child and family benefits to old-age pensions (ILO, 2017). The prevailing forms of social protection in many developing countries are usually social insurance programs such as employer mandates[4] or provident funds,[5] and to a lesser extent measures to safeguard consumption through, for example, cash transfers. As has been extensively documented, national social protection systems in developing countries mainly provide contributory coverage to formal workers, often leaving behind workers in the informal economy, i.e. those who engage in productive activities that are not taxed or registered by the government (Hall et al., 2004; Van Ginneken, 2010). Although non-contributory social protection programs in developing countries have relatively increased in recent years to reach poorest population, such programs remain far from optimal. Gough et al. (2004) refers to welfare systems in developing countries either as 'Insecurity Regimes' or 'Informal Security Regimes', and contrasts them to modern social protection systems based on the principles of citizen's rights and clear entitlement rules (i.e. Esping-Andersen (1990) family of welfare state regimes found in Europe and among the rich OECD member states). Provision in 'Informal Security Regimes' is discretionary, makes recipients dependent on those who provide assistance, while 'Insecurity Regimes' do not provide people with effective social protection against economic shocks and natural disasters.

Empirical evidence shows that government spending, and social spending in particular, are pro-cyclical in developing countries (Del Granado et al., 2010). In other words, social spending tend to increase during the times of economic growth and go down during the downturns. Furthermore, the degree of cyclicality is higher the lower the level of economic development. In rich countries the cyclicality issue is less pronounced due to the higher size of automatic stabilizers. The latter refers to the automatic adjustments of benefit entitlements and tax liabilities when earnings, employment status or people's characteristics change. The examples are unemployment benefits compensating income shortfalls after a loss of employment or progressive taxes reducing net gains when market incomes increase. By exacerbating economic fluctuations, procyclical spending in developing countries may have adverse effects on both growth and equity objectives (Zouhar et al., 2021).

[4] Employer mandates are designed to meet specifies contingencies though legal mandates imposed on employers by government (for example, compensation for injury).

[5] Provident funds are similar to social insurance financed by employees and sometimes employers contributions but contributions are not pooled and used to pay benefits to other workers.

There has been a fair amount of research in the literature investigating the impact of the size of social protection spending on poverty and inequality. These studies have confirmed that higher social protection spending is poverty and inequality reducing (Adema et al., 2014; Bárcena-Martín et al., 2014; Cammeraat, 2020; Chzhen, 2017; ILO, 2017; Kenworthy, 1999), in particular in nations with a broad and egalitarian provision of social services and cash transfers (Jacques & Noël, 2018; Korpi & Palme, 1998). One expenditure type found to be particularly effective in reducing both poverty and inequality is expenditure on cash benefits for families and children (Cammeraat, 2020; Nygård et al., 2019). It should be noted that the above studies of social protection spending have exclusively focused on high-income countries such as OECD and EU member states. One exception is a study by Haile and Niño-Zarazúa (2018) who examined the effect of government spending in social sectors (health, education and social protection) on three measures of well-being outcomes, the Human Development Index (HDI), the Inequality-adjusted Human Development Index (IHDI) and child mortality rates, using longitudinal data from 55 low- and middle-income countries from 1990 to 2009. Their analysis supports the proposition that growth in government social spending has played a significant role in improving well-being outcomes in the developing world.

Despite considerable effort in the cross-country literature geared towards assessing the impact of social protection spending on well-being outcomes such as poverty, inequality, or health and education outcomes, such analyses rarely account for the distribution of social spending across the population. Most studies measure the welfare state effort using an indicator of social spending as proportion of the GDP or in per capita terms. An increase in per capita social spending or their share in the GDP, however, does not necessarily imply that the poor are on the receiving end of the benefits.

Impact assessment of equity in social spending requires the data on the distribution of spending at the micro-level. This type of analysis is referred to as *the distributional analysis* (also called *benefit incidence analysis*). It is carried out by allocating public spending to individuals/households in the representative household survey so that one can compare the existing distribution of income with the counterfactual distribution of income in the absence of government expenditures. This analysis typically includes the following steps:

- Approximating the value to consumers of a benefit or public service. Benefits received by individuals are usually assumed to be equivalent to the costs of public provision.
- Identification of recipients/users in the household survey, allocation of government expenditures to these individuals/households, accounting for out-of-pocket expenditures required to access the benefit/public service.
- Aggregation of recipients/users into subgroups, for instance by income quintiles, region, urban/rural location, poverty status, gender, age, etc.
- Summarizing the results using some indices of redistribution. The simplest and most widely used measure is the *benefit incidence*, or the ratio (g) of benefits (G) to some measure of income (Y); that is, $g = G/Y$. This ratio can be calculated for each group of interest, e.g. individuals from the poorest quintile or living in the poorest geographical area. *Concentration shares* are often used to summarize how spending are distributed across the subgroups with different income levels. Concentration shares calculate the share of the total amount of benefits captured by a subset of the population such as the poorest 20% of individuals or the richest 20% of individuals. For example, if the richest 20% of the population receive 80% of the total social protection benefits in a given year, then the richest quintile's concentration share of benefits is 80% (and that in turn

implies that the other 80% of the population receive no more than 20% of total benefits).

While the distributional analyses of government social protection spending are generally available for rich countries, thanks to long-standing research infrastructures such as EUROMOD[6] and Luxembourg Income study,[7] their availability for the global South was quite limited until recently. With the development of tools such as the Atlas of Social Protection Indicators of Resilience and Equity (ASPIRE),[8] Commitment to Equity (CEQ),[9] and SOUTHMOD,[10] the lack of the data on the distribution of social protection spending for low- and middle-income countries is no longer a constraint.

