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ABSTRACT

Latin American countries experienced a significant reduction in income inequality at the turn of the 21st century. From the early 2000s to around 2012, the average Gini coefficient fell from 0.514 to 0.476. The period of falling inequality coincided with leftist presidential candidates achieving electoral victories across the region: by 2009, eleven of the seventeen countries had a leftist president – the so-called Pink Tide. We investigate whether there was a “leftist premium” on the decline in inequality and, if there was one, through which mechanisms. Using a range of econometric models, inequality measurements, and samples, we find evidence that leftist governments lowered income inequality faster than non-leftist regimes, increasing the income share captured by the first seven deciles at the expense of the top ten percent. Our analysis suggests that this reduction was achieved by increasing social pensions, minimum wages, and tax revenue.

JEL Codes: O1, D72, D63, I38, N36, H20.

Keywords: Inequality, government ideology, pink tide, Latin America.

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The Pink Tide and Inequality in Latin America¹

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The Pink Tide and Inequality in Latin America²

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Abstract

Latin American countries experienced a significant reduction in income inequality at the turn of the 21st century. From the early 2000s to around 2012, the average Gini coefficient fell from 0.514 to 0.476. The period of falling inequality coincided with leftist presidential candidates achieving electoral victories across the region: by 2009, eleven of the seventeen countries had a leftist president – the so-called Pink Tide. We investigate whether there was a “leftist premium” on the decline in inequality and, if there was one, through which mechanisms. Using a range of econometric models, inequality measurements, and samples, we find evidence that leftist governments lowered income inequality faster than non-leftist regimes, increasing the income share captured by the first seven deciles at the expense of the top ten percent. Our analysis suggests that this reduction was achieved by increasing social pensions, minimum wages, and tax revenue.

Keywords: Inequality, government ideology, pink tide, Latin America.

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Income inequality fell in practically every Latin American country during the first decade of the 21st century: from the early 2000s to around 2012, the average Gini coefficient for the region fell from 0.514 to 0.476. During that time voters also elected an unusual number of left-of-center presidents – commonly known as the “Pink Tide” or Latin America’s “Left Turn” (Weyland et al., 2010; Levitsky and Roberts, 2011). Were these two developments related? Figure 1 suggests that, indeed, countries governed by leftist presidents experienced a more pronounced decline in inequality.³ Simultaneously, most of these countries experienced an overlapping growth spurt as a consequence of the commodities boom.⁴ The decline in inequality, therefore, may have been a byproduct of economic growth and the concomitant larger fiscal space rather than the policies implemented by leftist governments.

Building on the experience of Western Europe, numerous studies support the idea that leftist governments adopt policies that redistribute both income and wealth (Castles, 1985; Esping-Andersen, 1990; Korpi, 1983; Stephens, 1979). The evidence, however, is not unambiguous (e.g., Bradley et. al, 2003; Huber & Stephens, 2010, 2012; Mahler, 2010; Rueda, 2007a).⁵ Heightened competition, changes in global finance, structural unemployment, and the decline in organized labor’s power in recent decades hindered or discouraged leftist

³ We define governments as Left and non-Left using the index from Baker and Greene (2011).

Table 1 provides the list of leftist governments in our sample. See below for details.

⁴ The 2000s commodities boom was the rise of many commodity prices (such as those of food, oil, metals, chemicals, fuels and the like) during the early 21st century (2000–2014).

⁵ For instance, Bradley et al. (2003) find that the cumulative power of the Left is a poor predictor of pre-tax inequality but has a positive and substantive effect on fiscal redistribution. Mahler (2010), instead, finds no effect of Left power on government inequality reduction.

governments from implementing broad redistributive policies (e.g., Rueda, 2007b; Thelen, 2014). In Latin America, smaller unions and larger informal sectors further limit the power of progressive governments to redistributive incomes (Holland & Schneider, 2017; Schneider & Soskice, 2009; Segura-Ubiergo, 2007).

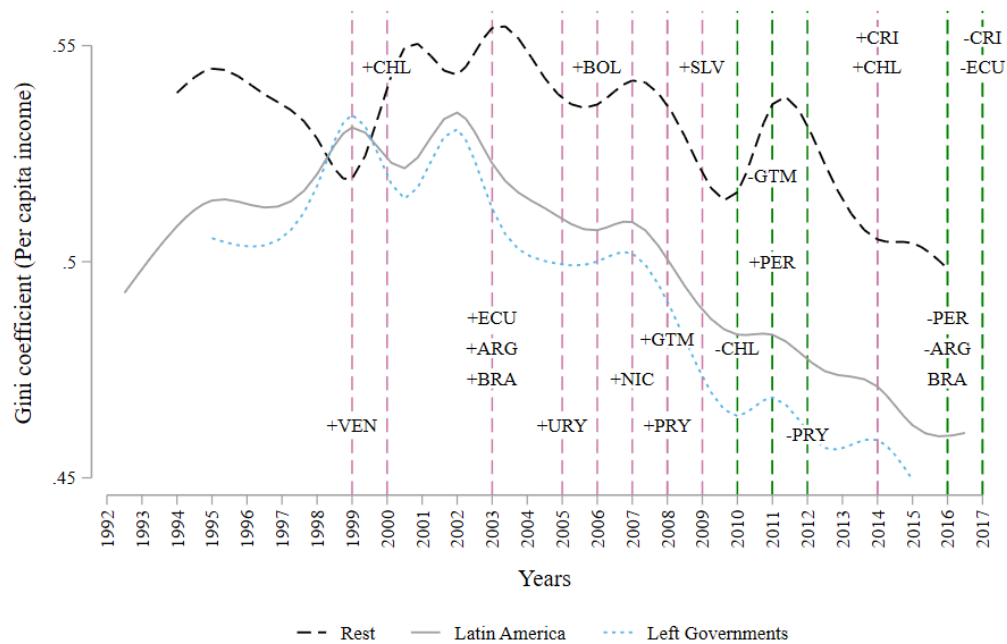


Figure 1. Inequality and government ideology in Latin America.

Source: SEDLAC (2018). Left includes the countries listed in fn. 1; “+” indicates the first year with a leftist president and “-” indicates the first year with a non-leftist president.

The question is, then, did countries governed by the Left experience a decline in inequality over and above what would have been predicted by other factors such as, for example, a higher fiscal space due to the commodity boom? If the answer is “yes,” what policies underpin this? Using the most complete data on income inequality available covering the period between 1992 and 2017, we study the contemporaneous impact of government ideology on income inequality and on redistributive policies. For that end, and to control for confounding factors, we use a difference-in-differences (DD) design and time-series and event-study regression models. Conceptually, we examine changes in income inequality in countries

before and after the Left came to office, relative to such changes in other countries without a left-wing government during the sample period. The key for identification is the so-called “parallel trends” assumption: were the patterns in inequality trends similar between the countries that were eventually governed by the Left and those that were not? We find that, on average, there were no differing patterns in inequality trends *prior* to the Left taking office: that is, the election of leftist executives does not appear to be related to particular dynamics of inequality trends. This result is in line with the findings by Lora and Olivera (2005), Kaufman (2009), Baker and Greene (2011), and Murillo et al. (2010), for example.

