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The role of the commodity price boom in shaping public social spending: Evidence from Latin America

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ABSTRACT

We study the potential impact of the commodity price boom of 2003 to 2013 on public social spending in Latin America. We estimate structural vector autoregressions and local projections for 16 Latin American countries over the period from 1990 to 2019 and investigate if we can attribute increases in public spending on health, education, and social protection to increases in a country's net commodity terms-of-trade. By focusing on the impulse responses derived from country-specific estimations, we find a huge variety in response patterns. Our study finds that two countries experienced lasting increases in public social spending due to the commodity boom (Argentina, Ecuador). Some others observed at least temporary increases of few years (Brazil, Mexico), reacted first with declines and then rises (Chile), and yet others did not respond at all (Bolivia, Colombia, Peru). As expected, we cannot relate public social spending with commodity prices in countries without commodity price boom. Among countries with positive responses, there is no clear tendency concerning the function of spending that benefits most. We discuss potential explanations behind the heterogeneity of our country-wise results and conclude that the presence of left-wing governments, fiscal rules, natural resource funds and economic diversification provide plausible explanations for single country cases, but no general patterns emerge. We conclude that the commodity price boom was neither necessary nor sufficient for social policy expansion in Latin America, and factors explaining its effects differ from country to country. Our study highlights the importance of in-depth examinations of country-specific factors and the need of (currently lacking) high-quality time series data in development research.

1. Introduction

Running counter global trends, Latin America – one of the most unequal regions in the world – surprised at the beginning of the 21st century with a substantial decline in inequality of income distribution (see e.g. Gasparini & Lustig, 2011; Lustig, Lopez-Calva, & Ortiz-Juarez, 2013). Increases in public social spending are commonly regarded as one of the major driving forces behind this decline (Clifton, Díaz-Fuentes, & Revuelta, 2020; Lustig, Lopez-Calva, & Ortiz-Juarez, 2016; Ocampo & Gómez Arteaga, 2018). In turn, because increases in public social spending coincided with a pronounced commodity price boom from 2003 to 2013, it is widely claimed that rising revenues from commodity exports made this possible. However, the allegedly positive impact of commodity prices on public social spending has been presupposed rather than studied. Against this background, this paper investigates the relationship between commodity prices and public social spending in Latin America over the past two decades.

Using a time series approach, we investigate if we can attribute increases in public social spending on health, education, and social

protection to rises in each country's net commodity export prices. We estimate structural vector autoregression models for 16 Latin American countries over the period from 1990 to 2019. Our study finds that two countries experienced lasting increases in public social spending due to the commodity boom (Argentina, Ecuador). Some others observed at least temporary increases of few years (Brazil, Mexico), reacted first with declines and then rises (Chile), and yet others did not respond at all (Bolivia, Colombia, Peru). Expectedly, we cannot relate public social spending with commodity prices in countries without commodity price boom. Overall, our results suggest that there is substantial between-country heterogeneity and no universal transmission from rising commodity prices to higher public social spending. In countries that have seemingly used increased revenues from commodity price booms for public social spending, there is no clear tendency concerning the function of spending that benefits most. We conjecture that the supposed importance of the commodity price boom as enabling factor for the increase in public social spending in Latin America is

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overstated in so far as it was neither necessary nor sufficient for social policy expansion. It is nevertheless plausible that public social spending benefitted from commodity prices in some countries, which leads us to conclude that country-specific determinants of the conditions under which increased policy space is used for public social spending deserve much closer scrutiny.

Our study advances the existing literature in several ways. First, our structural VAR approach allows us to take into account that public social spending on different functions – health, education, and social protection – might react quite differently to commodity price booms, while spending on one function is not independent of spending on the others. While some papers in the literature study impacts of external shocks on different functions of government separately, interdependencies are usually not considered. Second, we expect a high degree of cross-country heterogeneity that pooled or panel approaches may disguise. We conduct country-specific estimations to avoid this problem and indeed find an array of distinct situations in different (groups of) countries. All in all, we provide credible estimates to better understand the relationship between commodity prices and public social spending in Latin America. These results have implications also with respect to the role of the commodity price boom in the reduction of inequality at the beginning of the 21st century: even if we do not directly test the impact of the commodity boom on income inequality in this paper, we investigate one important channel – public social spending – through which such an impact may occur. Like a few other recent studies, we call the central role of commodity prices into question (Arza et al., 2022; Feierherd, Larroulet, Long, & Lustig, 2023).

The paper is organized as follows. Section 2.1 provides some theoretical background concerning the relationship between commodity prices and public social spending, before Section 2.2 discusses previous empirical research. Section 3 presents our empirical approach and data. Section 4 presents and discusses our results. Section 5 closes with a conclusion.

2. Theoretical considerations and previous literature

2.1. Theoretical approaches

It is a widely shared view that Latin American economies benefitted strongly from rising global commodity prices over periods of the past two decades. During what has been called a global commodity "supercycle", lasting from around 2003 to 2012 or 2014 (see e.g. Erten & Ocampo, 2013), Latin American economies faced a "very positive external environment" (Ocampo, Bastian, & Reis, 2018, p. 233; see also Cetrángolo, Ruiz del Castillo, & Jiménez, 2010; Mazzuca, 2013). At the same time, public social spending in Latin American countries expanded (see Section 3.2.1). Bringing these two developments together, much of the literature on social policy and public social spending in Latin America, implicitly or explicitly, highlights the contribution of the commodity boom to social policy expansion (Lavinas, 2013; Martínez Franzoni & Sánchez-Ancochea, 2018). A common take is exemplified by Grugel and Riggirozzi (2018, p. 555), who argue that "[t]he reasons the Left was able to extend welfare and avoid borrowing was the long global commodity boom".

Indeed, the conventional macroeconomic perspective holds that movements in terms-of-trade (ToT) have a substantial impact on macroeconomic performance and short-term fluctuations within the business cycle (Broda, 2004; Céspedes & Velasco, 2012; Fernández, González, & Rodriguez, 2018; Kose, 2002; Mendoza, 1995). Hence it is plausible that commodity price booms also expand a government's room for manoeuvre. Rising commodity prices could increase direct tax revenues from commodity exports as well as non-tax revenues such as royalties and profits from state-owned companies, and result in higher commodity rents in the hands of the state. This seems especially relevant in Latin America, where state-owned companies carry out mining and oil production in some countries. Higher commodity prices may

also contribute to higher economic growth by expanding aggregate demand (Ocampo, 2017) or easing balance-of-payments constraints (Rosnick & Weisbrot, 2014). In consequence, governments may see their tax revenues and fiscal space grow, thus easing political and fiscal restrictions on public spending (see e.g. Medina, 2016). Estimates from recent empirical literature suggest that commodity price booms are, on average, important for economic output of commodity-exporting economies, but there is a considerable degree of heterogeneity.[1]

Furthermore, rises in government revenues alone do not imply automatic increases in public social spending, as governments may choose not to allocate the additional fiscal resources towards this objective.[2] A large and interdisciplinary literature has investigated three broad strands of determinants of public social spending (see Flechtner & Sánchez-Ancochea, 2022, for a review with reference to Latin America): a trade and globalization hypothesis that investigates potential impacts of trade openness on government expenditure (e.g. Doyle, 2018; Rodrik, 1998), a modernization hypothesis that investigates the impact of rising living standards and industrialization (e.g. Williamson & Fleming, 1977), and a politics hypothesis that investigates the role of democracy or ideology of incumbent governments (e.g. Hicks & Swank, 1992; Huber, Ragin, & Stephens, 1993).

While this literature seeks to provide general explanations of the level and growth of public social spending, one can also draw on it to investigate the potential impact of commodity price booms in particular. The politics strand offers various potential explanations why additional fiscal resources from commodity booms may not be allocated towards public social spending. The political willingness to do so has been attributed in particular to left-wing governments (e.g. Birdsall, Lustig, & McLeod, 2012; Cornia, 2010; Huber & Stephens, 2012; Madrid, Hunter, & Weyland, 2010; Silva, 2017), although the evidence on this matter has produced mixed results (Altman & Castiglioni, 2019). On the one hand, in societies with high degrees of political polarization or fractionalization of political elites, competing groups may all insist on benefitting their voters, resulting in so-called "voracity effects" with more-than-proportional increases of public social spending (Gavin & Perotti, 1997; Lane & Tornell, 1996; Perotti, 1996; Tornell & Lane, 1999; Woo, 2009). On the other hand, the discretionary power of incumbent governments may be restricted by political decisions of previous governments, for instance when fiscal rules have been imposed on governments' utilization of windfall gains from commodity exports

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[1] Roch (2019) estimated that commodity ToT accounted for 29 percent of the fluctuation in economic output in commodity-exporting countries during 1980–2017, on average, with considerable cross-country differences. Fernández, Schmitt-Grohé, and Uribe (2017) found that world price shocks accounted for about one third of variations in domestic economic activity over 1965–2015. Troncoso Sepúlveda (2022) analysed the case of Ecuador and concluded that between 23 and 37 percent of macroeconomic fluctuations could be attributed to commodity ToT. Torres-García, Montoya-Arbeláez, and Wberth-Escobar (2022) analysed five Latin-American countries and found impacts on aggregate output of 29 to 40 percent. In contrast to this group of studies, Schmitt-Grohé and Uribe (2018) estimated that less than 10 percent of fluctuations in economic output were due to ToT shocks, on average, in a sample of 38 countries covering the period 1980–2011. Country-specific estimates for Latin American economies suggested that even in highly commodity-dependent economies, the impact of ToT fluctuations on aggregate economic activity was minor.

[2] In turn, rises in public social spending may also occur without rises in government revenues. Given the ongoing scrutiny surrounding the role of the commodity boom in economic output and the doubts regarding its impact on fiscal space, alternative factors have been examined. Notably, the presence of low interest rates and the availability of international loans could have facilitated the expansion of social policy in Latin America during the early 2000s (Campello, 2015; Dorlach, 2021). These factors may also provide insight into why Latin American countries that did not experience a commodity boom were still able to augment public social spending, even in the face of unchanged or declining ToT (Arza et al., 2022; Feierherd et al., 2023).

for social expenditures (Medina, 2016; Villafuerte, López-Murphy, & Ossowski, 2013). In a similar vein, natural resource funds are often designed to limit governments' decision-making power over windfall gains, by channelling them towards pre-determined purposes that are usually unrelated with social policy.