The recent examples of cross-country studies on equity in government social spending in low- and middle-income counties include Lustig (2016), Inchauste and Lustig (2017) and Lustig (2017). Using the CEQ data, the authors argue that redistributive success (in terms of poverty and inequality reduction) is broadly determined by the amount of resources (share of social spending in GDP) and their combined progressivity, i.e. the degree to which tax burdens and benefit entitlements rise or fall with household income. Other examples include studies by Gasior et al. (2022) and Arancibia et al. (2019) that used SOUTHMOD tax-benefit models to compare the redistributive capacities of taxes and social spending in several Sub-Saharan and Latin American countries, respectively. An important conclusion of these studies is that welfare systems in the majority of these countries had no poverty-reducing properties. This undesirable result is broadly due to the fact that the poor pay consumption taxes but receive very little in the form of cash transfers, the phenomenon which has been referred to as 'fiscal impoverishment' by Higgins and Lustig (2016).

The major limitation of the above-mentioned studies is that each of them covered a small number of countries (a study by Lustig (2017) had the largest sample of 29 countries), or were focused on countries from the same region, e.g. Latin America or Sub-Saharan Africa. The limited geographical scope prevented the authors from drawing conclusions about the association between equity in the distribution of social spending and outcomes in terms of poverty and inequality. Our study aims to address this gap.

[6] EUROMOD—a multi-country tax-benefit microsimulation model, initially developed at the University of Essex and currently being developed by the Joint Research Centre of the European Commission. See: https://euromod-web.jrc.ec.europa.eu/.

[7] Luxembourg Income Study Database (LIS)—a database of harmonised income microdata collected from multiple countries over a period of decades, based at the LIS Cross-National Data Center. See: https://www.lisdatacenter.org/our-data/lis-database/.

[8] The Atlas of Social Protection Indicators of Resilience and Equity (ASPIRE) of the World Bank provides harmonized indicators of social protection expenditures (including social assistance, social insurance and labour markets programs) and their distribution across the population and income subgroups for developing countries. See: https://www.worldbank.org/en/data/datatopics/aspire/indicator-glance.

[9] Commitment to Equity (CEQ)—a database of the studies of the impact of taxation and social spending on inequality and poverty for low- and middle-income countries developed by the CEQ Institute. See: https://commitmentoequity.org.

[10] SOUTHMOD—a multi-country tax/benefit microsimulation model for the Global South developed by UNU-WIDER, the EUROMOD team at the University of Essex, and Southern African Social Policy Research Institute (SASPRI). See: https://www.wider.unu.edu/project/southmod-simulating-tax-and-benefit-policiesdevelopment.

3 Data and Methodology

This study builds on the existing literature on the impact of social spending on well-being outcomes, to empirically test the proposition that greater equity in social protection spending is strongly associated with positive changes in income poverty and inequality, using a large dataset that combines country-level data on the distribution and size of social protection spending for advanced and developing countries. Our empirical analysis uses country-level data for 101 countries over the period 1998–2017. We include all countries and years for which all variables are available, which results in a total sample of 535 observations. Out of these, 336 observations belong to 31 high-income countries according to the World Bank classification, most of which are members of the European Union. For high-income countries, the data on all indicators we use is available for 11 years on average and without large gaps in time series. The remaining 199 observations come from 70 low- and middle-income countries, according to the World Bank classification. The data for these counties is available for 3 years on average. This highlights the gap in the availability of social spending and poverty/inequality data for rich and non-rich countries. The full list of the countries included in the sample and their classification by income levels is shown in Table 3.

To make sure that our estimates are not driven by the presence of the large number of observations from high-income countries, we estimate our models on two samples, one including all countries and one excluding high-income countries. Since the majority of high-income countries in our full sample comes from the EU, as a robustness check, we ran the same analyses by excluding EU countries only. These analyses yielded similar results to our main specification. Overall, the number of observations (years) per country in the full sample varies from 1 to 15, thus resulting in a highly unbalanced panel.

We assess equity in the distribution of social protection spending by comparing the concentration shares of spending across the subgroups with different income levels. Social protection comprises spending on cash and near-cash social assistance and social insurance benefits (including public pensions), both contributory and non-contributory. We use two measures of equity that are available for a large number of low- and middle-income countries: (1) share of social protection spending going to the first (poorest) quintile relative to the total spending, and (2) ratio of social protection spending going to the top (richest) quintile and the bottom (poorest) quintile. The higher the first indicator is, the higher the equity. The higher the second indicator is, the lower the equity. The equity measures are obtained from a combination of sources. For EU countries, and a number of non-EU countries, these have been calculated by the authors using tax-benefit microsimulation models EUROMOD and SOUTHMOD. For the rest we use the indicators available in the World Bank ASPIRE database and the CEQ Data Centre. We compared the definitions of these indicators across the data sources and concluded that they are broadly consistent. The indicators for the same country derived using these different sources, whenever those were available, were also consistent.

Our key spending variable is total public social protection expenditure as per cent of GDP, which is available for a large cross-section of countries from the ILO Social Protection Report (ILO, 2017). If not available in the ILO report, the variable was taken from the CEQ Data Centre and Eurostat.[11] The definition of social protection spending is broadly consistent across these databases. Expenditure on social protection comprises expenditure

[11] See: https://ec.europa.eu/eurostat/web/social-protection/data/database.

on social benefits, administration costs and other miscellaneous expenditure by social protection schemes. The ILO social expenditure data covers the period 2005–2015 with an up to five-year gap in between observations. Interpolation was used to fill in the missing observations of the social protection spending variable (in total 97 out of 535 observations were imputed using interpolation).

We use GDP per capita in purchasing power parity (PPP)-adjusted dollars in order to control for the general living standard and economic development. These data come from the World Development Indicators database.[12]

The four outcome measures we use are widely used in international comparisons of poverty and inequality. To assess inequality effects, we use the Gini coefficient. To analyse poverty, we use the poverty headcount, i.e. the share of the population with incomes (or consumption) below a poverty line. We follow the standard approach applied in the official statistics and academic studies for developing countries, whereby poverty is measured in absolute terms, using a poverty line determined by the monetary cost of a predetermined basket of goods. In contrast, most analyses of poverty in rich countries, including the majority of the OECD and EU member states, measure poverty in relative terms, setting the poverty line as a share of the median standard of living in a country. It should be noted though that national poverty lines in low- and middle-income countries, even if defined in absolute terms, may exhibit a relative component in that they are higher in PPP terms in countries with higher average incomes (Ravallion, 2010). To facilitate cross-country comparisons, we use the three absolute poverty thresholds available from the World Development Indicators database:

- International Poverty Line: Int$1.90 PPP, a global absolute minimum.
- Lower-middle income countries Poverty Line: Int$3.20 PPP.
- Upper-middle income countries Poverty Line: Int$5.50 PPP.