Our results suggest that countries experienced a more pronounced decline in income inequality after the Left came to power, even when controlling for other factors such as terms of trade, trade volume, the skill composition of their workforce, past levels of inequality, and country and year fixed effects. On average, countries with a leftist president featured a Gini coefficient 5 percent lower than non-Left countries. If the Left would stay in power for a sustained period of time, the Gini index would be 14 percent lower relative to the non-Left countries.⁶ The redistribution induced by the Left favors the income shares of the bottom and middle deciles at the expense of the share of the top 10 percent.

We also investigate three policies through which the Left can induce a contemporaneous reduction in inequality: an expansion of direct transfers (more so if targeted to the poor), an increase in the minimum wage, and a progressive tax reform (Cord et al., 2014; Lopez-Calva & Lustig, 2010). Our findings indicate that leftist governments expand total tax revenue (but leaving revenue from direct taxes as a share of GDP unaffected), implement more generous social pensions, and raise the minimum wage at a higher pace than non-leftist

⁶ We obtain the long-term effect of a Left victory using a Koyck transformation. See fn. 26 for more details. To see the extended results, see Table A3 in Appendix.

governments.⁷ By contrast, both Left and non-Left governments spend similar amounts on cash transfers targeted to the poor.⁸

The relationship between the Left and inequality in Latin America has been studied quantitatively by Birdsall et. al (2012), Cornia (2010), Huber & Stephens (2012), and Morgan & Kelly (2013). Our work complements and improves upon these studies in several ways. Morgan and Kelly (2013) find that the Left affects “gross” but not “net” income inequality; in turn, Huber and Stephens (2012) find that Left power improves income equality, but only when democracy is firmly established. These studies focus on the impact of the long-term strength of the partisan Left, measured as the legislative partisan balance accumulated over time (usually, over a 15-year period). Our work, in contrast, finds a contemporaneous effect of government ideology on disposable (“net”) income inequality over and above democracy because all countries in our sample were democratic when the Left took power.⁹

Closer in spirit to our paper, Cornia (2010) and Birdsall et al. (2012) study the contemporaneous effect of government ideology on inequality. Although they find a positive connection between different “types” of leftist governments (so-called “radical” and “moderate”) and inequality decline, their work covers only a few years of the “Pink Tide” (as

⁷ In general, increasing revenues in a progressive fiscal system will result in a higher reduction in inequality through fiscal redistribution. Data from the Commitment to Equity Institute suggests that tax systems are progressive in Latin America. See Lustig (2020).

⁸ For these outcomes, we only find statistically significant results when controlling for autoregressive effects between past and current levels of the outcome.

⁹ Huber & Stephens (2012) study the 1970-2005 period, thus excluding from their analysis a substantial part of the “Pink Tide.”

does Huber & Stephens 2012) and does not explore the policy mechanisms by which governments equalize incomes.

Our main contributions are twofold. First, we provide a more comprehensive, empirically robust, and up-to-date analysis of the influence of leftist regimes on the evolution of income inequality in Latin America during the period of widespread decline. In particular, we examine a longer period than previous analyses and include all seventeen countries. Importantly, we use several indicators of inequality, test our hypothesis over different samples, and carefully check identification assumptions. Second, we provide new evidence on the policies that leftist administrations use to affect inequality, examining a wide range of potentially redistributive policies.

In all, our findings contribute to an emerging literature on the relationship between inequality, redistribution, and government ideology outside the context of advanced nations. While scholars of Latin America often emphasize the weak programmatic character of political parties in the region, either because they rely on clientelistic and patronage networks (e.g., Gonzalez-Ocantos and Oliveros 2019), or because they often depart radically from their campaign promises (e.g., Stokes, 2001), our study shows that leftist governments in the region implemented policies and delivered results in line with their ideological programs. Our study also suggests that, unlike their socialdemocratic counterparts in Western Europe (Rueda, 2007a), leftist governments in the region implement policies that favor those at the bottom of the income distribution disproportionately.¹⁰

¹⁰ Instead, Rueda finds that left-of-center parties in Europe favor the interests of so-called “insiders” (workers in “standard” jobs) at the expense of part-time workers and the unemployed.

Inequality, Commodity Boom, and the Left

Latin America is among the most unequal regions in the world. Income inequality increased steadily in the 1980s and 1990s across the region, a period in which most countries also implemented market-oriented reforms, including trade and financial liberalization. By the turn of the 21st century, however, inequality began to recede, marking a watershed moment in the region. By 2013, inequality had declined in all 17 countries, in some quite significantly.¹¹

The decline in inequality has been associated to a range of short- and long-term factors, including a decline in the skill premium and the expansion of cash transfers programs that favored the poor (Lopez-Calva & Lustig, 2010). Since this expansion coincided (in South America) with more favorable terms of trade – the so-called commodities boom –, the sharp decline in inequality may have been the byproduct of economic growth and the larger fiscal space that ensued. However, there are reasons to believe that better economic conditions were not the sole factor behind the rise in the generosity of transfers.

Table 1 splits countries on whether they were governed by the Left at some point between 1992 and 2017, using the index developed by Baker and Greene (2011). Admittedly, these governments were hardly homogeneous. Some, like the governments of Lagos (2000-2006) and Bachelet (2006-2010, 2014-2018) in Chile, were seen as more moderate and market-friendly; others, like the Venezuelan governments of Hugo Chavez and Nicolas Maduro (1999-present), were often portrayed as “populist” or radical.¹² And some, like the government of Humala in Peru (2011-2015), rejected their leftist programs in favor of more orthodox policies once in office.¹³ Table 1 also reports the Gini index change during this period. Inequality

¹¹ For a review of regional trends, see Alvaredo & Gasparini (2015).

¹² There are several typologies classifying the “New Left” governments of Latin America (e.g., Weyland et al., 2010; Levitsky and Roberts, 2011).

¹³ Below we explain our coding strategy in greater detail.

declined in countries with above-the-average growth rates (Chile, Peru) and in those with more moderate (Brazil, Ecuador) or little growth (Mexico); it declined in both predominantly commodity exporters (Argentina, Bolivia, Brazil, Ecuador, and Peru) and commodity importers (El Salvador, Guatemala, Nicaragua, Panama). Thus, the commodity boom and the ensuing growth does not appear to be a necessary condition for countries to experience a decline in inequality.