Drawing on the trade and globalization strand, it might be the case that governments of countries with a higher degree of commodity dependence and hence exposure to price volatility observe a larger political need to compensate voters for risks that economic openness may entail, as stated by Rodrik (1998). Concerning the modernization and growth strand, one may expect that additional fiscal resources are more likely to be used for public social spending in richer economies because of higher voter demands for social policy. Furthermore, it might be easier for richer and more diversified economies to use windfall gains from commodity booms to get increases of public social spending going, especially with longer-lasting increases in mind. The reason is the minor relative economic importance of these windfall gains in comparison with smaller, commodity-dependent economies. Whereas these latter economies must be careful not to increase public social spending without securing funding for the longer term, more diversified economies might find it easier to use temporary increases in revenues to bring public social spending to higher levels with the aim of securing funding from other sources in the medium term. Here, it is important to note that economic growth and augmented fiscal space do not inherently lead to an automatic expansion of social spending, as documented by historical analyses (Bértola & Ocampo, 2012; Prados de la Escosura, 2007).

From a theoretical angle, different functions of governments' social spending may respond differently to fluctuations in the business or commodity cycle (Martínez Franzoni & Sánchez-Ancochea, 2021). Some functions, such as unemployment insurance, often exhibit a countercyclical nature, primarily due to the presence of automatic stabilizers. In Latin America, automatic stabilizers have historically played a relatively minor role though (Arze del Granado, Gupta, & Hajdenberg, 2013). Conversely, public spending on education is commonly perceived to exhibit procyclical behaviour: in times of economic affluence governments are more inclined to increase spending on education, while they may reduce it during times of crisis (Delaney & Doyle, 2011). Public health expenditure is closely intertwined with the health status of the population and tends to exhibit an inverse relationship. The business cycle can have procyclical (Bellés-Obrero & Vall Castelló, 2018; Neumayer, 2005) and countercyclical effects (Darby & Melitz, 2008; Tapia Granados, 2005) on the population's health. Still, political processes and borrowing constraints contribute to procyclical health spending in developing (Liang & Tussing, 2019) and OECD countries (Abbott & Jones, 2021).

To conclude theoretical considerations, it remains *a priori* uncertain what impact a commodity boom will likely have on public social spending. Even when a commodity boom does expand governments' fiscal space, it is uncertain that this additional fiscal capacity will be allocated towards public social spending, and it might be the case that different functions of government respond differently. Still, it is not implausible to assume links between the commodity boom and growing public social spending in Latin America, which makes empirical analysis indispensable.

2.2. Previous empirical literature

To the best of our knowledge, no empirical analyses of our research question have been proposed, but there are a few related studies that can inform the discussion. Using vector autoregression models, Medina (2016) analyses the effect of commodity price changes on primary government revenues and government expenditures in eight Latin American countries during 1995–2013. He finds a uniformly positive response of government revenues to price shocks, but rather heterogeneous response patterns of government expenditure. The analysis does

not focus on social spending in particular. Villafuerte et al. (2013) study the fiscal policies of seven non-renewable-resource-exporting countries in Latin America and the Caribbean during the boom period 2003–2008 and find that most countries relaxed their fiscal policies during price boom times and exhibited a procyclical behaviour, but they became more heterogeneous after the boom. The authors attribute cross-country heterogeneity in fiscal policy partly to different fiscal rules and guidelines. Altman and Castiglioni (2019) study the effect of economic growth – which they place in the context of the commodity boom – on the expansion of equitable social policy over the commodity boom period. They analyse data from 18 Latin American countries over the period 1990–2013 using panel estimations and find that economic growth had no effect on equitable social policy – which is a different concept from public social spending. Fairfield and Garay (2017) conduct a qualitative comparison of Chile and Mexico, that shows how higher tax revenues from commodity exports were translated into higher social spending. According to their analysis, social policy demands created pressures on the tax front, while higher commodity prices weakened the influence of the business elite on social policy.

Studies using global data also reach conclusions that emphasize cross-country heterogeneity. Spatafora and Samake (2012) study the effect of commodity price increases on government spending on health and education, using a sample of 116 countries over the period 1990–2010. Based on cross-country panel regressions, they find that social expenditure rose strongly in response to commodity export prices, especially in low-income countries that relied on commodity exports. Arze del Granado et al. (2013) analyse public spending on health and education in 145 countries over the period 1987–2007 and also find that these types of spending were pro-cyclical in developing countries. Jalles (2020) investigates the cyclicality of different types of social spending in 45 developing economies from 1982 to 2002 and obtains a different result: education, health and social protection all behaved acyclically, whereas pensions showed a procyclical behaviour. However, there was considerable heterogeneity across countries and many individual countries violated common trends.

Overall, there is some evidence that commodity price booms have translated into higher public social spending in some countries, but not in others. As reasons for this heterogeneity, authors have suggested fiscal rules and fiscal regimes as well as different political coalitions, as far as discretionary spending or amendments of fiscal rules are concerned. So far, to the best of our knowledge, there are no studies which examine the link between commodity prices and public social spending in Latin America, taking into account differences within the region, as well as different functions of social spending.

3. Empirical approach and data

3.1. Estimation strategy

We carry out country-wise structural vector auto-regression (SVAR) estimations to analyse the responses of public social spending on three main functions – education, health and social protection – to increases in commodity ToT.[3] It is investigated if there are differences in responses across countries and across the different functions of social spending. We use annual time series data on public social spending on education, health and social protection in 16 Latin American countries from 1990 to 2019 (see Table 1 and Section 3.2 below). To the best of our knowledge, all previous studies that have looked into different functions of public social spending have treated these outcome variables as independent from each other. In contrast, we think that spending on the different functions is not independent since

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[3] A replication package with raw data and code to reproduce data cleaning and analysis is available at https://github.com/svenjafl/socialspending_replication.

higher spending on one function reduces the budget for the others. To take this dependency into account, we employ a SVAR model in which dependent variables are regressed on their past observations as well as the past observations of the other dependent variables (Baum, 2006).[4] Country-by-country estimations are conducted instead of panel estimations as several studies indicate that there is strong heterogeneity in social spending across countries (e.g. Jalles, 2020, 2021; Medina, 2016). In panel estimations, this heterogeneity might lead to positive and negative reactions that cancel each other out, and results might not be very telling (Flechtner & Gräbner, 2019). We therefore choose to estimate a simple SVAR for each country. We follow closely the approach and the notation by Schmitt-Grohé and Uribe (2018):

$$\mathbf{A}_0 x_t = \mathbf{A}_1 x_{t-1} + \mu_t \tag{1}$$

in which the vector x_t is given by

$$x_t \equiv \begin{bmatrix} cp_t \\ edu_t \\ hlt_t \\ sp_t \end{bmatrix}$$

The variables cp_t, edu_t, hlt_t, sp_t represent the logarithmised values of the levels of the commodity ToT index, education spending, health spending, and social protection spending, respectively.[5]

$\mathbf{A}_0$ and $\mathbf{A}_1$ are 4×4 matrices of coefficients, whereby $\mathbf{A}_0$ is lower triangular with 1 on the main diagonal. μ_t is a 4×1 random vector which has a mean of 0 and a diagonal variance–covariance matrix Σ. When multiplying the formula by $\mathbf{A}_0^{-1}$, it can be written as:

$$x_t = \mathbf{A} x_{t-1} + \Pi \varepsilon_t \tag{2}$$

where

$$\mathbf{A} \equiv \mathbf{A}_0^{-1} \mathbf{A}_1, \quad \Pi \equiv \mathbf{A}_0^{-1} \Sigma^{0.5}, \quad \varepsilon_t \equiv \Sigma^{-0.5} \mu_t$$

The vector ε_t is a random variable with mean zero and identity variance–covariance matrix. In accordance with a large literature (e.g. Broda, 2004; Fernández et al., 2017; Gruss & Kebhaj, 2019; Medina, 2016; Raddatz, 2007), we assume that countries are price-takers on global commodity markets, which allows us to treat commodity ToT indices as exogenous from the perspective of single countries. Therefore, we specify the commodity ToT variable in our model as exogenous to changes in the different types of social spending, which are the three endogenous variables of the SVAR. This restriction implies that all elements of the first row of $\mathbf{A}_1$ are zero, except the first element. Under these conditions, the first equation of the SVAR system (2) represents the law of motion of commodity ToT and can be represented by

$$cp_t = \alpha_{11} cp_{t-1} + \pi_{11} \varepsilon_t^1. \tag{3}$$

α_{11} and π_{11} describe the elements (1, 1) of $\mathbf{A}$, respectively Π. The first element of ε_t, ε_t^1 can be interpreted as a commodity ToT shock because it is the only contemporaneous effect on the commodity ToT, as all elements except the first of $\mathbf{A}_0$ are zero.

The model is a simple SVAR in the sense that due to the Cholesky decomposition, there are no contemporaneous interaction effects between the endogenous variables. Consequently, the endogenous variables are affected by past observations of themselves and the other endogenous variables, but not by the contemporaneous observations of the other endogenous variables. In this setup, and as we are only interested in

the effect of the commodity ToT shock on the endogenous variables, the order of the latter has no effect on our results (Drechsel & Tenreyro, 2018; Schmitt-Grohé & Uribe, 2018). To account for our relatively small sample size with a maximum of 30 observations per country, we make small-sample degree-of-freedom adjustments and report small-sample t and F statistics (Baum, 2006). We also include only one lag due to the small sample size. For the majority of the countries in the sample, different lag-order selection criteria favoured one lag over two lags. The estimated SVARs are stable for all countries.[6] We then estimate impulse response functions (IRF), which we report as our main results in Section 4.1. For robustness, we also estimated IRFs via local projections (Jordà, 2005). When SVARs are well-specified, IRFs from SVARs and local projections should resemble closely, thus making LP estimation a useful robustness test (Plagborg-Møller & Wolf, 2021).

3.2. Data

Our analysis uses two main variables: public social spending and commodity ToT. We present the data sources used to measure these variables alongside descriptive statistics in the following subsections.

3.2.1. Public social spending in Latin America since 1990

We rely on public social spending data obtained from the Economic Commission for Latin America and the Caribbean (ECLAC). It is important to note the scarcity of comparable, comprehensive, and extensive public social spending data for Latin American economies. A significant challenge arises from the decentralized nature of public social spending, with different levels of government handling various functions such as education or healthcare separately or jointly. Moreover, these responsibilities may change over time, and lead to further complexity in data collection and analysis (Martínez & Collinao, 2010).[7] Unfortunately, many data sources do not provide clear indications of the government level(s) from which they gather information, sometimes even combining data points from different levels into a single time series. As a result, it is challenging to compare countries and track changes over time (see Flechtner & Sánchez-Ancochea, 2022, for a detailed discussion).