Ideally, we would have liked to disaggregate the international poverty headcounts by age, but this information is not available for a sufficiently high number of low- and middle-income countries. A recent joint report by the World Bank Group and UNICEF contains the estimates of child poverty for 149 countries pertaining to 2017 (Silwal et al., 2020). These estimates could be included in the regression analysis in the future if the number of observations is increased.

The question we seek to answer is whether social protection spending has a stronger (positive) impact on income inequality and poverty reduction in countries with higher equity in social protection spending. Our strategy is to regress poverty and inequality outcomes on the indicators of equity in social spending, controlling for the level of social protection spending relative to the GDP and the country wealth measured by per capita GDP. We estimate the following functional form:

$$\begin{aligned}\text{Poverty/Inequality Outcome}_{i,t} = {} & \delta_0 + \delta_1 \text{Equity in social protection spending}_{i,t} \\ & + \delta_2 \text{Social protection spending as percentage of GDP}_{i,t} \\ & + \delta_3 \text{GDPpercapita}_{i,t} + \epsilon_{i,t}\end{aligned} \tag{1}$$

where the variables for country i are:

[12] See: https://databank.worldbank.org/source/world-development-indicators.

Poverty outcome—poverty headcount (per cent of population) at three poverty lines measured in PPP-adjusted dollars: (1) Int$1.90 a day; (2) Int$3.20 a day; (3) Int$5.50 a day;

Inequality outcome—Gini index * 100;

GDP per capita—per capita GDP converted to international dollars using PPP rates; data are in constant 2017 international dollars;

Social protection spending—measured as share of social protection spending in GDP;

Equity in social protection spending—measured as (1) share of social protection spending going to the bottom quintile; (2) ratio of social protection spending going to the top and bottom quintiles;ε—an error term.

Our analysis is using a pooled cross-section time-series dataset, with countries as units of analysis. This technique maximizes the number of observations, but is also very sensitive for biases resulting from the error term. The standard way to deal with that bias is using the Ordinary Least Squares (OLS) regressions with panel corrected standard errors (Beck & Katz, 1995). This estimation method assumes that the errors are heteroskedastic and contemporaneously correlated across panels. Preliminary analyses indicated the presence of a bias related to autocorrelation. Thus, we opted for using a Stata command *xtpcse* with option *correlation(ar1)*. This option specifies that, within panels, there is first-order autocorrelation AR(1) and that the coefficient of the AR(1) process is common to all the panels.

We start by estimating associations between the outcome variables and each of the covariates, i.e., the country wealth measured by the GDP per capita (Model 1), the size of social protection spending relative to the GDP (Model 2), the share of spending going to the bottom quintile (Model 3) and the ratio of spending going to the top and bottom quintiles (Model 4). We then combine the GDP per capita and share of social protection spending in the same model (Model 5). Then we consecutively add the two measures of equity in spending to this baseline model (Model 6 and 7), and add them both simultaneously (Model 8). Given that the database was compiled using different sources, we used the fixed effects for the source of data (EUROMOD/SOUTHMOD, ASPIRE, or CEQ) in all the models. To test the validity of the findings we have performed the analysis for all countries in our sample (Table 4) and for low- and middle-income countries only, having excluded high-income countries (Table 5).

4 Findings

Our poverty headcount and inequality regressions for all countries use a sample of 535 observations from 101 countries over years 1998–2017 (see Table 1). The mean value of poverty headcounts is 4.2% at Int$1.90 a day (in 2011 international dollars, PPP adjusted), 9.2% at Int$3.20 a day and 17.5% at Int$5.50 a day. The mean value of the Gini index is 35.7%. The average share of social protection spending in GDP is at 14%, and ranges from 0.1% to over 27.2% of GDP. The mean values for the equity indicators—the share of the bottom quintile and ratio of public social protection spending going to the top and bottom quintiles—are 14% and 7.7 times, respectively. Finally, on average, a typical country in our dataset has a per capita GDP of 28,650 PPP-adjusted dollars.

Regressions for low- and middle-income countries (with high-income countries excluded) use a sample of 199 observations from 70 countries (see Table 2). This sample has considerably higher poverty and inequality levels. The mean value of poverty

Table 1 Summary statistics of variables used in regressions, all countries

	Observations	Mean	Std.Dev	Min	Max
Equity measures					
Share of the bottom quintile in social spending, %	535	14.0	7.7	0.1	35.5
Ratio of social protection spending going to the top and bottom quintiles, times	535	7.7	42.8	0.0	705.9
Controls					
GDP per capita in PPP dollars/1000	535	28.7	19.6	0.8	115.4
Social protection spending as % of GDP	535	13.4	6.0	0.1	27.2
Outcomes					
Poverty headcount at $1.90 a day, % of population	535	4.2	11.1	0.0	94.1
Poverty headcount at $3.20 a day, % of population	535	9.2	17.6	0.0	98.5
Poverty headcount at $5.50 a day, % of population	535	17.5	25.1	0.0	99.7
Gini index*100	535	35.7	7.9	23.7	64.8

headcounts is 10.3% at Int$1.90 a day, 22.2% at Int$3.20 a day and 41.2% at Int$5.50 a day. The average value of the Gini index is 41.4%. The average share of social protection spending in the GDP is lower (at 8.6%) than in the full sample of countries, and social protection spending is distributed in a less equitable way, once high-income countries are removed from the sample. The mean share of the bottom quintile in social protection spending is 9.6%, while the ratio of social protection spending going to the top and bottom quintiles amounts to 19.2 times. The per capita GDP in this sample is 2.5 times as low as in the sample for all countries ($11,010 PPP on average).