As seen in Table 1, inequality also declined in countries governed by Left and non-Left presidents. However, countries under leftist regimes experienced a faster decline in inequality (as seen in Figure 1). The likely candidate to explain the more rapid decline of income inequality in these countries is the policies implemented by the wave of leaders and parties generically dubbed "leftist" that came to power during this period. To the extent that these governments were more likely to implement redistributive policies, government partisanship should logically reduce levels of income inequality over and above other common factors.

In what follows, we review the arguments and evidence linking three redistributive policies and the "Pink Tide" governments: social spending in the form of direct transfers, minimum-wage policy, and taxation. These policies have an immediate effect on income inequality. Other policies, including an increase in education and health spending, also impact inequality but only in the medium or long run. That is why we do not examine them here.

Country	Commodity Boom	Left	President	Average annual percent change		
				Gini full sample	Gini during left governemnt	Gini during non-left governemnt
Argentina	2003-2012	2003-2015	Nestor Kirchner Cristina Fernandez	-0.3%	-1.7%	1.5%
Bolivia	2002-2012	2006-2019	Evo Morales	-1.3%	-2.1%	0.1%
Brazil	2004-2011	2003-2016	Lula da Silva Dilma Rousseff	-0.5%	-0.9%	-0.3%
Chile	2003-2011	2000-2009 2014-2017	Ricardo Lagos Michelle Bachelet	-0.8%	-0.9%	0.2%

Costa Rica	-	2014-2017	Luis Guillermo Solis Rivera	0.3%	-0.1%	0.4%
Ecuador	2004-2013	2003-2007 2007-2016	Lucio Gutierrez Rafael Correa	-1.1%	-1.2%	-0.7%
El Salvador	-	2009-2018	Mauricio Funes Salvador Sanchez	-1.5%	-1.7%	-1.0%
Guatemala	-	2008-2011	Alvaro Colom Caballeros	-0.8%	-1.8%	-0.4%
Nicaragua	-	2007-	Daniel Ortega	-0.9%	0.8%	-1.1%
Paraguay	2007-2014	2008-2011	Fernando Lugo	-0.7%	0.7%	-0.8%
Peru	2001-2012	2011-2015	Ollanta Humala	-1.0%	-0.6%	-1.2%
Uruguay	2008-2014	2005-2017	Jose Mujica Tabare Vazquez	-0.2%	-1.0%	0.8%
Venezuela	2001-2012	1999-	Hugo Chavez Nicolas Maduro	0.3%	-1.0%	1.9%
Colombia	2004-2011	Non-left		-0.6%		-0.6%
Honduras	-	Non-left		-0.1%		-0.1%
Mexico	-	Non-left		-0.3%		-0.3%
Panama	-	Non-left		-0.4%		-0.4%
Total				-0.6%	-0.9%	-0.1%

Table 1. Classification of Countries by Political Regime and Commodity Exporters/Importers

Source: SEDLAC (2018; consulted October 1st, 2019) and The World Bank (2020e).

Notes: Commodity boom: counted from first year in which terms of trade rose until they peaked, since 2000; Left: counted since the year where the government begins to the ending year, if the government ends after the first half of the year.

Redistribution and the Left

Consider, first, the political determinants of social spending. Until the turn of the century, regional scholars agreed that the relationship between government ideology and social spending was weak or nonexistent. Unlike their European counterparts, left-of-center parties were not more likely to increase social spending than other parties in government (Huber et al, 2008; Kaufman & Segura-Ubiergo, 2000). Analyzing data from 1970 to 2000, Huber et al. (2008) concluded that because the prevailing tax structure in the region was regressive, progressive governments were often wary of expanding spending (p. 431).

Beginning in the 2000s, however, governments of varying political orientations across the region introduced important changes to social policy (Diaz-Cayeros et. al, 2016; Garay, 2016; Pribble, 2013). Of particular importance was the expansion of conditional cash transfers

(CCTs), unconditional cash transfers (UCTs), and non-contributory pensions. These transfers benefit the poor disproportionately, ranking “among the most progressive in Latin America, and indeed in the developing world as a whole” (De Ferranti et. al, 2004; p. 281). Evidence on the progressivity of cash transfers in most countries for which these indicators exist can be found in the Commitment to Equity Institute’s Data Center on Fiscal Redistribution.¹⁴

While there is substantial consensus that governments from across the ideological spectrum adopted cash transfer programs targeted to the poor, some scholars contend that leftist governments adopted more generous and progressive transfers (Garay, 2016; Huber & Stephens, 2012). A recent study by Altman & Castiglioni (2020), in fact, provides quantitative evidence that experts on the region agree that left-of-center parties promote more “equitable” policies. A majority of the evidence favoring this thesis, however, comes from qualitative case studies. Below, we examine the effect of leftist governments on various forms of spending using quantitative models. In particular, we focus on conditional and unconditional cash transfers, and social pensions, as a share of gross domestic product (GDP), thus providing an important test on whether leftist governments implement more generous transfers to the poor.

The effect of minimum wage policy on inequality depends both on its level (i.e., whether the minimum wage is “binding”), its enforcement (i.e., its coverage), and whether the positive effect on the incomes of poorer workers dominates the negative effect on any potential employment losses. Examining data from Latin America, Messina & Silva (2017) conclude

¹⁴See <https://commitmenttoequity.org/datacenter/>.

that “an increasing minimum age, despite pervasive incomplete compliance and ever-present but small employment losses, still has a wage-equalizing effect” (p. 158).¹⁵

Messina & Silva (2017) present descriptive evidence that suggests that the coverage and level of minimum wages increased by more in Left-governed countries. The largest increases happened in Argentina, Bolivia, Brazil, Chile, Ecuador, and Nicaragua. In non-Left countries, by contrast, minimum wages rose little or none (e.g., Colombia and Mexico) although in some cases, like in Colombia, the minimum wage was already high at the beginning of the commodities boom (Messina and Silva, pp. 160-161).

We finally consider tax policy as the last channel through which governments can achieve a rapid change in income inequality. If a tax system is progressive, raising taxes will in general increase the fiscal system’s progressivity. As shown in the detailed and comparative fiscal incidence results housed in the Commitment to Equity Institute,¹⁶ tax systems in Latin America are progressive, though less so than in the developed world.¹⁷ We also examine whether Left governments increase the progressivity of the system, for instance, by increasing the revenue from the direct taxes, including taxes on rents, income, profits and capital gains. Latin American countries collect, on average, more revenue from consumption taxes and less from personal taxes than developed nations, which is one reason why post-fisc inequality is

¹⁵ This equalizing effect, however, depends on a positive economic environment. Since the prevalence of leftist administrations coincided with booming economies, we postulate that a positive effect of Left partisanship on minimum wage levels was inequality reducing.

¹⁶ <https://commitmentoequity.org/datacenter/>.