Given all the limitations, we consider the annual public social spending data published by ECLAC to be the most reliable data source. It comprises information on public social spending in per-capita and percentage terms. ECLAC's data collection distinguishes four levels of government spending: central government, general government, financial public sector spending, and non-financial public sector spending. In some instances, data on spending from multiple government levels is available for certain countries and years. Unfortunately, for the majority of countries, data is only available for central government (CG) spending, or the CG time series provides more data points. With the exception of Argentina and Peru, we end up utilizing information from this level. We consider the lack of more comprehensive data a central

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[4] Because most of the literature investigates the types of social spending separately, we also estimated bivariate SVARs, in which each type of social spending is regressed only on the commodity price, to test for the robustness of our approach. Overall, the results remain unchanged. The only case in which we observe slight changes is Brazil: the small and short-lasting responses of per-capita spending on education and health disappear. The respective IRFs can be found in appendix C.1.

[5] The use of log levels is similar to e.g. Drechsel and Tenreyro (2018).

[6] It is not necessary that all variables of the SVAR be stationary, but the SVAR as a whole. To confirm this, we report results from the eigenvalue stability condition in appendix B. We further report results from the Lagrange multiplier test for autocorrelation in the residuals.

[7] The use of central government spending is particularly problematic in countries with federal structures, where social spending is decentralized. In Brazil, for example, the federal government spent less than 60 percent of public social spending, while state governments and municipalities were responsible for 23 percent and 20 percent, respectively. In Argentina in 2003, 53 percent of total public spending was attributed to the national government, 40 percent to provinces and 7 percent to municipalities (ECLAC, 2007, 127). Since the beginning of our period of study, many Latin American countries have undergone decentralization reforms. As a result, even in non-federal countries like Bolivia or Colombia, sub-national governments account for over 70 percent of public spending in education and about 50 percent in health (Brosio & Jiménez, 2012).

Table 1
Public social spending data for Latin American countries, 1990–2019.

Country	Spending level	Period	Public social spending			
			% GDP		per capita	
			First year	Last year	First year	Last year
Argentina	NFPS	1990–2019	15.5	27.2	1267.7	3159.97
Bolivia	Central Gov.	1990–2019	5.1	12.4	96.3	442.8
Brazil	Central Gov.	1990–2019	13.0	17.3	735.1	1593.2
Chile	Central Gov.	1990–2019	12.1	17.4	677.2	2725.8
Colombia	Central Gov.	1990–2019	2.8	12.5	109.1	854.2
Costa Rica	Central Gov.	1993–2019	7.5	11.9	497.1	1504.5
Dominican Republic	Central Gov.	1990–2019	4.0	7.7	101.0	643.1
Ecuador	Central Gov.	1990–2015	2.9	8.6	131.8	480.2
El Salvador	Central Gov.	1990–2019	2.9	8.6	72.4	356.7
Guatemala	Central Gov.	1991–2019	2.4	7.8	76.9	339.3
Honduras	Central Gov.	1990–2015	6.5	8.9	120.5	203.9
Mexico	Central Gov.	1999–2019	5.8	9.2	484.8	883.5
Nicaragua	Central Gov.	1990–2019	6.5	10.7	80.0	205.0
Panama	Central Gov.	2000–2019	8.4	8.9	611.8	1397.2
Paraguay	Central Gov.	1990–2019	3.2	9.6	102.2	546.1
Peru	General Gov.	1999–2019	9.3	11.0	313.2	778.1
Uruguay	Central Gov.	1990–2019	6.1	16.1	568.3	3019.0
Venezuela	Central Gov.	1997–2014	9.7	18.8		

Data: ECLAC (2017) and (2023). Per-capita spending is measured at constant prices in US dollars of 2010.
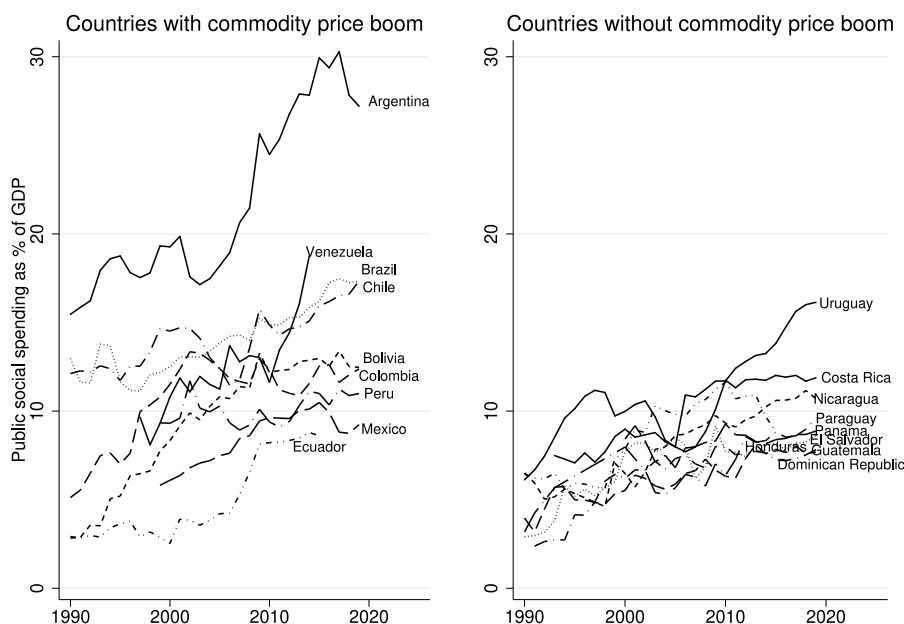

Fig. 1. Public social spending in Latin America, % of GDP, 1990–2019
Data source: ECLAC. Please see Table 1 and appendix E for details on individual country's time series and note that all time series show Central Government spending, except for Argentina (Non-financial public sector) and Peru (General Government).

limitation of our study that is not easily solved in the foreseeable future. Table 1 outlines the specifics of the time series we utilize. Generally, we have comparable data from 1990 to 2021, although some countries have shorter time series or data gaps. In the analysis, we include data until 2019 only, in order to end before the Covid-19 pandemic. As this observation period is already relatively short, only the results for countries with complete time series should be interpreted with confidence. We report results for Ecuador (1990–2015), Mexico (1999–2019) and Peru (1999–2019), but emphasize that these should be interpreted with caution. Due to incomplete data, we could not derive any results for Venezuela. In general, in comparison to earlier studies, this paper entails the advantage of including more post-boom years, allowing for a better analysis of potential longer-lasting effects of commodity price increases on public social spending.

Over the past decades, most Latin American countries have experienced a joint upward trend of public social spending. Figs. 1 and 2

show that spending levels have increased across the whole region, both in per-capita and in percentage of GDP terms. While increases have clearly been much stronger in some countries than in others, virtually no country has stagnated. The group of boom economies is more heterogeneous in itself than the non-boom countries, owing partially to the rather similar Central American economies in the latter group. If one assumes that additional fiscal resources from the commodity boom have a role to play in explaining the social policy expansion, the high degree of heterogeneity among boom countries – especially in contrast to the other group – could be read as an early indicator that commodity resources are only one factor among several.

While this big picture refers to total public social spending, our analysis differentiates public social spending by function of government and focuses on public spending on education, health, and social protection. In all countries of our sample, these three functions account for the bulk of total social spending. Spending in the other categories considered in
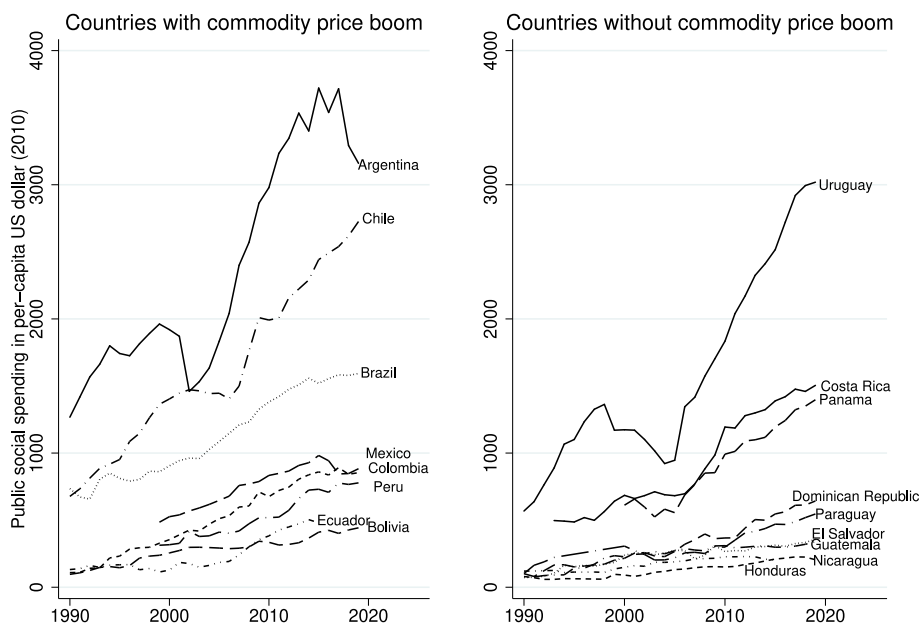
Fig. 2. Public social spending in Latin America, per capita (US dollar), 1990–2019
Data source: ECLAC. Please see Table 1 and appendix E for details on individual country's time series and note that all time series show Central Government spending, except for Argentina (Non-financial public sector) and Peru (General Government).

the ECLAC dataset – environmental protection, recreation, culture and religion, and housing and community amenities – is mostly marginal and there are many missing values; therefore, we excluded them. Social protection accounts for the largest share of total spending in about half of the countries, while education occupies the first rank in the other half. In terms of growth trends over time, there is quite some heterogeneity. When focusing on public social spending as percentage of GDP, for example, some countries observed increases (e.g. Argentina, Ecuador, Peru) of spending on health, while the share more or less stagnated in others (e.g. Brazil, Costa Rica, Panama). Within countries, it is common for one function to grow relatively while others stagnate or even decrease. For example, the percentage of spending on social protection in GDP decreased over the past 20 years in Peru, while the shares of education and health grew. In Mexico, the share spent on education increased and then decreased, while social protection grew and health remained more or less stable. Detailed descriptive statistics by country and function of spending are presented in appendix E.

In our analysis, we consider public social spending measured in per-capita terms as well as measured as percentage of GDP. Both measures are common and have been used in previous literature, most often without further consideration, even though each may represent a different scenario (see e.g. Flechtner & Sánchez-Ancochea, 2022). During a commodity price boom, net exports experience an increase, subsequently stimulating economic growth and expanding public budgets. As a result, this expansion may lead to an expansion of per-capita public social spending. However, such dynamics do not necessarily imply a proportional increase in public social spending as a percentage of GDP. A rise in the percentage of spending would require not only per-capita increases but also a larger relative allocation of the growing GDP towards public social spending. In other words, public social spending would need to grow more than proportionately.