Table 4 contains the estimates of our model given in Eq. (1) for the three poverty variables and Gini coefficient on the full sample that includes high-income countries. It shows unstandardized β-coefficients, panel-corrected standard errors and levels of

Table 2 Summary statistics of variables used in regressions, low- and middle-income countries

	Observations	Mean	Std.Dev	Min	Max
Equity measures					
Share of the bottom quintile in social spending, %	199	9.6	6.8	0.1	35.5
Ratio of social protection spending going to the top and bottom quintiles, times	199	19.2	68.5	0.0	705.9
Controls					
GDP per capita in PPP dollars/1000	199	11.0	6.3	0.8	26.2
Social protection spending as % of GDP	199	8.6	5.7	0.1	27.2
Outcomes					
Poverty headcount at $1.90 a day, % of population	199	10.3	16.5	0.0	94.1
Poverty headcount at $3.20 a day, % of population	199	22.2	23.4	0.0	98.5
Poverty headcount at $5.50 a day, % of population	199	41.2	27.2	0.7	99.7
Gini index*100	199	41.4	8.5	24.6	64.8

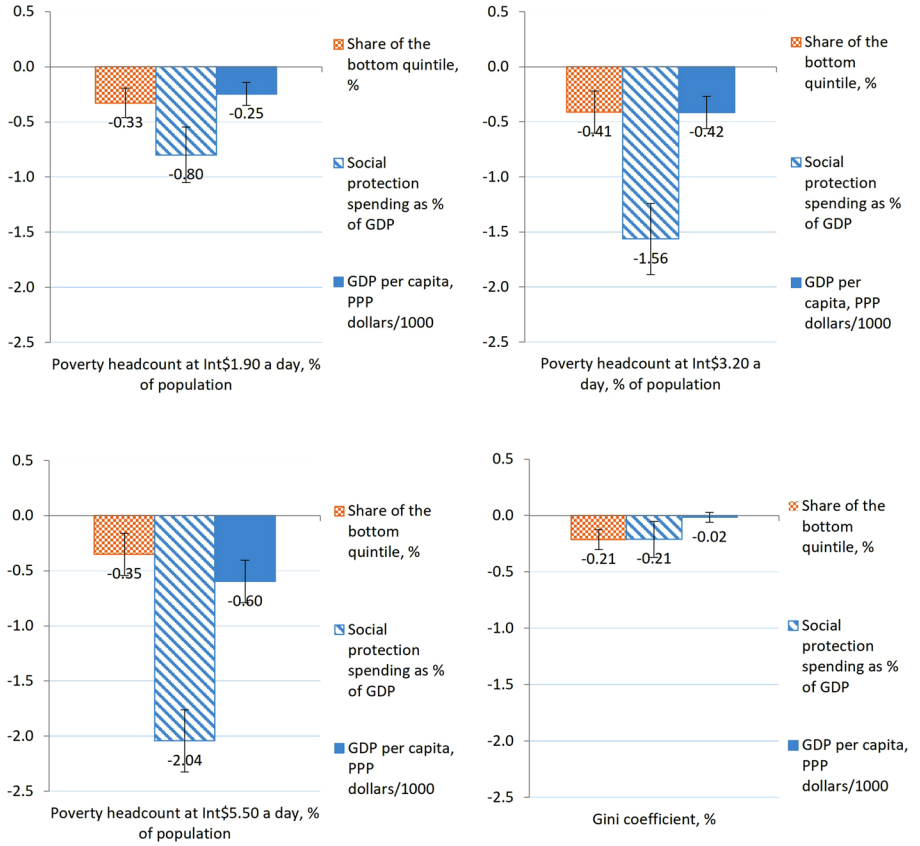

Fig. 1 The impact of equity in social protection spending on absolute poverty and inequality, all countries. *Note*: This figure shows unstandardized β-coefficients and their confidence intervals from pooled OLS regressions with panel corrected standard errors and autocorrelation (AR1) for each of the four outcomes, with fixed effects for the source of data (EUROMOD/SOUTHMOD, ASPIRE, or CEQ). Vertical bars show confidence intervals. The full models are shown in Table 4 (Model 6)

statistical significance from pooled OLS regressions of the four outcomes on measures of equity in social spending, the overall level of spending as percentage of GDP and the GDP per capita. The results we obtained by adding each of these covariates separately are what we expected, that is poverty and inequality is lower in countries with higher GDP (Model 1) and with higher share of social protection spending in the GDP (Model 2). The higher share of spending going to the bottom quintile is poverty and inequality reducing (Model 3), while the higher ratio of the top and bottom quintiles increases poverty and inequality (Model 4). This measure of equity, however, is not statistically significant once added to the models with other controls (Models 7 and 8). Thus our subsequent analysis is based on Model 6, where we add the first equity measure (the share of the bottom quintile) and control for the GDP per capita and the share of social protection spending in the GDP.

Figure 1 shows the unstandardized β-coefficients from Model 6 for all countries, for the four outcomes. It indicates that controlling for the GDP per capita, a 1 pp increase in social protection spending is associated with a 0.8 pp reduction in poverty at Int$1.90 a