¹⁷ Some authors argue that the tax system is regressive (Flores Macias, 2019), but the evidence from detailed fiscal incidence analysis is overwhelming to the contrary.

not much lower than the pre-fisc inequality in the region (Lustig, 2017). Caro and Stein (2013) provide evidence that leftist governments produce more progressive tax systems.

Hypotheses

In sum, the relationship between government ideology, inequality, and redistribution in Latin America warrants additional examination. Below, we test the following hypotheses. Compared to non-Left regimes, in countries governed by the Left: 1. Income inequality declines by more; 2. Spending on cash transfers increases by more; 3. The minimum wage increases by more; 4. Government revenues as a share of GDP increase by more; 5. Revenues from direct taxes as a share of GDP increase by more.

Data and Descriptive Statistics

To assess the influence of government ideology on inequality dynamics we construct an annual panel of 17 Latin American countries from 1995 to 2017. We combine different sources of information on government ideology, inequality, social policies, and macroeconomic indicators. As will be described below, we test our hypotheses using two different models: a difference-in-differences or “static” model and a “dynamic” model that accounts for potential autoregressive dynamics.

Independent variables. Our main independent variable is a dummy variable that reflects the ideology of the government. We classify governments as Left and non-Left using the updated ideology score developed by Baker and Greene (2011).¹⁸ This score is based primarily on an expert survey conducted by Wiesehomeier and Benoit (2009) that asked respondents to locate parties on a general left-right dimension. Baker and Greene complement this dataset with information from Pop-Eleches (2009), Coppedge (1998), and their own assessments. We code parties with a score equal or less than nine (over a 19-point scale) as

¹⁸ The updated dataset is available here: <https://www.colorado.edu/faculty/baker/data>.

Left. The lowest score for a leftist government in our sample is 2, which corresponds to the governments of Mauricio Funes (2009-2014) and Salvador Sanchez (2014-2019), from the FPL, in El Salvador; the highest value, in turn, corresponds to the Nicaraguan government of Daniel Ortega (FSLN), in power since 2007, with a value of 8.55. These governments are listed in Table 1. We code the variable $Left_{i,t}$ equal to 1 if a Left government is elected in country i in year t and 0 otherwise. In the main analysis, once the Left is replaced in office by a non-leftist government, we exclude the country from the analysis.¹⁹

The main issue with expert coding indexes is that they are built in part to reflect the policies implemented by parties while in office, thus raising potential endogeneity concerns. To account for this, we code parties according to the rating they receive the first time they enter Baker and Greene's dataset.²⁰ Reassuringly, our classification includes governments undeniably leftist like PT's Lula da Silva but also governments that campaigned on the left and governed on the center-right, like Humala's government in Peru (Levitsky, 2014). In turn, it excludes conservative government that governed on the left, like the government of Zelaya in Honduras.²¹

¹⁹ See Appendix A13 for details on our classification and robustness tests for alternative thresholds.

²⁰ The key question is whether experts reclassify parties considering temporary policy shifts in their party programs. In his instructions to country experts, for instance, Coppedge requested them to classify parties that take positions across the ideological spectrum as “center” parties (1998, p. 4). If this criterion was also used by experts more generally, then our dummy coding of Left should err on the conservative side, including some (incongruent) Left governments in the “control” group.

²¹ For Argentina, Baker and Greene code “personality-led factions” within parties with different values. That is why Menem and the Kirchners receive different scores. Our results

To account for any effect the commodities boom may have had on the distribution of incomes we include two variables: the terms of trade and the volume of trade. For the terms of trade, we use the terms of trade for goods and services from the ECLAC.²² Trade volume or openness is measured by the sum of imports and exports as a percentage of the GDP, using data from World Bank and OECD national accounts.²³ This variable is a proxy for how much a given country in fact benefits from its terms of trade. Together, these two variables account for the effect of the boom over income inequality. Better external conditions can impact inequality by improving the fiscal balance of the government. Also, commodities booms are usually accompanied by construction booms, which raise the relative demand of low skilled workers.²⁴

We also control for the skill distribution of the economy to account for any wage premium on education.²⁵ We measure the skill distribution as the ratio of high- versus low-

are robust to recode Menem's and both Kirchner governments as non-Left, both as Left, and dropping Argentina from our sample. See Figure 5.

²² ECLACSTATS at <https://cepalstat-prod.cepal.org/>. Consulted: July 25, 2020.

²³ Available at <https://data.worldbank.org/>. Consulted: October 17, 2019.

²⁴ Critically, Campello and Zucco Jr (2016) test whether “good economic conditions” – an index combining higher commodity prices and lower international interest rates – affect government-reelection rates after controlling for the ideology of the government, which may vary in their propensity to redistribute incomes. They find, however, that the effect of external conditions on the reelection success of incumbents is unaltered after controlling for government ideology.

²⁵ One suggested explanation for the reduction of inequality during the 2000s is the expansion of secondary and tertiary education in the 1990s, which increased the relative supply of more

skilled people, where “high” skill are individuals with more than 13 years of formal education and “low” are those with 0-8 years of formal education. These data come from Socio-Economic Database for Latin America and the Caribbean (SEDLAC, 2018; consulted October 1st, 2019).

In the robustness section, we also control for the rate of economic growth and for the partisan composition of the legislative branch, using data from the World Bank and the Database of Political Institutions 2017-IDB (Consulted March 3, 2021), respectively. Finally, we control for changes in the ideological disposition of the electorate to account for changes in the position of the “median voter” using data from Latinobarometro. This survey covers all the Latin American countries between 1995 and 2017. With this data, we control for the average response to a question asking respondents to determine, on a 10-point scale, where they were located in the ideological spectrum, where higher values indicate more rightist positions.

Dependent variables. Our main outcome variable is the log of the Gini coefficient of per capita household (disposable) income, which we obtain from the Socio-Economic Database for Latin America and the Caribbean (SEDLAC, 2018; consulted October 1st, 2019). In the Appendix, we also use the Standardized World Income Inequality Database (SWIDD), which uses a Bayesian approach to standardize observations from several sources (see section A1). We also study changes in the logged income shares of different groups, again using data from SEDLAC: the income ratio between the 90 and 10 percentiles; the sum of the income shares

educated workers and a decline in the wage premium. This effect is also taken into account by controlling for the ratio of high- to low-skilled workers.

of the deciles 4, 5, 6 and 7; the income shares of the poorer 10 and 20 percent; and the income share of the richest 10 percent.²⁶ These data cover a time span between 1992 and 2017.²⁷

Additionally, we study the effect of government partisanship on several distributive policies: the real minimum wage, extracted from the LAC Equity Lab; the total spending on conditional and unconditional cash transfers, and on social (i.e., non-contributory) pensions, as percentage of the GDP. Information on these measures comes from the World Bank's Atlas of Social Protection Indicators of Resilience and Equity (ASPIRE). Finally, we examine tax revenue data by country as percentage of GDP from the OECD. We look at total tax revenue and the revenue coming from taxes on income, rents, profits and capital gains. We transform all these variables using the natural logarithm.