3.2.2. Commodity prices

It is commonly understood that Latin America has been affected by the 2003–2013 commodity boom as a region. However, experiences in each country differed considerably from one another. This heterogeneity stems from different export and production structures: individual economies rely on different commodities whose prices have behaved

rather differently (Gruss & Kebhaj, 2019). Even though commodity prices tend to be correlated, this does not translate into correlations of commodity ToT indices in cross-country comparison (Cashin, Mc-Dermott, & Scott, 2002; Gruss & Kebhaj, 2019). Moreover, commodity exports play different roles in the countries' total exports. Some countries rely rather heavily on (sometimes only a few) commodities and some have more diversified export structures, while commodity dependence also varies over time. The share of commodities in total exports – and hence exposure to global price cycles – varies from around 25% in Mexico to nearly 90% in Venezuela (see table A.1). Finally, some Latin American countries are also importers of commodities that experienced price hikes. As a result, their experiences have been rather diverse overall. As Fig. 3 shows, about half of Latin American countries experienced declining or fairly constant ToT changes during the boom phase of 2003 to 2013. Among boom countries, there is also some heterogeneity with respect to ToT growth curves. A table listing boom and non-boom countries is available in the appendix (table A.2).

To do justice to country-specific heterogeneity, our analysis utilizes the International Monetary Fund's net commodity terms-of-trade index developed by Gruss and Kebhaj (2019).[8] This index comprises time-varying information about import and export baskets in each country. This is advantageous because even though specific countries can often be related with one dominant export commodity – such as copper in Chile –, the overall composition of production and exports is usually rather unstable and tends to fluctuate considerably over time (Daruich, Easterly, & Reshef, 2019). Because prices of different commodities vary, the ToT developments of individual countries are very heterogeneous and hardly captured by a global price index. To corroborate this point, we report a correlation matrix of the country-specific commodity ToT index that we use with a global commodity price index created by Jacks (2019) (table A.3 in the appendix). The country-specific indices are highly correlated with the global index in some countries (with the highest correlation coefficients observed in Colombia (0.95), Ecuador (0.91) and Mexico (0.84)) but less so in others (0.73 in Bolivia and

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[8] We use the version of the index that weights the value of each commodity's net export as share of total trade.
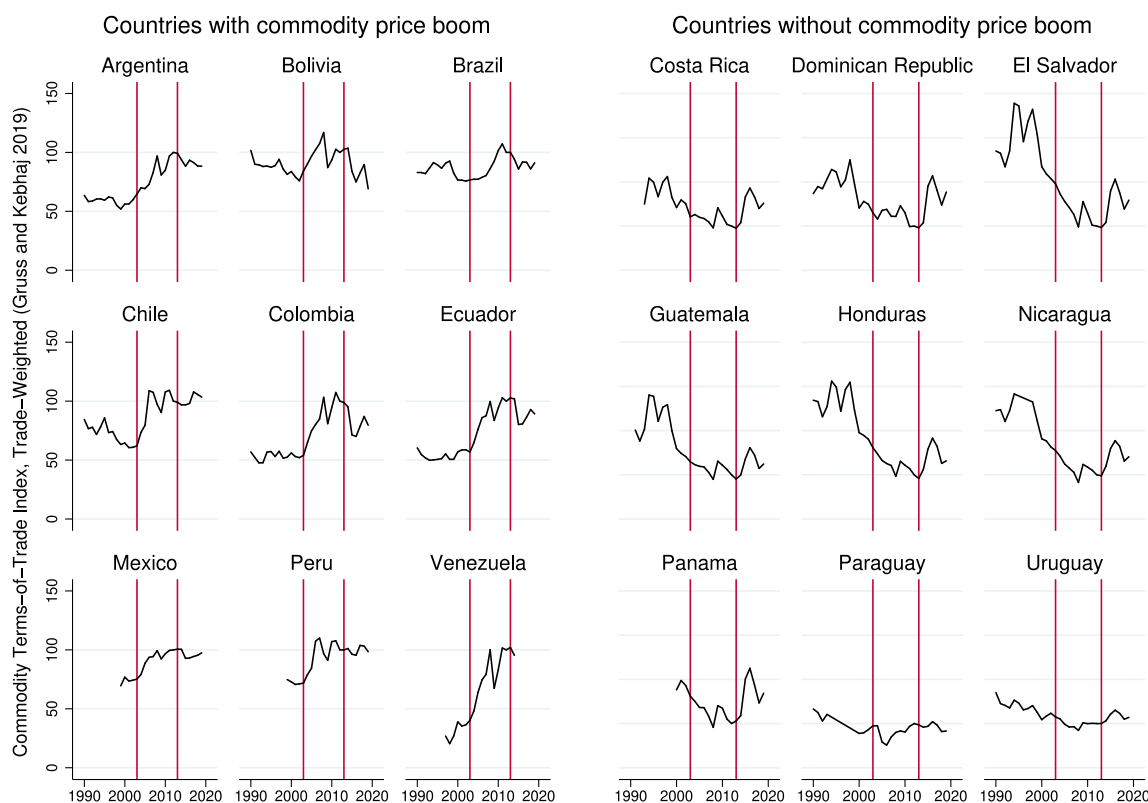
Fig. 3. Commodity terms-of-trade in Latin America, 1990–2019.

Peru, 0.74 in Chile, 0.49 in Brazil). Also, the country-specific indices are often only weakly correlated among themselves, indicating considerable heterogeneity across countries.

4. Empirical findings

4.1. Results

In this section, we present graphs of the IRFs estimated on the basis of SVARs fitted as outlined in the previous section. Point 0 on the horizontal axis represents the moment of a positive shock in commodity ToT, and the following numbers indicate the years since this positive shock has passed. The shaded areas in the graphs illustrate the 95% confidence intervals of the IRFs.[9] Figs. 4 to 11 show the results for eight of the nine countries that experienced a commodity price boom. As previously noted, results for Ecuador, Mexico and Peru should be regarded with caution due to shorter time series, and Venezuela was excluded altogether. Results for the remaining, non-boom countries are presented in appendix D. We do not find statistically significant effects of commodity ToT on public social spending in the non-boom countries, with only one minor exception in Uruguay, which is in line with theoretical expectations.

In Argentina, we find that both percentage and per-capita spending react positively and lastingly to commodity ToT rises in all three functions of public social spending. We refer to lasting increases when a rise in spending as a response to rising commodity ToT is maintained for several years. In the case of Argentina, we estimate that a peak in the increase of public social spending is reached only after about five years. Education, health and social protection behave similarly not only

regarding the shape of their response functions but also the responses' magnitude.

In Bolivia and Colombia, we observe no significant reactions of public social spending to commodity ToT.

In Brazil, per-capita spending on education and health experiences a temporary increase after commodity ToT increases. We refer to temporary increases when spending reaches a peak after one or two years already, and then quickly tempers down to previous levels. The magnitude of the temporary effects in Brazil is smaller than in Argentina. We observe no statistically significant reaction of the percentage of GDP spending, which implies that per-capita rises keep the pace with GDP growth but leave the share of GDP devoted to public social spending unchanged. For social protection, we observe no statistically significant responses.

In Chile, we observe initially statistically significant negative reactions – that is, drops in both per-capita and percentage spending – in all three functions of spending. Thereafter, however, spending levels recover very quickly. For per-capita spending on health and education, the responses even turn positive after a few years. The pattern is initially similar for social protection, but here the recovery after the drops does not lead to increases above previous levels. The magnitude of all effects is relatively small, hence comparable to the responses in Brazil.

Results for the remaining three countries should be regarded with caution because of shorter time series. In Ecuador, there is a positive and lasting reaction in education and health spending, both in per-capita and percentage terms. The pattern resembles the experience of Argentina, with an increase that peaks after four to five years and tempers down thereafter. Social protection is boosted with a particularly steep upswing. The effect lasts nearly as long as for the other functions and the magnitude of the response is more than twice as strong.

In Mexico, we observe long-lasting positive responses of public spending on health and social protection, both per-capita and as percentage of GDP. Health starts off earlier but also falls back earlier,
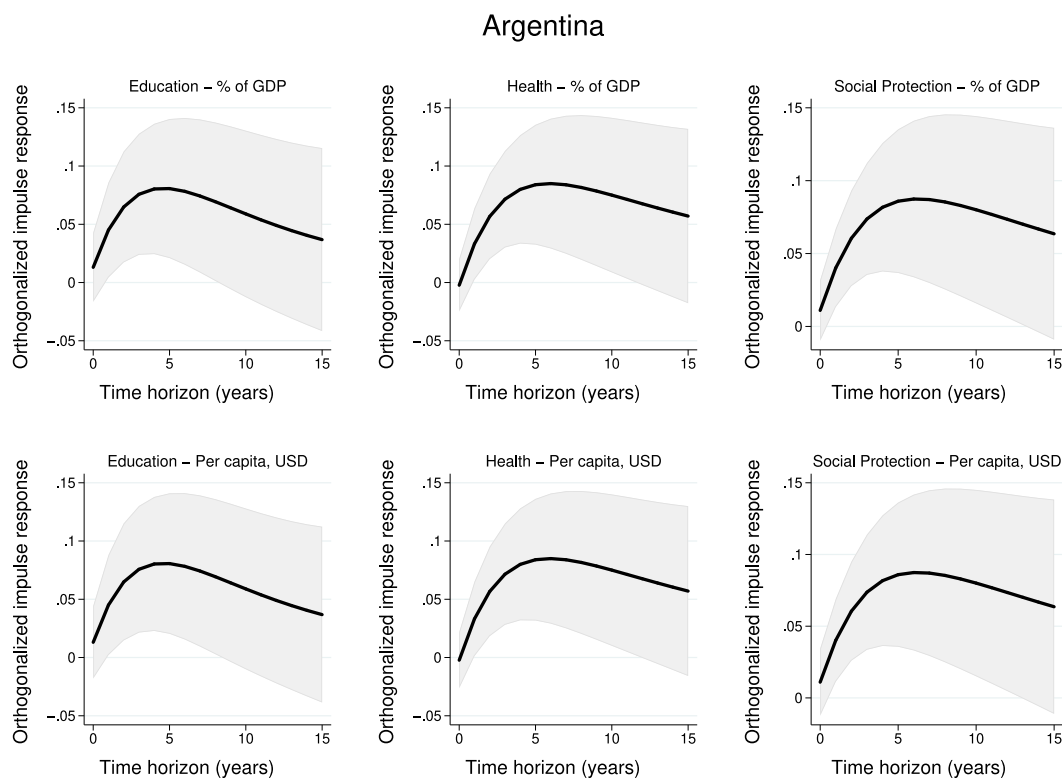
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[9] Several other studies using IRFs illustrate 90% or even lower confidence intervals (e.g. Medina, 2016; Roch, 2019; Schmitt-Grohé & Uribe, 2018). We report the 95% interval as it is more precise and the common level of statistical significance.