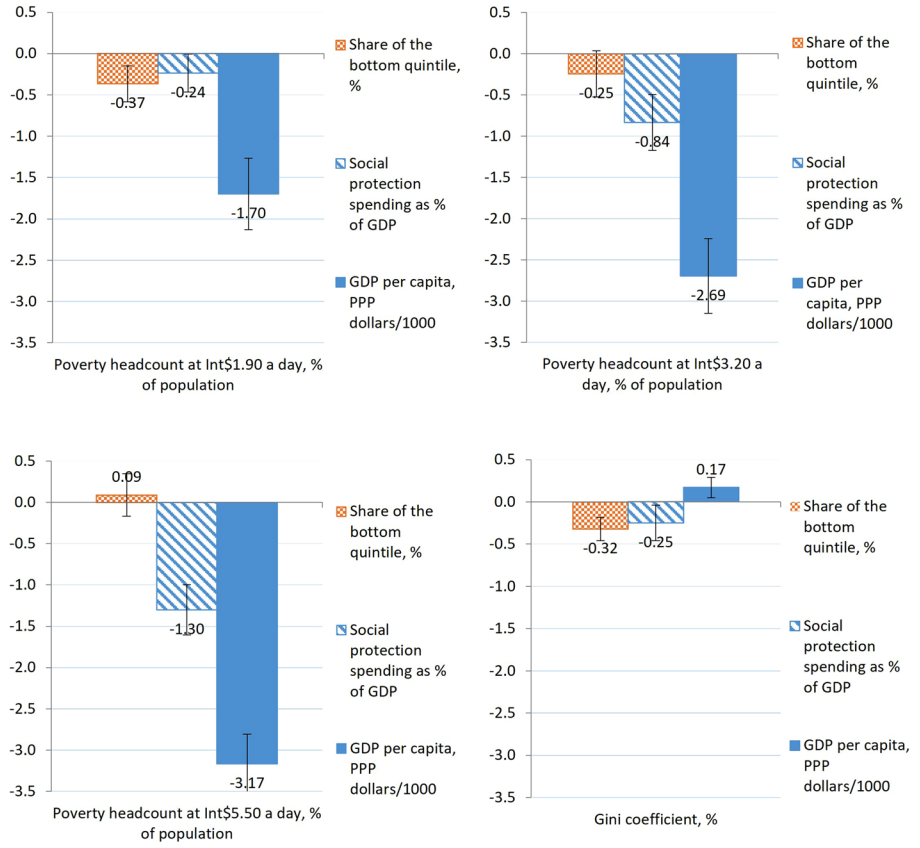

Fig. 2 The impact of equity in social protection spending on absolute poverty and inequality, low- and middle-income countries. *Note*: This figure shows unstandardized β-coefficients and their confidence intervals from pooled OLS regressions with panel corrected standard errors and autocorrelation (AR1) for each of the four outcomes, with fixed effects for the source of data (EUROMOD/SOUTHMOD, ASPIRE, or CEQ). Vertical bars show confidence intervals. The full models are shown in Table 5 (Model 6)

day. At the same time, a 1 pp increase in the share of social protection spending going to the bottom quintile is linked with a 0.33 pp reduction in poverty at Int$1.90 a day.

In the models for poverty headcounts at Int$3.20 a day and at Int$5.50 a day, the poverty reducing effect of the share of the bottom quintile in social protection spending goes up to − 0.41 and − 0.35 pp, respectively. The poverty reducing effect of the level of social spending in GDP also goes up, to − 1.6 and − 2 pp, respectively.

When the Gini index is used as an outcome, the coefficient of the share of the bottom quintile is significant and negative (− 0.21 pp), as well as the coefficient of the share of social spending in GDP (− 0.21). The size of both coefficients, however, is much lower than in the models for poverty outcomes.

Table 5 contains the estimates of our model given in Eq. (1) for the three poverty variables and Gini coefficient on the subsample of low- and middle-income countries,

with high-income countries excluded. The bivariate associations between covariates and outcomes show the same patterns as in the models for all countries discussed above. One exception is the association between the GDP per capita and inequality measured by Gini index, which is low and not statistically significant, and becomes positive when other covariates are added to the model. Secondly, we find that both equity measures are statistically significant in the models for poverty at Int$1.90 a day and for the Gini coefficient, when they are added to the models separately (Models 6 and 7). When they are added together (Model 8), the second measure is no longer statistically significant.

Figure 2 shows the results from the model for low- and middle-income countries that includes the share of the bottom quintile as a measure of equity in social protection spending (Model 6). In the models for poverty headcounts at Int$3.20 a day and at Int$5.50 a day, the share of spending going to the bottom quintile is not statistically significant. A plausible explanation for the lack of the effect of this measure in low- and middle-income countries is that these poverty lines may be set too high to represent a poverty standard in the sample of low- and middle-income countries. As we can see from Table 2, on average 22.2% and 41.2% of the population of these countries can be considered poor using Int$3.20 a day and Int$5.50 a day poverty lines, respectively.

In the model for poverty at Int$1.90 a day, the effect of the share of the bottom quintile, however, is statistically significant and similar in terms of size to the one in the model for all countries, while the effect of the size of spending is smaller than in the model for all countries (Fig. 2). Controlling for the GDP per capita, a 1 pp increase in the share of social protection spending going to the bottom quintile is linked with a 0.37 pp reduction in extreme poverty, while a 1 pp increase in social protection spending is associated with a 0.24 pp reduction in extreme poverty.

The share of the bottom quintile in social spending has a stronger effect on the Gini index (-0.32) in low- and middle-income countries, as compared to the full sample of countries. At the same time, a 1 pp increase in the share of social spending in GDP reduces Gini index by -0.25 pp, which is similar to the results obtained in the model for all countries.

Overall, the results of our analysis presented for Figs. 1 and 2 support the following conclusions: (1) countries spending a higher share of their GDP on social protection programs have lower income poverty and inequality; (2) when it comes to extreme poverty (measured at Int$1.90 a day) and inequality (measured by the Gini index), the effectiveness of social protection spending in lowering poverty and inequality is positively correlated with the equity in spending, specifically with the share of social protection spending going to the bottom quintile; (3) in low- and middle-income countries poverty and inequality reducing impact of this equity measure is stronger than in the sample including all countries.