Columns 1 through 3 in Table 2 present the mean and standard errors for the dependent variables for the full sample separately for “treated” and “control” countries. Countries in the two groups exhibit significant differences in all economic indicators over the full sample period.

Research Design

Our empirical strategy employs a difference-in-differences (DD) design to study the effect of a leftist government on income inequality and several distributive policies. Our general regression model takes the following form:

$$Outcome_{i,t} = \beta_0 + \beta_1 Left_{i,t} + \beta_2 X_{i,t} + Country_i + Year_t + \varepsilon_{i,t} \quad (1)$$

where $Outcome_{i,t}$ is a measure of inequality or a policy variable depending on the hypothesis to be tested (e.g., the logs of the Gini coefficient or the level of the minimum wage) in country i and year t . $Left_{i,t}$ is an indicator variable that equals 1 if a leftist president was

²⁶ All the distributional measures are calculated using the per capita income.

²⁷ In the Appendix, section A7, we present the coverage for each variable.

elected in country i at time t and 0 otherwise. In our main analysis, once a leftist president is replaced by a non-leftist president, we drop the country from our sample.²⁸ $\mathbf{X}_{i,t}$ is a vector of time-varying socioeconomic factors. $Country_i$ are the country-level fixed effects that capture the time-invariant differences between Left and non-Left countries. $Year_t$ are the year-fixed effects that control for time-specific shocks. Finally, $\varepsilon_{i,t}$ is the idiosyncratic error term. Thus, β_1 measures the average causal effect of the election of a left-wing government on the outcome variable in year t . In all our specifications, we cluster standard errors are clustered at the country level to take care of serial correlation.

<i>Variable</i>	<i>Full sample</i>		
	Left Mean ¹	Non-Left Mean	Difference
<i>Gini coefficient</i> ²	0.530 [0.003]	0.491 [0.003]	-0.0398*** [0.0047]
<i>Income share of the bottom 20%</i> ²	3.27 [0.078]	4.01 [0.064]	0.74*** [0.1003]
<i>Income share of the middle deciles 4, 5, 6 & 7</i> ²	24.82 [0.155]	26.84 [0.178]	2.02*** [0.2356]
<i>Income share of the top 10%</i> ²	41.12 [0.266]	37.65 [0.319]	-3.47*** [0.4149]
<i>Income ratio 90/10</i> ²	12.99 [0.403]	10.62 [0.318]	-2.37*** [0.5125]
<i>Spending in Conditional cash transfers as % GDP</i> ⁵	0.22 [0.021]	0.30 [0.020]	0.08** [0.0291]
<i>Spending in Unconditional cash transfers as % GDP</i> ⁵	0.18 [0.027]	0.14 [0.015]	-0.035 [0.0313]
<i>Total tax revenues as % of GDP</i> ³	15.85 [0.295]	18.94 [0.355]	3.09*** [0.4614]

²⁸ This reduces potential bias that may arise from having units going back and forth from “treatment” and “control” groups. See Goodman-Bacon (2018). In the appendix, Table A9, we show results for a different estimand: the effect of having been “ever” governed by a left-wing president (during the 1990-2017 period). In this specification, we do not drop countries after the Left loses office; instead, the remaining country observations are coded as “treated.”

<i>Total tax revenues on rents, income, profits and capital gains as % of GDP³</i>	4.47 [0.111]	4.15 [0.110]	-0.32** [0.1559]
<i>Real minimum Wage index^{4,6}</i>	117.26 [3.509]	123.81 [2.670]	6.55 [4.4032]
<i>Spending in Social pensions as % GDP⁴</i>	0.10 [0.016]	0.46 [0.031]	0.36*** [0.0349]

Significance levels: * < 10% ** < 5% *** < 1%.

Clustered standard errors at country level in brackets.

1 Left countries are those with a Left government as defined in Table 1. Non-Left are those countries that never were governed by the Left between 1992 and 2017.

2 Source: SEDLAC (CEDLAS and The World Bank). Version : May 2018. Consulted July 25, 2020. The Gini coefficient and all the income shares were calculated using per capita income.

3 Source: OECD et al. (2021), *Estadísticas tributarias en América Latina y el Caribe 2021*, OECD Publishing, Paris, <https://doi.org/10.1787/96ce5287-en-es>.