Argentina

Fig. 4. Impulse response functions of public social spending, by category, to a one-standard deviation commodity ToT shock, in % - Argentina (NFPS).
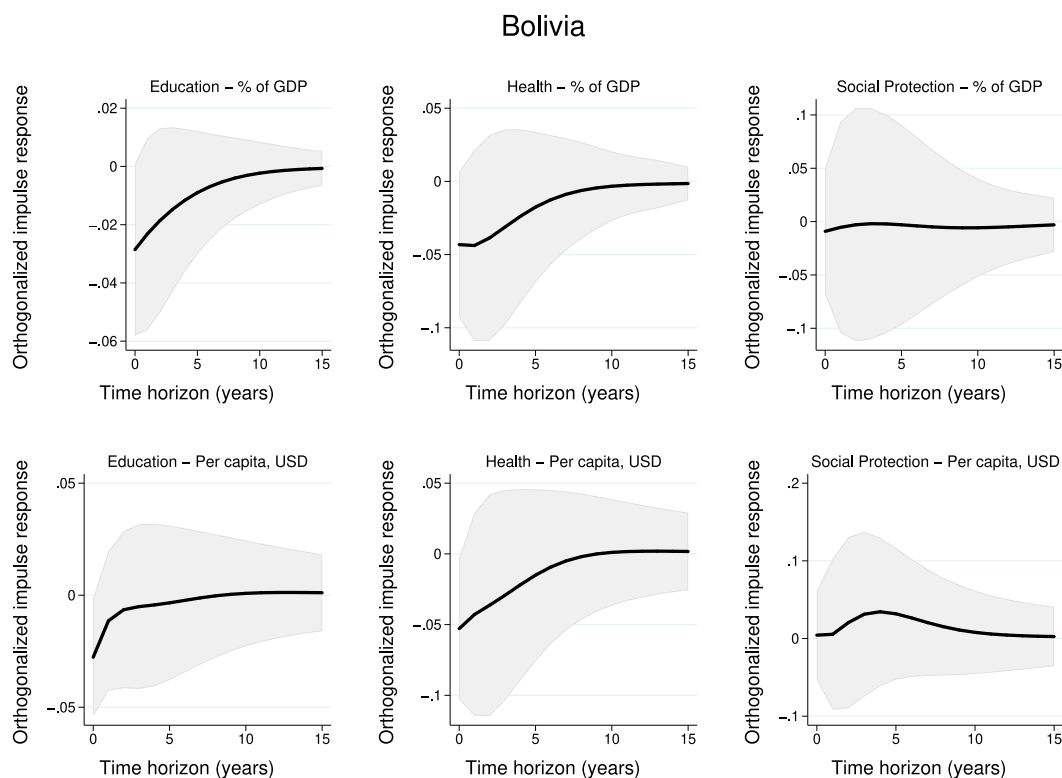
Bolivia

Fig. 5. Impulse response functions of public social spending, by category, to a one-standard deviation commodity ToT shock, in % - Bolivia (Central Government).

after about seven to eight years. Social protection increases appear with a short delay but are maintained even longer. The magnitude of the effects on health and social spending is larger than in Chile and Brazil. Results for education spending are hardly ever statistically significant.
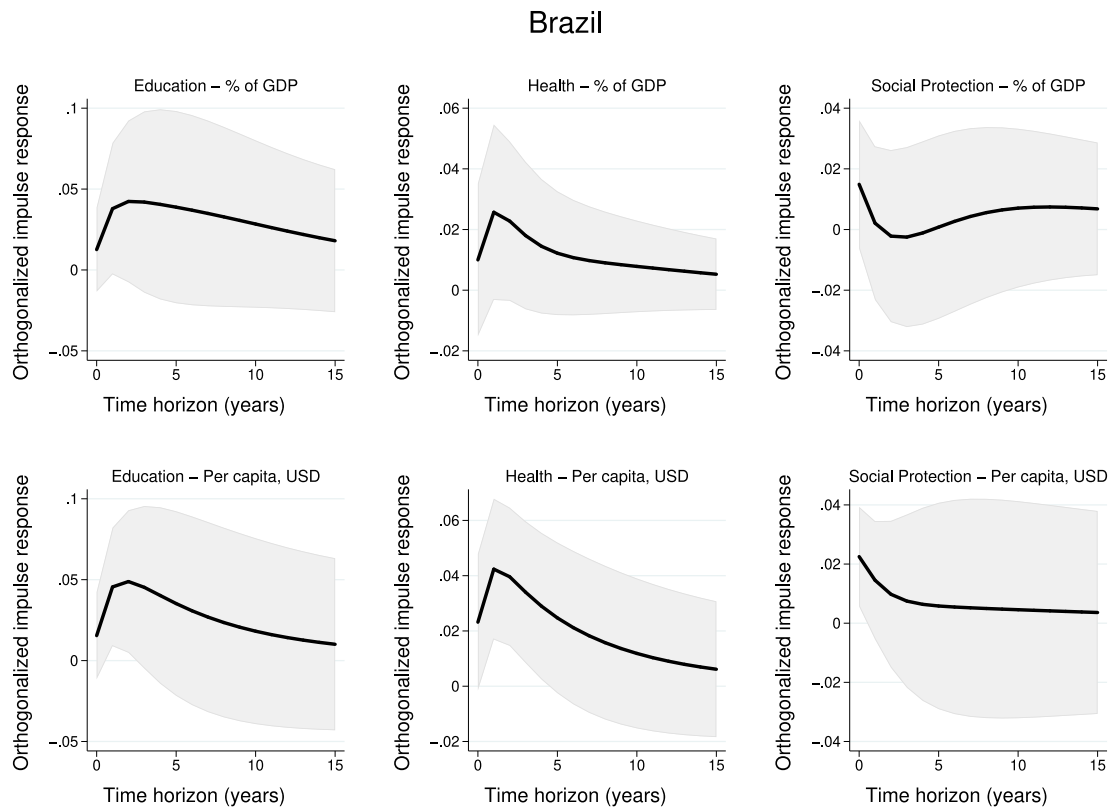
Brazil

Fig. 6. Impulse response functions of public social spending, by category, to a one-standard deviation commodity ToT shock, in % - Brazil (Central Government).
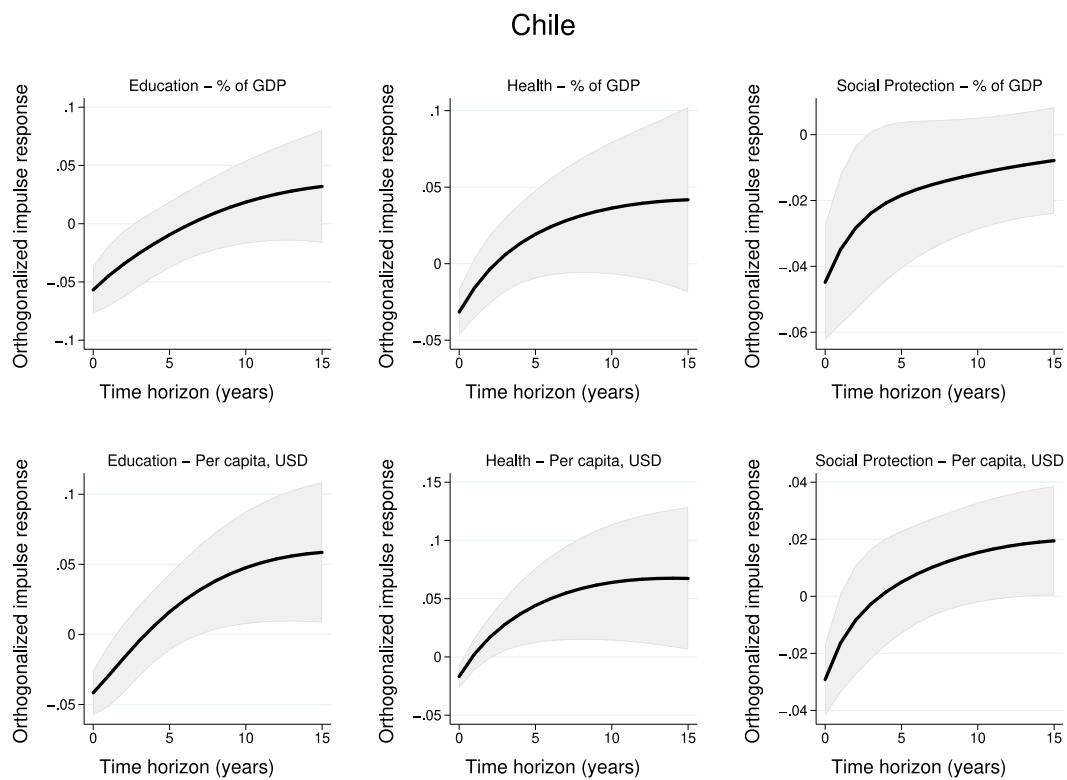
Chile

Fig. 7. Impulse response functions of public social spending, by category, to a one-standard deviation commodity ToT shock, in % - Chile (Central Government).
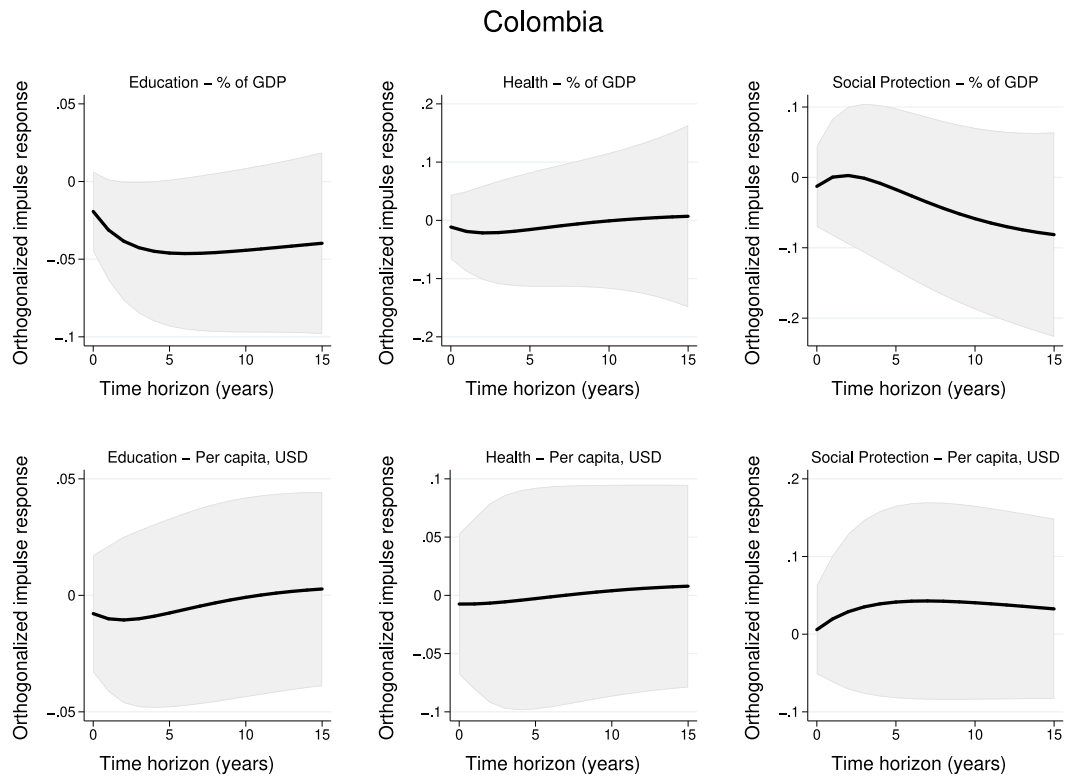
Colombia