5 Conclusions and Discussion

This study aimed to investigate whether higher equity in government social protection spending strongly predicts positive changes in income poverty and inequality. In this study, we have empirically assessed how income poverty and inequality in low- and middle-income countries are affected by the distribution of social protection spending. While it

will vary by country, inequity in the distribution of social protection spending (on cash and near-cash social assistance and social insurance benefits, including public pensions, both contributory and non-contributory) results from the composition of spending that tends to favor those in the highest income quintiles. As has been extensively documented in the literature, national social protection systems in developing countries tend to provide far better coverage to workers in the formal economy, compared with informal workers. Although social protection programs in developing countries have relatively increased in recent years to reach poorest population, such programs remain far from optimal, and major efforts are needed to reach poorest and most disadvantaged groups with adequate social protection.

Previous cross-country research on the effectiveness of social spending measured the welfare state effort using an indicator of social spending as proportion of the GDP or in per capita terms, without accounting for the distribution of spending across the population, and/or was largely limited to high-income countries for which such data is readily available. In this paper we have analysed the distributional impacts of equity in social protection spending, using a dataset of 535 observations from 101 countries over years 1998–2017, including 199 observations for 70 low- and middle-income countries. This dataset was compiled using data from different sources (EUROMOD and SOUTHMOD, ASPIRE, CEQ and ILO). We confirmed that the indicators stemming from different sources are consistent, by having compared the definitions used across these sources and having checked those cases where we had data from different sources for the same country.

Our approach was to regress the poverty and inequality outcomes on the indicators of equity in social protection spending, controlling for the level of spending and the country wealth measured by per capita GDP. Our findings support the proposition that equity in social spending (measured by the share of social protection spending going to the bottom quintile) is a strong predictor of improved distributional outcomes (extreme poverty measured at Int$1.90 a day and inequality measured by the Gini index). Furthermore, in low- and middle-income countries in our sample the poverty and inequality reducing impact of this equity measure was stronger than in the sample including all countries. More specifically, we find that in low- and middle-income countries a 1 pp increase in the share of social protection spending going to the bottom quintile is associated with a 0.37 pp reduction in poverty headcount at Int$1.90 a day and a 0.32 pp reduction in the Gini index. These findings confirm what proponents of equity in public spending have been arguing: more equitable distribution of social protection spending is critical for reducing extreme income poverty and inequality in low- and middle-income countries.

Some policy implications follow from these findings. The presence of a significant gap in equity of social protection spending between the high-income countries and the rest of countries included in the study signifies that there is a large potential in improving equity in social protection spending in low- and middle-income countries. On average, in all the countries covered by this analysis, 14% of overall social protection spending is going to the poorest quintile. This share drops to 9.6% when the high-income countries are excluded from the sample. The level of equity in social protection spending in low- and middle-income countries may take decades to converge to the levels observed in the high-income countries, even under situations of considerable increases in government social protection spending. Existing distributional inequalities in social protection spending seem to

constrain, at least partly, the effectiveness of social spending in low- and middle-income countries.

Given these findings, in developing countries the social protection reforms should be focused on extending the coverage of social protection programs and improving access to social protection for the poorest segments of the population. Higher effectiveness of social protection spending in terms of poverty and inequality reduction could be achieved by reducing non-productive spending (such as, for instance, universal energy subsidies) and on improving tax compliance in order to create larger fiscal space. The right policy choices require assessing the incidence of social protection programs on different population groups, particularly the poor, prior to their implementation. Addressing the problem of pro-cyclicality of social spending in developing countries may have positive effects on equity.

Finally, this study draws attention to the significant gaps in the availability of data on equity of social spending and distributional outcomes for low- and middle-income countries. Our study has focused on the impact of equity in government social protection spending on income poverty and inequality due to the small number of low- and middle-income countries for which the data on the distribution of spending in other social sectors (education and health) and other well-being outcomes (such as, for instance, multiple deprivation and social exclusion) is available. We would have liked to include the breakdowns of income poverty indicators by age in our analysis but this data was not available for a sufficiently high number of low- and middle-income countries at the moment of writing. Next, in our modelling we could not account for time trends, because the data on equity measures for low- and middle-income countries was only available for 3 years on average. Further analyses are warranted in order to understand the joint effect of social protection spending and tax policies on inclusiveness. Gross social protection spending may seem generous and pro-poor, but if the poor pay more taxes, transfers net of taxes received by the poor could be negative. This is left for future research.

Appendix

See Tables 3, 4, and 5.

Table 3 The list of countries included in the analysis and number of observations per country

High income countries	N	Upper middle income countries	N	Lower middle income countries	N	Low income countries	N
Austria	11	Albania	2	Bangladesh	2	Burkina Faso	2
Belgium	13	Argentina	1	Benin	1	Congo, Dem. Rep	2
Chile	5	Armenia	7	Bhutan	2	Gambia, The	2
Croatia	8	Belarus	6	Bolivia	7	Mozambique	1
Cyprus	12	Botswana	1	Cameroon	1	Rwanda	2
Czechia	13	Brazil	5	Congo Republic	1	Sudan	1
Denmark	11	Bulgaria	11	Cote D'Ivoire	3	Uganda	2
Estonia	13	China	1	Egypt, Arab Rep	1		
Finland	11	Colombia	4	El Salvador	7	Total	12
France	12	Costa Rica	5	Ghana	2		
Germany	8	Dominican Republic	8	Honduras	4		
Greece	13	Ecuador	7	India	1		
Hungary	13	Fiji	1	Kenya	1		
Ireland	11	Georgia	2	Kiribati	1		
Italy	13	Guatemala	1	Kyrgyz Republic	4		
Latvia	12	Indonesia	2	Lao PDR	1		
Lithuania	13	Jamaica	1	Mauritania	1		
Luxembourg	11	Jordan	2	Moldova	3		
Malta	11	Kazakhstan	4	Mongolia	4		
Mauritius	2	Malaysia	1	Nepal	1		
Netherlands	12	Maldives	1	Nicaragua	2		
Panama	8	Mexico	4	Pakistan	2		
Poland	13	Paraguay	5	Papua New Guinea	1		
Portugal	11	Peru	7	Philippines	2		
Romania	11	Russian Federation	4	Solomon Islands	1		
Slovakia	11	Samoa	1	Sri Lanka	3		

Table 3 (continued)