4 Source: CEPALSTATS. Consulted: October 31, 2020.

5 Source: World Bank's Atlas of Social Protection Indicators of Resilience and Equity (ASPIRE). Consulted

6 The real wage index is calculated using the value of 2000.

Table 2. Descriptive Statistics for Outcome Variables

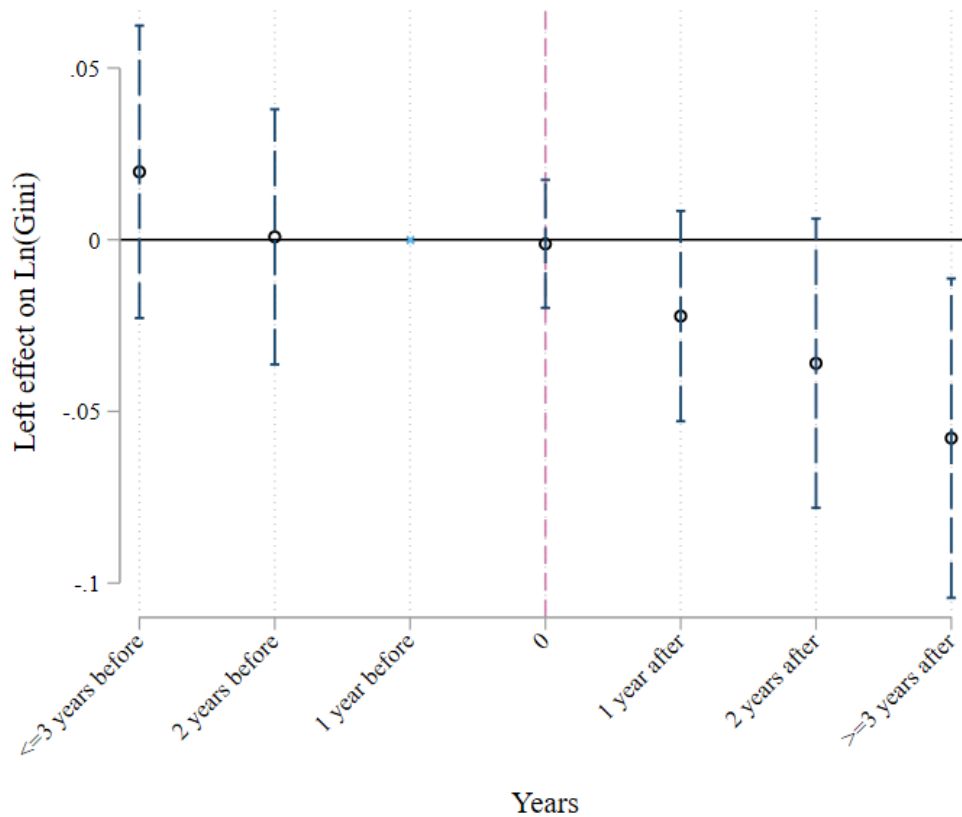
Parallel trends assumption

The key assumption of the DD strategy is the existence of parallel trends (in the absence of treatment) between treatment and control countries. Even though this assumption cannot be tested directly, we can test whether pre-trends in inequality differ for “treated” and “untreated” countries. Our DD strategy is likely to produce biased and inconsistent estimates if pre-treatment levels of inequality determine both the probability of a leftist party being elected and the concurrent level of inequality. Under the parallel trend assumption, this should not happen. To validate the assumption that the trends of the treatment and control groups would be parallel absent the elected leftist government, we employ a strategy akin to an event-study regression:

$$Outcome_{i,t} = \sum_{t \in (-3, -2, 0, 1, 2, 3+)} \beta_1 Left_{i,t} + \beta_2 X_{i,t} + Country_i + Year_t + \varepsilon_{i,t} \quad (2)$$

where $Left_{i,t}$ is a set of indicator variables that equal 1 if t years have passed since the Left was elected in country i , where t is between -3 and 3+, with 3+ indicates 3 years or more. The year before the leftist government is elected is omitted and used as the comparison

group. If the coefficients associated to three years or more before the treatment ($\beta_{1,-3}$) and two years before the treatment ($\beta_{1,-2}$) are not significantly different from zero, the parallel trends assumption is likely to hold. Figure 2 shows the estimates for the log of the Gini coefficient, our main dependent variable. Before the Left takes office, the coefficients are not statistically significant, and they are very close to zero. Once the Left is in power, however, inequality drops rapidly and significantly in these left-governed countries, lending initial support to our main hypothesis. Appendix A5 presents results for the other dependent variables as well showing similar trends.



Notes: Each coefficient corresponds to the change in the natural logarithm of the Gini coefficient relative to the change one year before the leftist government begins. The dashed line represents the year where the Left government begins. We control for the terms of trade, the total trade relative to the GDP, and the ratio between high skilled and low-skilled workers.

Figure 2. Trends in inequality before and after the Left takes office²⁹

To bolster confidence in our empirical strategy, we perform an additional test. We drop all observations with a leftist government, and then assign a “placebo” treatment to those countries eventually governed by a leftist president, but four years before they take the office. If the parallel trend assumption holds, differences in outcomes between treatment and control groups should be small and statistically insignificant. This is in fact what we find for our main outcome variables (see Table A2 in Appendix for the full results).

These results are consistent with research on elections in Latin America. While Debs & Helmke (2010) suggest there may be an inverted-U shape relationship between inequality and voting, with inequality pushing poor voters to the Left at medium levels of inequality, other studies have failed to find a link between levels of inequality and support for leftist candidates when examining the rise of the “Pink Tide.” Kaufman (2009) reviews survey evidence, controlled-case comparisons, and electoral returns, and concludes that “[t]here is no systematic relation between income inequality and Left voting” (p. 364). Similarly, Murillo et al. (2010) claim that “retrospective evaluations of right-leaning presidents of the 1990s and their poor performance in handling the economy (...) explain the increase in Left vote share in the 2000s” (p. 90). Baker and Greene (2011) also fail to find a relationship between income inequality and support for the Left. In most cases, leftist parties only consolidated their support among the poor *after* taking office.³⁰ Therefore, our assumption that government ideology was orthogonal to past trends in inequality has broad empirical support.

²⁹ Figure A2 in the appendix shows parallel trend plots for all the dependent variables.

³⁰ See, for instance, Hunter & Power (2007) on Brazil, and Madrid (2007) on Bolivia.

Estimation

We estimate Equation 1 using standard OLS regression. This equation models the data generating process linearly and in a “static” fashion – i.e., it assumes past treatments do not affect current versions of the outcome (Imai & Kim, 2019). Even though the parallel trends assumption seems to hold, it is not unthinkable that past levels of inequality affect both the future political orientation of the government and ensuing levels of inequality. If that is the case, trends in non-Left countries are not a good counterfactual for trends in countries governed by the Left: the coefficient for the treatment effect would reflect the compound effect of the Left as well as the effect from autoregressive dynamics.

We address this concern by employing an additional “dynamic” linear model that controls for autoregressive effects. This model includes one lag of the outcome variable to account for the fact that past outcomes may affect both current levels of the outcome and the treatment. We include only one lag because since we cannot reject the null hypothesis of no serial correlation in the corresponding AR2 test.³¹ Our model takes the following form:

$$Outcome_{i,t} = \beta_0 + \beta_1 Left_{i,t} + \beta_2 X_{i,t} + \rho Outcome_{i,t-1} + Year_t + \varepsilon_{i,t} \quad (3)$$

The assumption behind this model is that, conditional on the lags of the outcome variable, time-varying covariates, and year-fixed effects, countries with a leftist president are not on a different trend. We estimate this model using the Generalized System Method of Moments (GMM) proposed by Arellano & Bover (1995) and Blundell & Bond (1998).

The effect of Left on income inequality

We first present results on the relationship between Left incumbency and income inequality using the “static” version of our model (Eq. 1). Table 3 presents the conditional

³¹ We perform the AR2 test because, by definition, the first-differenced residuals in the system GMM estimation presents serial correlation.

relationship between government ideology and different measures of inequality. For the log of the Gini index, the coefficient for Left incumbency is negative and statistically significant at the 1% level. Countries with a leftist president featured a Gini coefficient 5 percent lower than the non-Left countries. The Left increases the income share of the deciles in the bottom and middle of the income distribution. On average, the income share of the bottom 20% is roughly 9 percent higher relative to what happens to the same group under a non-Left government (p-value<0.05). The middle-income deciles also benefit with the Left: the income share of the deciles 4 through 7 is 4 percent higher (p-value<0.01). Conversely, the income share of the top 10% drops 4.8 percent and the income ratio between the centiles 90 and 10 by 11 percent (p-value<0.01). Overall, our findings suggest that the Left premium comes from an increasing income share of the first seven deciles at the expense of the top 10% percent.