Fig. 8. Impulse response functions of public social spending, by category, to a one-standard deviation commodity ToT shock, in % - Colombia (Central Government).
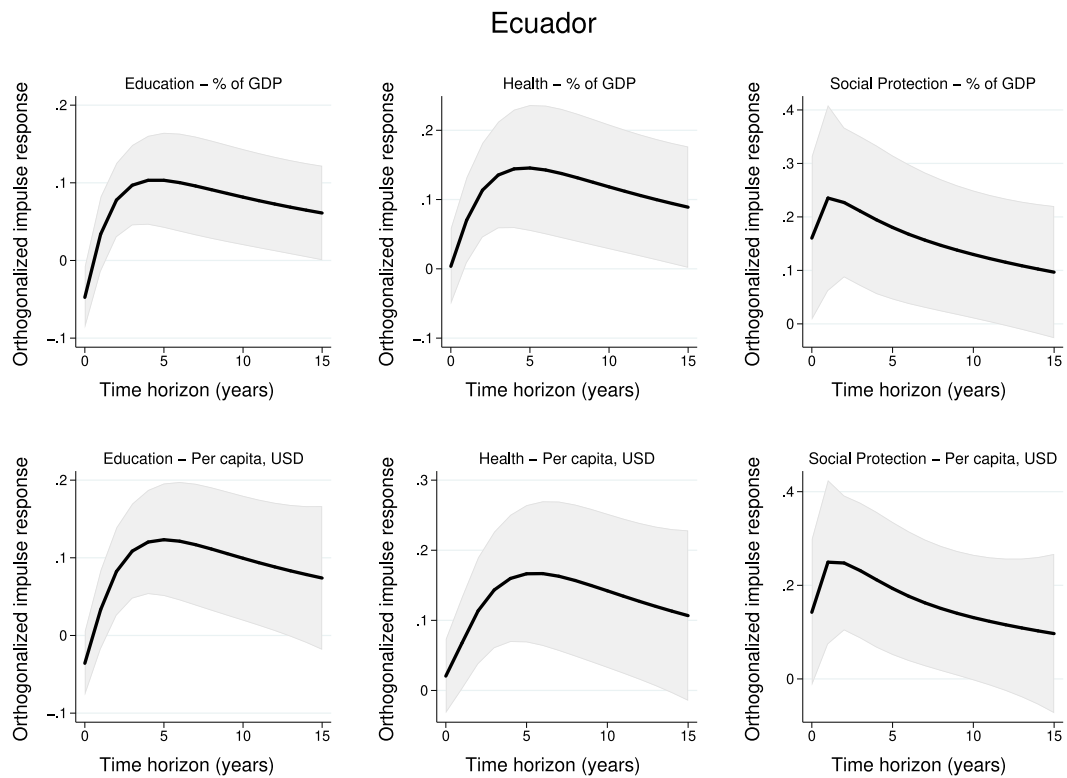
Ecuador

Fig. 9. Impulse response functions of public social spending, by category, to a one-standard deviation commodity ToT shock, in % - Ecuador (Central Government).

Mexico

Fig. 10. Impulse response functions of public social spending, by category, to a one-standard deviation commodity ToT shock, in % - Mexico (Central Government).

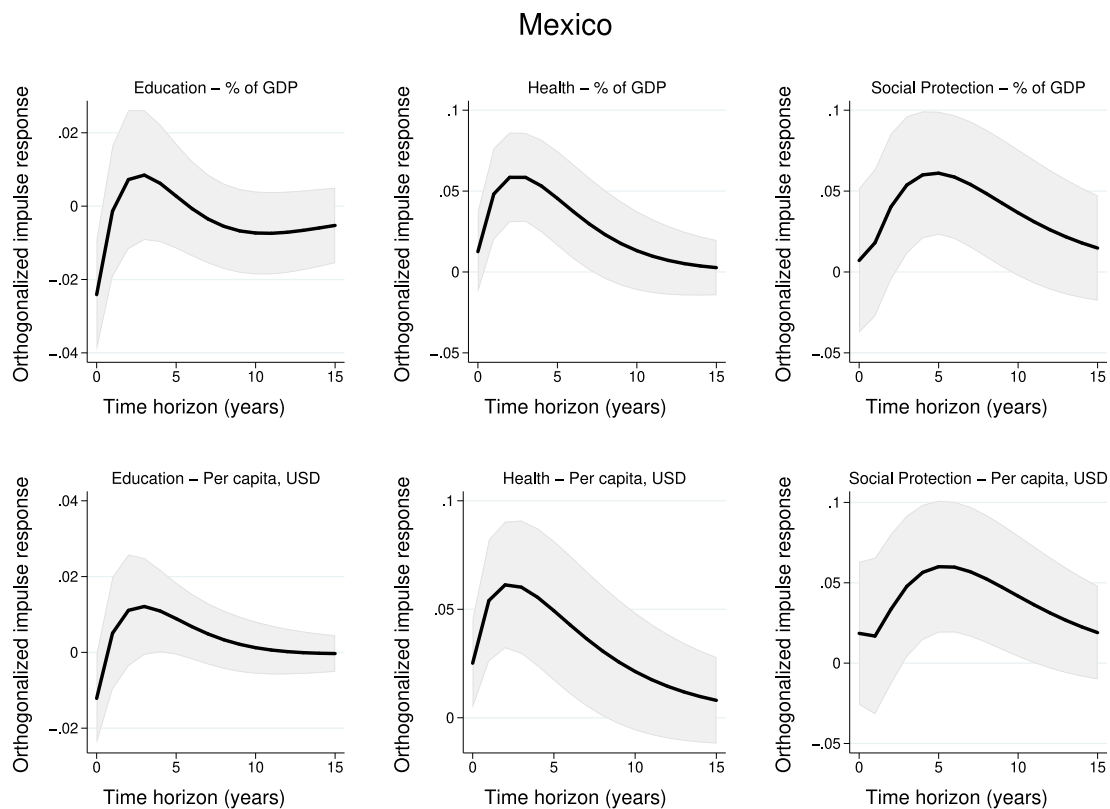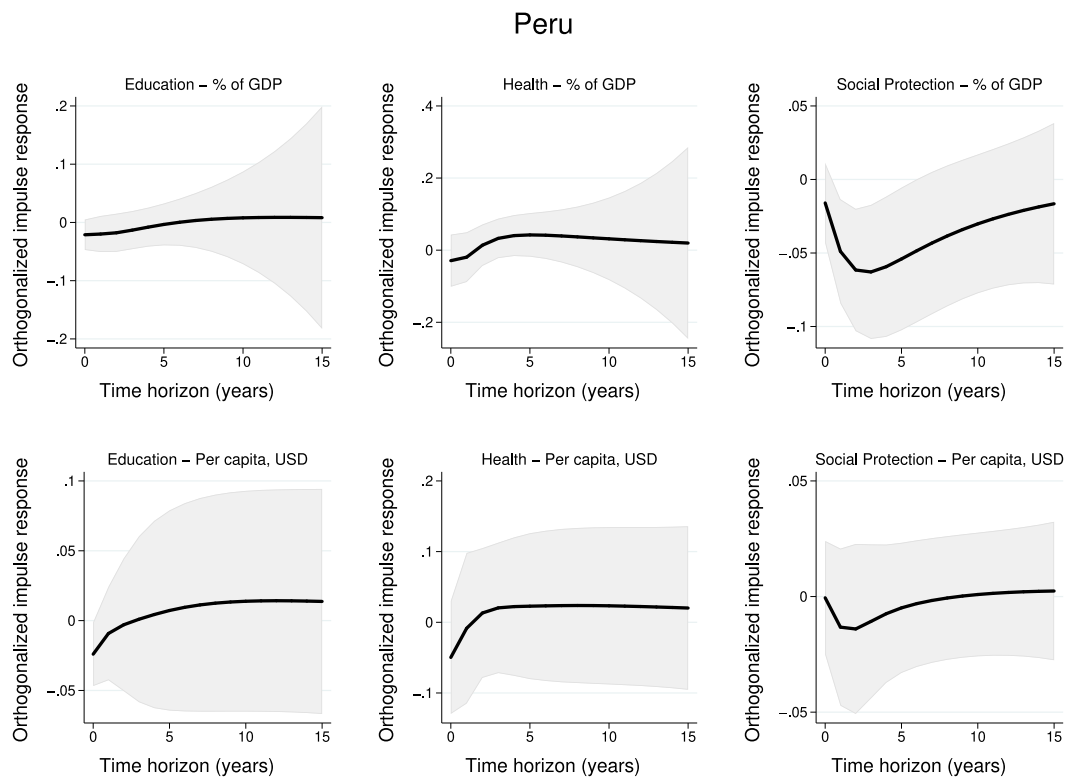## Peru

Fig. 11. Impulse response functions of public social spending, by category, to a one-standard deviation commodity ToT shock, in % - Peru (General Government).

In the case of Peru, education and health show no significant reaction to a commodity ToT shock. Spending on social protection measured as percentage of GDP drops three to five years after the shock, before previous spending levels are recovered.

4.2. Robustness checks

4.2.1. Local projections

For the five boom countries with complete time series covering the period 1990–2019 – Argentina, Bolivia, Brazil, Chile and Colombia – , we estimate IRFs via local projections (LPs) for robustness. These results are reported in appendix C.2. Unfortunately, time series are too short to estimate LPs for the remaining commodity boom countries (Ecuador, Mexico and Peru). Overall, the IRFs for the SVARs are smoother than for local projections. Results are identical for Bolivia, Chile and Colombia, while two differences are worth mentioning. First, in Argentina, the positive and long-lasting responses of public social spending occur later than estimated by the SVARs, as of period three to four after the shock. Second, the positive and quick response of public health spending per capita in Brazil is not replicated. In turn, while the SVAR does not estimate substantial effects on education spending in Brazil, the LP approach estimates positive short-term hikes in both per-capita and percentage spending on education. The deviations in selected functions of spending in Argentina and Brazil suggest that these specific results should be taken with a grain of salt and deserve further scrutiny. Overall, however, we think that our main results are replicated to a reasonable degree.