High income countries	N	Upper middle income countries	N	Lower middle income countries	N	Low income countries	N
Slovenia	12	Serbia	2	Timor-Leste	1		
Spain	13	South Africa	3	Tunisia	1		
Sweden	12	Thailand	4	Ukraine	5		
United Kingdom	12	Turkey	12	Vietnam	3		
Uruguay	5			Zambia	1		
		Total	115	Zimbabwe	1		
Total	336			eSwatini	1		
				Total	72		

Notes: Countries are divided into four income groupings (low, lower-middle, upper-middle, and high income) according to the World Bank classification for 2020. The data has been accessed at: http://databank.worldbank.org/data/download/site-content/CLASS.xls

Table 4 The impact of equity in social protection spending on absolute poverty and inequality, all countries

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7		Model 8	
	B	se	B	se	B	se	B	se	B	se	B	se	B	se	B	se
Poverty headcount at Int$1.90 a day, % of population																
GDP per capita, PPP dollars/1000	−0.3876***	(0.0633)							−0.2785***	(0.0589)	−0.2477***	(0.0531)	−0.2692***	(0.0570)	−0.2444***	(0.0521)
Social protection spending as % of GDP			−0.9968***	(0.1450)					−0.7921***	(0.1231)	−0.7999***	(0.1288)	−0.7602***	(0.1260)	−0.7722***	(0.1321)
Share of the bottom quintile, %					−0.4334***	(0.0881)					−0.3286***	(0.0685)			−0.2907***	(0.0780)
Ratio of the shares of top and bottom quintiles, times							0.0409**	(0.0153)					0.0275*	(0.0123)	0.0226+	(0.0124)
Constant	15.9762***	(2.1507)	16.8662***	(2.2472)	8.6884***	(1.6520)	1.0036***	(0.2873)	24.2209***	(2.8186)	28.9153***	(3.5264)	23.3342***	(2.8404)	27.6688***	(3.7146)
Observations	535		535		535		535		535		535		535		535	
R-squared	0.3211		0.3494		0.2815		0.2748		0.3835		0.4066		0.4000		0.4178	
Number of countries	101		101		101		101		101		101		101		101	
Poverty headcount at Int$3.20 a day, % of population																
GDP per capita, PPP dollars/1000	−0.7007	(0.0000)							−0.4487***	(0.0800)	−0.4158***	(0.0756)	−0.4404***	(0.0774)	−0.4118***	(0.0740)
Social protection spending as % of GDP			−1.8950***	(0.1682)					−1.5610***	(0.1635)	−1.5648***	(0.1647)	−1.5222***	(0.1708)	−1.5335***	(0.1739)

Table 4 (continued)

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7		Model 8	
	B	se	B	se	B	se	B	se	B	se	B	se	B	se	B	se
Share of the bottom quintile, %					−0.5694***	(0.1363)					−0.4109***	(0.0972)			−0.3670**	(0.1168)
Ratio of the shares of top and bottom quintiles, times							0.0499*	(0.0217)					0.0323+	(0.0183)	0.0260	(0.0191)
Constant	0.5030		0.5543		0.4292		0.4260		0.5904		0.6049		0.5993		0.6104	
Observations	535		535		535		535		535		535		535		535	
R-squared	0.5030		0.5543		0.4292		0.4260		0.5904		0.6049		0.5993		0.6104	
Number of countries	101		101		101		101		101		101		101		101	
Poverty headcount at Int$5.50 a day, % of population																
GDP per capita, PPP dollars/1000	−0.9502***	(0.0898)							−0.6254***	(0.0993)	−0.5976***	(0.0980)	−0.6132***	(0.0965)	−0.5939***	(0.0966)
Social protection spending as % of GDP			−2.5098***	(0.1377)					−2.0415***	(0.1431)	−2.0436***	(0.1440)	−2.0138***	(0.1507)	−2.0199***	(0.1534)
Share of the bottom quintile, %					−0.5505***	(0.1561)					−0.3501***	(0.0978)			−0.3160**	(0.1163)
Ratio of the shares of top and bottom quintiles, times							0.0478*	(0.0223)					0.0256	(0.0184)	0.0201	(0.0193)

Table 4 (continued)

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7		Model 8	
	B	se	B	se	B	se	B	se	B	se	B	se	B	se	B	se
Constant	41.6374***	(3.0107)	44.6108***	(2.7903)	14.5897***	(2.7446)	5.1622***	(1.2302)	61.2729***	(1.9907)	66.3824***	(1.9333)	60.3384***	(2.0161)	65.2494***	(2.4129)
Observations	535		535		535		535		535		535		535		535	
R-squared	0.6983		0.7401		0.6172		0.6156		0.7760		0.7814		0.7784		0.7830	
Number of countries	101		101		101		101		101		101		101		101	
Gini coefficient, %																
GDP per capita, PPP dollars/1000	−0.0886***	(0.0169)							−0.0539**	(0.0201)	−0.0166	(0.0222)	−0.0504**	(0.0195)	−0.0161	(0.0221)
Social protection spending as % of GDP			−0.2250***	(0.0640)					−0.1876*	(0.0746)	−0.2111**	(0.0813)	−0.1789*	(0.0781)	−0.2035*	(0.0851)
Share of the bottom quintile, %					−0.2176***	(0.0454)					−0.2140***	(0.0451)			−0.2028***	(0.0477)
Ratio of the shares of top and bottom quintiles, times							0.0094*	(0.0047)					0.0080+	(0.0045)	0.0060	(0.0047)
Constant	36.4019***	(0.8100)	36.3016***	(1.0016)	36.4139***	(0.8452)	32.9713***	(0.4860)	37.7946***	(0.8061)	40.2143***	(1.0693)	37.5035***	(0.8786)	39.8829***	(1.2142)
Observations	535		535		535		535		535		535		535		535	
R-squared	0.9026		0.8987		0.8948		0.8993		0.9012		0.8961		0.9020		0.8970	
Number of countries	101		101		101		101		101		101		101		101	