We obtain similar results once we account for potential autoregressive effects (Panel B, Table 3). In countries governed by a leftist government, the Gini index declines and the income shares for the first 7 deciles increase, again at the expense of the top 10%. In addition to the yearly or short-run effects reported in the table, with the dynamic model we can calculate the aggregate long-run effect of a Left government maintaining power over time (Figure 3). The suggested effect on the log of the Gini coefficient after one year of the Left in power is 2 percent. If the Left stayed in power for four years, the cumulative effect would be 5 percent, and for eight years, the effect would be 7.4 percent.³² The asymptotic long-run effect (i.e., if the Left would stay in office for a prolonged period of time) of a change from a non-Left to a Left regime on the log of the Gini coefficient would be equal to a decline of 14 percent. Similarly, the Left in office would cause a fall of 13.6 percent in the income share of the top

³² These effects are obtained by forward iteration using the model presented in Equation 3.

For more detail about how to compute the long run effects see section A9 in the appendix.

10% in the long run, while the bottom 20% would accumulate an 20 percent additional share of the national income. The income shares of the middle deciles (4, 5, 6, and 7), in turn, would increase by 11 percent (Table A3 in Appendix presents the full results).

Dependent Variable	Panel (a): Static Model					Panel (b): Dynamic Model (System GMM)				
	Ln(Gini)	Ln(Share of income top 10%)	Ln(Share of income 4,5,6 & 7 decile)	Ln(Share bottom 20%)	Ln(Share 90 centile/ Share 10 centile)	Ln(Gini)	Ln(Share of income top 10%)	Ln(Share of income 4,5,6 & 7 decile)	Ln(Share bottom 20%)	Ln(Share 90 centile / Share 10 centile)
Left ¹	-0.049*** [0.015]	-0.048** [0.018]	0.042** [0.016]	0.088* [0.048]	-0.115* [0.062]	-0.011** [0.005]	-0.015** [0.006]	0.014** [0.005]	0.024** [0.010]	-0.035** [0.014]
Ln(ToT) ²	-0.046 [0.031]	-0.039 [0.032]	0.031 [0.031]	0.100 [0.080]	-0.122 [0.095]	0.006** [0.003]	0.010*** [0.003]	-0.009*** [0.003]	0.004 [0.014]	-0.007 [0.019]
Ln(Trade/GDP) ³	-0.054 [0.056]	-0.083 [0.068]	0.078 [0.058]	0.093 [0.168]	-0.132 [0.212]	-0.003 [0.003]	-0.006 [0.005]	0.007 [0.005]	0.001 [0.012]	0.002 [0.016]
Ln(High skilled/Low skilled) ⁴	-0.052 [0.049]	-0.090 [0.059]	0.112** [0.046]	0.156 [0.119]	-0.219 [0.135]	-0.004 [0.003]	-0.008* [0.005]	0.008* [0.004]	0.009 [0.008]	-0.009 [0.011]
Lagged dependent variable						0.918*** [0.022]	0.891*** [0.026]	0.873*** [0.028]	0.881*** [0.027]	0.871*** [0.032]
Observations	255	251	251	251	251	205	203	203	203	203
Country FE	YES	YES	YES	YES	YES	NO	NO	NO	NO	NO
Period FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R2 Adjusted	0.811	0.813	0.801	0.759	0.740					
Arellano-Bond test for AR(1)								0.00146	0.00126	0.00206
Arellano-Bond test for AR(2)								0.537	0.703	0.567

Clustered standard errors at country level in brackets.

*** p<0.01, ** p<0.05, * p<0.1

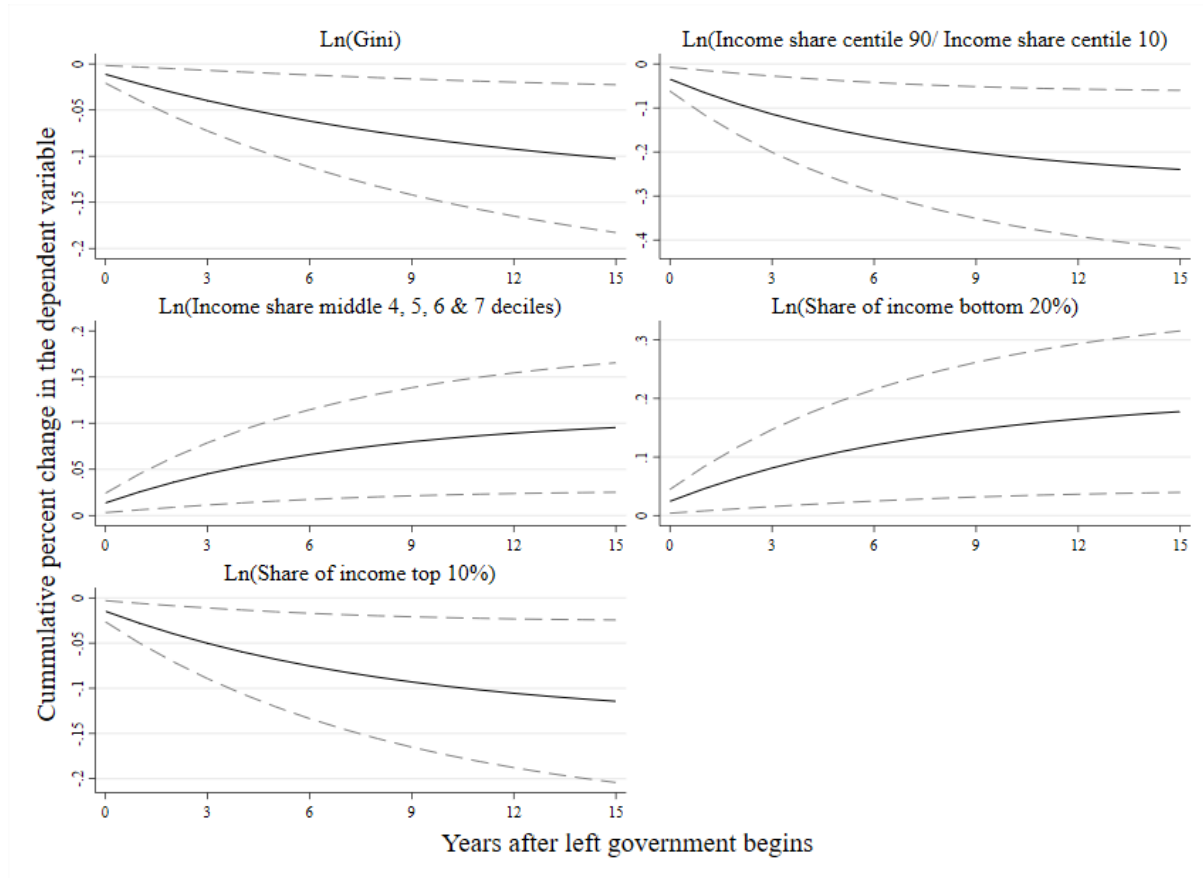
Note 1: Left is equal to missing after left-governed countries go back to being governed by a non-left government.