4.2.2. GDP per capita as control variable

A country's GDP strongly impacts government revenues and the fiscal space. While commodity ToT can certainly be one important driver of GDP in commodity-dependent countries, many other economic developments will potentially influence GDP as well, and increase or decrease the fiscal scope for public social spending. Furthermore, it might theoretically be the case that countries increase their level of public social spending as their GDP grows, along with growing voter demand for social policy. By controlling for GDP per capita, we take other possible drivers of public social spending into account and test if we – wrongly – attribute GDP effects to commodity ToT. In our specification, commodity ToT remain exogenous whereas GDP per capita is influenced by the commodity ToT as well as by past observations of social spending. Results are reported in appendix C.3. The IRFs of the different functions of social spending to a shock in commodity ToT remain very similar to the baseline estimation, with a few minor differences. For Peru, the effects in per-capita spending of all three functions, which are insignificant in the baseline estimation, become slightly positive five years after the shock. In addition, we observe a new small short-term drop on percentage spending on education. For Brazil, the short and small positive effect on education (per capita) in the baseline estimation becomes insignificant. Finally, for Chile, spending on education and health (in percentage of GDP) remains negative in the first periods after the shock as in the baseline estimation but then becomes significantly positive in later periods. For all other countries and functions of public social spending, the responses remain similar to the baseline estimations. Overall, we conclude that results are largely robust to the inclusion of GDP per capita and that commodity ToT have a particular effect that is not captured by taking only aggregate economic development into account.

4.2.3. Interest rates as control variable

Besides commodity ToT, a government's fiscal space can be influenced by access to credit. When interest rates are lower, governments can finance expenditures at a lower cost. Even though fiscal rules might constrain the possibility of credit-led fiscal expenditure, it is still plausible that lower interest rates could lead to higher social spending, ceteris paribus. At the same time, rising commodity ToT

may increase the value of a country's collateral and thereby lower the interest rate cost. To test if we – wrongly – attribute interest rate effects to commodity ToT, we include interest rates as a control variable in another robustness test. We specify that interest rates may impact public social spending and use the same variable ordering as in the previous robustness estimation (because we assume that interest rates may not be independent of commodity ToT). Due to limited data availability, we are unable to estimate results for Argentina and Ecuador, and we have to use the lending rate as indicator for the interest rate for the remaining countries (except Brazil, for which we use the money market rate). Results (reported in appendix C.4) are very similar to our baseline results: controlling for the potential effect of the interest rate, the magnitudes and duration of the responses to commodity ToT shocks remain substantially unaltered. In exceptional cases, existing tendencies become statistically significant: an initial drop in health in Bolivia and an initial increase in education in Brazil (in per-capita spending). Furthermore, we observe an initial drop on percentage spending on health in Chile.

4.3. Discussion

As evidenced in Table 2, our findings offer a vital illustration of the heterogeneous impact of commodity ToT increases on public social spending across different Latin American countries. Among the commodity boom countries, we find very diverse responses of the various functions of public social spending to commodity ToT shocks. Responses range from no statistically significant responses in Bolivia and Colombia over temporary and longer-lasting increases of social spending to declines. The analysis reveals significant variations in the occurrence, magnitude, and longevity of reactions, as well as differences in how these reactions vary across functions of public social spending.

We observe an immediate and lasting increase in public social spending across all three functions in only two countries: Argentina and Ecuador. Other countries experience raises in some functions and mostly of shorter duration: Mexico in health and social protection, but not education, and Brazil in education and health spending per capita. The case of Chile is special: after an initial decline in expenses for all functions, per-capita spending turns positive for education and health after a few years. Peru also experiences an initial drop with recovery in percentage spending on social protection.

Only in the cases of Brazil and Chile, we find that social spending increases significantly in per-capita terms, but not as percentage of GDP. Here, apparently, economic growth and public social spending grow proportionately, thus leaving the share of GDP devoted to public social spending unchanged. In the remaining cases, statistically significant responses of public social spending to commodity ToT occur both in per-capita terms and as percentage of GDP. This implies that the increase in public social spending is stronger than GDP growth, hence public social spending grew over-proportionately.

We cannot find any general tendencies concerning the functions of public social spending that benefit more or less from ToT shocks. Sometimes responses vary across functions with respect to the time lag until a response occurs (Ecuador, Mexico, Chile), to the magnitude of the response (Ecuador) or to the occurrence of a response at all (Brazil, Chile, Mexico, Peru). There is no clear tendency that one function of social spending might especially benefit from commodity ToT increases in comparison to the other categories. Rather, variations in the responses seem to be country-specific. Variation of responses is larger between countries than between the different functions of social spending. Overall, we conclude that the theoretically different responses of health, education and social protection spending to the business cycle are not reflected in our data.

Based on our results, it seems difficult to argue that the commodity price boom was a main driver behind the increase in public social

Table 2
Results summary.

Country	Education	Health	Social protection
Argentina	Increase over about 5 years, partial decline thereafter		
Bolivia	no statistically significant response		
Brazil	Small and short increase per capita, then back to previous levels; no response in % spending		no stat. significant response
Chile	Initial drop followed by recovery; long-term increase in per-capita		Initial decline then recovery
Colombia	no statistically significant response		
Ecuador	Increase over about 5 years, partial decline thereafter		Quick upswing, slow decline
Mexico	no stat. significant response	Increase with peak around year 2	Increase with peak in year 5
Peru	no statistically significant response		initial decline, then recovery (% spending)

If not explicitly mentioned otherwise, summaries refer to both per-capita and percentage of GDP spending.

Table 3
Potential factors explaining the heterogeneity of our results.

Country	Left-wing government	Expenditure rule in place	Budget balance rule in place	GDP per capita	ECI
Argentina	2003–2015	2000–2009, 2018–2019	2000–2009	7666	0.14
Bolivia	2006–2019	–	–	977	−0.4
Brazil	2003–2016	2000–2019	1998–2019	3726	0.85
Chile	2000–2009, 2014–2017	–	2001–2019	5097	−0.01
Colombia	–	2000–2019	2011–2019	2527	0.12
Ecuador	2003–2016	2010–2019	2003–2009	1451	−1.02
Mexico	–	2014–2019	2006–2019	7232	0.9
Peru	2011–2015	2000–2019	2000–2019	1941	−0.39

Own table. Data: Left-wing governments: Feierherd et al. (2023, p.6); Fiscal rules: Budina, Kinda, Schaechter, and Weber (2012); GDP per capita (current USD, 2000): World Bank; ECI: Economic Complexity Index (2000): Harvard Dataverse (2019).

spending in Latin America, not even among the countries that experienced considerable commodity ToT gains during the boom. This does not mean, of course, that the price boom could not have been an enabling factor that led to social policy expansion in conjunction with other crucial factors, or under certain conditions. Several of such factors have been proposed in the literature (see Section 2). In the following, we briefly explore if these factors could help to sort our heterogeneous results.

4.3.1. Potential explanation 1: Left-wing and right-wing governments

In the discussion about Latin America's social policy expansion, a prominent explanation put forward has been the "pink tide" argument. The past decades witnessed the rise of left-wing governments in the region, and many observers propose that these are more prone to implement redistributive social policies as compared to rather right-wing governments (e.g. Birdsall et al., 2012; Cornia, 2010; Huber & Stephens, 2012). Feierherd et al. (2023) conduct a study examining the impact of left-wing governments on inequality reduction through the implementation of redistributive social policies, and identify an unconditional effect. Using a difference-in-differences approach while accounting for increased fiscal space from the commodity boom and other factors, they find that left-wing governments were able to decrease inequality relative to other governments – but over the whole region and not only in commodity boom countries. One might expect that increases in commodity prices are more likely to transmit into higher public social spending when the incumbent government is from the political left. We use the classification from Feierherd et al. (2023) to examine if our heterogeneous results could result from the governments' partisanship. Column 2 in Table 3 reports the years of left-wing governance in the commodity boom countries of our sample.

At the beginning of our observation period in 1990, none of the analysed countries had a left-wing government. During the commodity

price boom phase, four countries elected left-wing governments (Argentina, Bolivia, Brazil, Ecuador). Peru had a left-wing government only during the last four years of the commodity price boom, while Chile had it at the beginning of the boom and again after the end of it. Mexico and Colombia had no left-wing governments during the observation period. Coming back to our findings, we observe that lasting rises in public social spending occurred indeed in left-wing governed Argentina and Ecuador as well as temporary increases in the left-governed Brazil. In Bolivia and the briefly left-governed Peru, however, there have been no effects of commodity ToT on public social spending during left-wing governments, and Mexico experienced social policy expansion in response to increases in commodity ToT without a left-wing government.

To test the pink tide argument further, we add a dummy for left-wing governments as well as an interaction term with the commodity ToT index to our SVAR model for those countries that were governed by a left-wing government at some point during our period of study. The IRFs, which we report in appendix C.5, refer to the interaction term and can be interpreted as the difference in response to a commodity ToT shock during a left-wing government in comparison with a non-left-wing government. In most cases, we do not observe statistically significant differences. Chile is the only case where we find that nearly all functions of public social spending (except health per capita) reacted significantly more positively to a commodity ToT increase under left-wing governments. For Bolivia, we find an initially negative effect on health related to the presence of left-wing governments. Unfortunately, we could not derive any results for Peru due to the shorter time series and the short period of left-wing governance.

In conclusion, a left-wing government seems neither a necessary nor a sufficient condition for a positive relation between commodity ToT and social spending among our set of countries that experienced a

commodity price boom. This does not mean that left-wing governments played no role at all: they may have contributed to social policy expansion regardless of commodity boom effects, or may have even played a crucial role in one case (Chile). But we conjecture that it is too simple to expect that left-wing governments allocate additional resources from commodity booms towards public social spending in consistent manners and more than other governments. One may object that the classification of governments into left and non-left is too crude. For example, Arza et al. (2022) argue that it matters whether leftist governments are populist or not. Future research should pursue these avenues further.

4.3.2. Potential explanation 2: Fiscal rules

Fiscal rules are a common instrument to avoid overspending during boom phases of a business or commodity cycle. While developing countries, including Latin America, have for long exhibited procyclical government spending, there has been a move towards countercyclical fiscal policy over the past 20 years. A majority of Latin American countries designed institutions and employed fiscal rules to reduce procyclicality (Céspedes & Velasco, 2014). Fiscal rules have important implications for public social spending because they are designed to constrain governments' room for manoeuvre in both boom and bust times.