Standard errors are shown in parentheses *** $p<0.001$, ** $p<0.01$, * $p<0.05$, + $p<0.1$. Results are obtained using pooled OLS regressions with panel corrected standard errors and autocorrelation (AR1), with fixed effects for the source of data (EUROMOD/SOUTHMOD, ASPIRE, or CEQ)

Table 5 The impact of equity in social protection spending on absolute poverty and inequality, low- and middle-income countries

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7		Model 8	
	B	se	B	se	B	se	B	se	B	se	B	se	B	se	B	se
Poverty headcount at Int$1.90 a day, % of population																
GDP per capita, PPP dollars/1000	−1.9360***	(0.2294)							−1.7776***	(0.2360)	−1.6998***	(0.2202)	−1.7301***	(0.2389)	−1.6762***	(0.2216)
Social protection spending as % of GDP			−1.2548***	(0.2235)					−0.2946*	(0.1233)	−0.2363*	(0.1164)	−0.2820*	(0.1180)	−0.2335*	(0.1137)
Share of the bottom quintile, %					−0.8624***	(0.1830)					−0.3659**	(0.1116)			−0.3195**	(0.1239)
Ratio of the shares of top and bottom quintiles, times							0.0461**	(0.0167)					0.0214*	(0.0106)	0.0161	(0.0108)
Constant	37.1445***	(4.7864)	16.9929***	(3.1033)	17.0847***	(3.8189)	2.5881+	(1.5282)	37.6324***	(4.9240)	41.8443***	(5.4963)	36.5630***	(4.9949)	40.5503***	(5.7981)
Observations	199		199		199		199		199		199		199		199	
R-squared	0.4724		0.2609		0.1920		0.1540		0.4750		0.4904		0.4833		0.4954	
Number of countries	70		70		70		70		70		70		70		70	
Poverty headcount at Int$3.20 a day, % of population																
GDP per capita, PPP dollars/1000	−3.2112***	(0.2276)							−2.7506***	(0.2437)	−2.6949***	(0.2309)	−2.7118***	(0.2479)	−2.6742***	(0.2329)
Social protection spending as % of GDP			−2.3622***	(0.2837)					−0.8740***	(0.1743)	−0.8356***	(0.1725)	−0.8627***	(0.1721)	−0.8328***	(0.1705)
Share of the bottom quintile, %					−1.0982***	(0.2812)					−0.2460+	(0.1432)			−0.2014	(0.1655)

Table 5 (continued)

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7		Model 8	
	B	se	B	se	B	se	B	se	B	se	B	se	B	se	B	se
Ratio of the shares of top and bottom quintiles, times							0.0581*	(0.0241)					0.0182	(0.0140)	0.0151	(0.0152)
Constant	0.6742		0.4495		0.2563		0.2420		0.6926		0.6951		0.6956		0.6974	
Observations	199		199		199		199		199		199		199		199	
R-squared	0.6742		0.4495		0.2563		0.2420		0.6926		0.6951		0.6956		0.6974	
Number of countries	70		70		70		70		70		70		70		70	
Poverty headcount at Int$5.50 a day, % of population																
GDP per capita, PPP dollars/1000	−3.8099***	(0.1671)							−3.1522***	(0.1829)	−3.1666***	(0.1835)	−3.1398***	(0.1864)	−3.1546***	(0.1856)
Social protection spending as % of GDP			−3.0010***	(0.2248)					−1.2848***	(0.1488)	−1.3017***	(0.1552)	−1.2810***	(0.1507)	−1.3011***	(0.1544)
Share of the bottom quintile, %					−0.9223**	(0.3104)					0.0888	(0.1314)			0.1126	(0.1436)
Ratio of the shares of top and bottom quintiles, times							0.0502*	(0.0237)					0.0060	(0.0137)	0.0078	(0.0143)
Constant	83.4627***	(4.1531)	49.4260***	(4.6410)	31.8359***	(6.8806)	16.4087**	(5.7638)	86.3733***	(4.4859)	85.2004***	(4.7072)	86.0920***	(4.7694)	84.5316***	(5.2923)
Observations	199		199		199		199		199		199		199		199	
R-squared	0.8102		0.6208		0.4040		0.3979		0.8436		0.8427		0.8439		0.8428	
Number of countries	70		70		70		70		70		70		70		70	

Table 5 (continued)

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7		Model 8	
	B	se	B	se	B	se	B	se	B	se	B	se	B	se	B	se
Gini coefficient, %																
GDP per capita, PPP dollars/1000	−0.0452	(0.0420)							0.1055*	(0.0469)	0.1704**	(0.0621)	0.1307**	(0.0478)	0.1815**	(0.0608)
Social protection spending as % of GDP			−0.2391*	(0.0975)					−0.2929*	(0.1170)	−0.2494*	(0.1072)	−0.2847*	(0.1212)	−0.2481*	(0.1095)
Share of the bottom quintile, %					−0.3330***	(0.0782)					−0.3221***	(0.0698)			−0.2982***	(0.0750)
Ratio of the shares of top and bottom quintiles, times							0.0123*	(0.0059)					0.0120*	(0.0057)	0.0078	(0.0054)
Constant	40.7866***	(1.4102)	42.6631***	(1.4995)	45.6240***	(1.5306)	39.9463***	(1.0490)	41.4234***	(1.2943)	45.2316***	(1.4549)	40.8493***	(1.4391)	44.5948***	(1.7389)
Observations	199		199		199		199		199		199		199		199	
R-squared	0.7148		0.7126		0.6996		0.7416		0.7251		0.7037		0.7315		0.7066	
Number of countries	70		70		70		70		70		70		70		70	

Standard errors are shown in parentheses ***$p<0.001$, **$p<0.01$, *$p<0.05$, +$p<0.1$. Results are obtained using pooled OLS regressions with panel corrected standard errors and autocorrelation (AR1), with fixed effects for the source of data (EUROMOD/SOUTHMOD, ASPIRE, or CEQ)

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