Data from the IMF Fiscal Rules Dataset (see column 3 and 4 in Table 3) shows that all countries of our sample, except Bolivia, had fiscal rules during the observation period (for varying time spans). The fiscal rules include expenditure rules and balanced-budget rules (BBR) (Heresi & Villacreces Villacis, 2023). Their designs differ across countries. Expenditure rules mainly comprise limits to government expenditure growth in relation to GDP (Argentina, Mexico) and to permanent revenues (Brazil, Ecuador). The Argentinian and Chilean BBR go in a similar direction, by linking expenditure to revenues. In Chile, the margin of government expenditure depends partly on the long-term copper and molybdenum prices, which is a direct reference to resource revenues. In Ecuador, the BBR limits government expenditure growth to a maximum of 3.5 percent independent of GDP or revenue development, while in Colombia and Peru it is linked to GDP growth. The Colombian BBR allows for higher expenditure when GDP lays at least two percentage points below the long-term growth trajectory, thus providing the possibility for countercyclical spending. In Brazil, the BBR refers to the "golden rule" that the government is only allowed to take credit for investments but not for current expenditure.

All of these rules limit the possibilities to increase government spending more than GDP growth or revenue growth. In some cases (Brazil, Argentina, Ecuador, and Peru), rules apply for current expenditures (like social spending), while capital spending is excepted. This limits the possibilities of governments to increase social spending during commodity price uptakes. Even in the Chilean case, where the cap is linked to resource prices, the reference to long-term prices prevents that short-term uptakes of these prices lead to larger financial leeway. Additionally, some rules require that permanent expenditure can only be financed by permanent revenues. The volatile revenues during commodity windfalls cannot account as permanent and therefore do not classify as a funding source for longer lasting social spending.

As nearly all countries of the sample applied fiscal rules at least during a large part of the commodity price boom, it could be that these rules reduced to some extent the response of social spending to commodity price increases. Overall, the existence of these rules cannot explain the heterogeneous reactions of social spending across countries – specially since Bolivia, a country without any responses, is the only country without fiscal rules and should thus have had more opportunities to increase public social spending as a reaction to commodity price increases (Banegas Rivero & Vergara González, 2019).

4.3.3. Potential explanation 3: Natural resource funds

Natural resource funds usually pursue the aim of reducing spending volatility and of contributing to the diversification of the economy away from resource dependence in commodity-abundant countries (Mami, 2023). These funds can take different forms. While sovereign wealth funds with the aim of inter-generational saving are commonly used in rich economies such as Norway, stability funds with a focus on flattening government expenditure over a shorter time horizon might provide better opportunities in capital-constrained developing countries (van der Ploeg & Venables, 2018). This particular form of natural resource fund is used to allocate commodity revenues towards a predetermined purpose, thus limiting the governments' discretionary power over revenue utilization (Fotak, Gao, & Megginson, 2013). Mostly, natural resource funds aim to strengthen economic, rather than social development. In other words, their resources are rarely used for social spending (Bauer, Rietveld, & Toledano, 2014). Hence we would expect that the existence of a natural resource fund limits the government's possibilities to increase social spending after a positive commodity price shock.

At the end of the commodity price boom, natural resource funds existed in Chile, Colombia (not yet in operation), and Mexico (Bauer et al., 2014). The Chilean natural resource funds are considered among the most successful examples of such an instrument (Schmidt-Hebbel, 2012).[10] It is plausible that their existence may have contributed to the temporary decline of public social spending as share of GDP in Chile: when commodity prices push GDP upwards but the revenues from their exports cannot be used for social spending due to the funds, a relative decline is a plausible effect.[11] In Mexico, public social spending did increase in reaction to commodity ToT increases despite the existence of a sovereign wealth fund, while the lack of social policy expansion in Colombia can hardly be attributed to a fund that was not yet operational during the strongest commodity price upswings. Overall, the presence of a natural resource fund is a plausible explanation of the observed patterns in one country of our sample.

4.3.4. Potential explanation 4: Degree of commodity dependence versus diversification

In commodity-dependent countries, where commodities account for a relatively high share of national economic activity, an increase in commodity prices should have a stronger effect on fiscal revenues as compared to countries where commodity exports play a minor role. Hence, the diversity of our results may be related to the varying degrees of commodity dependence across Latin American countries. Theoretically, commodity-dependent countries could have experienced larger effects on their fiscal space and hence on public social spending, while effects were minor in more diversified economies.

The degree of commodity dependence varied considerably across commodity price boom countries (see table A.1). Three groups can be distinguished: Venezuela and Ecuador are highly commodity-dependent with commodities accounting for more than 80% of total exports; a second group registers shares of commodities in total exports between 65 and 75 percent (Argentina, Bolivia, Chile, Colombia, Peru); and a third group, Brazil and Mexico, shows shares of 54 and 22 percent, respectively. The latter countries are classified as non-commodity dependent according to United Nations Conference on Trade and Development (2021).

Comparing the IRFs of these three groups, we observe no apparent relationship between response patterns of public social spending to commodity ToT and degree of commodity dependence. Long-lasting effects of commodity ToT increases on public social spending

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[10] For a description of the functioning of the Chilean copper funds see Solimano and Calderón Guajardo (2018).

[11] It should be noted though that the natural resource funds cannot explain the drop in per-capita spending that we observe in Chile.

are found in Ecuador, Argentina and Mexico, which are representatives of each of the three groups and include the most and least commodity-dependent countries. Likewise, temporary increases are found in non-commodity dependent Brazil, whereas no effects can be detected in highly commodity-dependent Colombia, Bolivia, and Peru. Consequently, within the group of countries that experienced a commodity price boom, the degree of commodity dependence does not seem to provide an explanation for the pattern of our findings.

Another potential explanation could turn this idea around and depart from an economy's degree of diversification instead. Theoretically, it might be easier for richer and more diversified economies to use windfall gains from commodity booms to get increases of public social spending going, especially with longer-lasting increases in mind. This is because the relative economic importance of these windfall gains is minor here in comparison with smaller, commodity-dependent economies. Whereas smaller and commodity-dependent economies must be careful not to increase public social spending without securing funding for the longer term, more diversified economies might find it easier to use temporary increases in revenues to bring public social spending to higher levels with the aim of securing funding from other sources in the medium term.

To assess this potential explanation, we measure diversification using the Economic Complexity Index (ECI), shown in column 6 of Table 3. A higher value indicates that the country exports a larger variety of rather complex products. Furthermore, we consider a country's GDP per capita (column 5 of the same table). The most diversified and income-richest economies among our boom countries are Argentina, Mexico and Brazil. Chile is income-rich but rather commodity-dependent and not as diversified. Indeed, Argentina, Brazil and Mexico were among the countries where we observed positive responses of public social spending to commodity ToT increases – although partly only short-term and with exceptions. The case of Argentina appears to be particularly relevant, since long-lasting increases in all functions of public social spending were achieved. All in all, among the potential explanations that we considered, the idea that richer economies have a larger scope to use commodity windfalls for social policy expansion seems to apply to the largest number of individual countries.

5. Conclusion

This paper examined the responses of different types of public social spending (health, education, and social protection) to changes in commodity terms-of-trade in Latin America from 1990 to 2019. The commodity price boom from 2003 to 2013 fell into this period, to which many scholars attribute the simultaneous rise in public social spending in the region. Our results, however, show that rising commodity ToT led to rather heterogeneous responses across Latin American commodity exporters. Some countries experienced increases that lasted several years (Argentina, Ecuador), others observed temporary increases of few years (Brazil, Mexico), others reacted first with declines and then rises (Chile), and yet others did not respond at all (Bolivia, Colombia, Peru). Different functions of public social spending were affected to different degrees in different countries, without any clear patterns. As expected, we could not relate public social spending with commodity prices in countries without commodity price boom.

Our results suggest that there is substantial between-country heterogeneity in the relationship of commodity prices and public social spending, and no universal impacts of the former on the latter. In other words, the commodity boom was neither necessary nor sufficient for the rise of public social spending in Latin America. Among countries that have seemingly used increased revenues from commodity price booms for public social spending, there is no clear tendency concerning the function of spending that benefits most. Overall, the variance in the response of public social spending across countries seems to be larger than the variance between the different functions of social spending.

Whilst not the topic of this paper, we note that the observed increases in public social spending alone do not say much about the quality of social policy, as public spending on health, education or social protection can be implemented in various ways and benefit target populations more or less successfully (see e.g. Birdsall, Lustig, & Meyer, 2014).

We conjecture that the purported significance of the commodity price boom as enabling factor for augmenting public social spending in Latin America generally may be overrated, as it neither proved indispensable nor sufficient for fostering social policy expansion. Nonetheless, it remains plausible that public social spending was influenced by commodity prices in certain countries, prompting us to assert the need for in-depth examination of country-specific factors and processes that determined the circumstances in which expanded policy space is allocated to public social spending. We considered several potential explanations and discussed if they could be used to sort our heterogeneous findings. First, the presence of left-wing governments – a frequent explanation of Latin American social policy expansion in the literature – is certainly no plausible explanation for all our country cases, but could potentially have played a role in the case of Chile. Second, different institutional settings that govern the use of commodity windfall gains could theoretically explain varied responses to the commodity boom, but do not seem to play a particular role in any of the countries we studied. Third, natural resource funds also limit the discretionary use of such windfall gains considerably. Such funds are in place in only three Latin American countries, and only the one in Chile may help explain the short-term declines of social spending observed there. Fourth, richer and more diversified economies – in our sample, Argentina, Brazil, Chile and Mexico – could have found it easier to use windfall gains from commodity booms to bring on social policy expansion. Ecuador could be regarded as an exceptional case that expanded public social spending despite being commodity-dependent, while the other less rich and equally dependent countries did not. Future research could explore these lines of interpretation further.

This study is limited by the availability of appropriate time series data. As discussed in detail, we only had access to public social spending information at the level of the central government for most countries. In reality, additional revenues from the commodity boom may have benefited public revenues and public spending at sub-national levels, for which no time-series data are available. This is a potential source of bias of our results and hence a limitation not only for our analysis but also for policy advice, and highlights the urgent need for better data. Future research will hopefully be able to replicate our analysis using richer data sources. In the meantime, this shortcoming may be adequately addressed in country case studies, too.

CRediT authorship contribution statement

Svenja Flechtner: Writing – review & editing, Writing – original draft, Validation, Methodology, Investigation, Data curation, Conceptualization. **Martin Middelanis:** Writing – review & editing, Writing – original draft, Software, Methodology, Investigation, Formal analysis, Conceptualization.

Declaration of competing interest

Both authors declare that they have no competing interests to declare.

Data availability

The replication package is available in the github repository https://github.com/svenjafl/socialspending_replication.

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Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.worlddev.2024.106717.

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