Note 2: Ln(ToT) is the logarithm of Terms of trade for each country.

Note 3: Ln(Trade/GDP) is the logarithm of the ratio between all trade and GDP for each country.

Note 4: Ln(High skilled/Low skilled) is the logarithm of the ratio between high- and low-skilled workers.

Table 3. The effect of the Left on inequality



Notes: The solid black lines represent the estimated effect of being governed by a leftist government at each point in time. Grey dashed lines represent the 95% percent confidence interval. In the x-axis we show the years after to the beginning of the leftist government.

Figure 3. Cumulative impact of Left on inequality measures over time

The effect of Left on direct transfers, minimum wages, and taxation

In this section, we explore the policies through which a leftist government might influence inequality performance in a country during its time in office. In particular, we examine the impact of the Left on several type of direct transfers, the level of the minimum wage, and tax policy (Table 4). While the coefficient for $Left_{i,t}$ fails to achieve statistical significance at conventional levels for any of the policy outcomes in the static model, we find a significant effect of Left incumbency on tax revenues, the minimums wages, and social pensions using our dynamic model. Reassuringly, the sign of the estimates for the static models are all in line with the estimates from the autoregressive models (see Table 3 in Appendix).

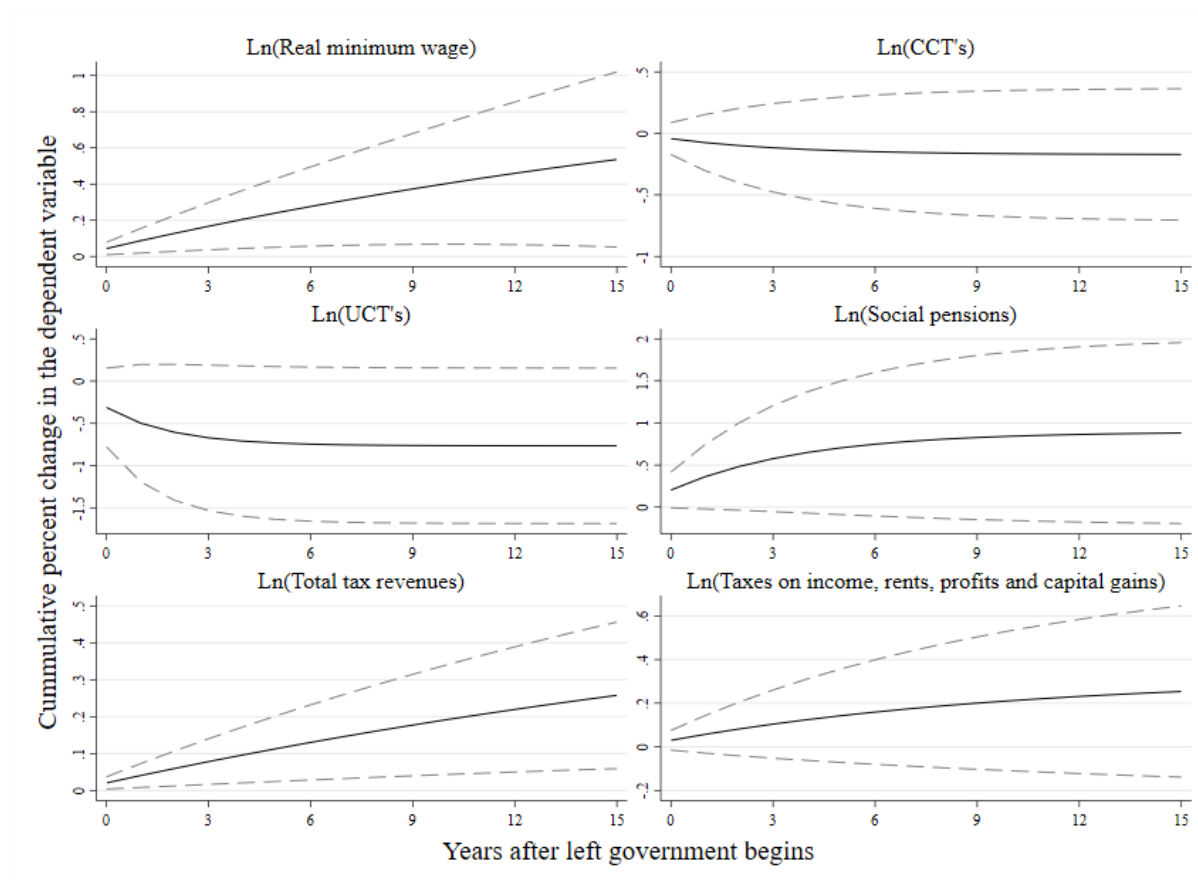
The Left produces a yearly average increase of 2.1 percent on tax revenues over GDP relative to a non-leftist government.³³ In the Appendix, we show that if the Left stayed in power for one, four and eight years, the cumulative effect on the log of the total tax revenues as percentage of the GDP would be 4, 10 and 16 percent, respectively. In the long run, this translates into a cumulative impact of 61 percent (Table A3 in Appendix). From Lambert's fundamental equation on the redistributive effect of fiscal systems, we know that when taxes increase in a progressive fiscal system, the system becomes more equalizing.³⁴ From Lustig (2020), we know that in all countries in Latin America the combination of taxes and transfers reduces inequality. Thus, we can conclude that the Left in power in Latin America redistributes income by raising revenue at a higher pace than other parties even if it does not affect the progressiveness of the tax system. In fact, the coefficient for the effect of Left incumbency on direct taxes (i.e., taxes on rents, income, profits and capital gains) is positive but small and statistically insignificant at conventional levels.

We also find that the Left implements more generous social pensions, which increase on average by 20 percent compared to countries not governed by the Left. After one year of the Left in office, the log of the social pensions as percentage of the GDP would be 36 percent higher, and after four and eight years, social pensions would increase by 64 and 80 percent,

³³ The size of the coefficients is similar to those presented in Caro and Stein (2013), who use an older version of the same tax data from CIAT-IDB.

³⁴ Lambert (1992) shows that the system-wide progressivity equals a weighted sum of the progressivity of taxes and transfers.

respectively.³⁵ The level of the minimum wage also increases under the Left, in line with descriptive data presented previously.



Notes: See Figure 3.

Figure 4. Cumulative impact of Left on policy measures over time

³⁵ The dynamic model also suggests that leftist governments spend more on wages and salaries in the public sector (as a share of GDP) and on social expenditures (as a share of GDP). However, there is no evidence that expanding employment or raising wages in the public sector should be inequality-reducing. Regarding social expenditures, it is only spending on cash transfers that affects inequality contemporaneously and we test the nexus between spending on cash transfers and the Left separately.

The effect of the Left on the log of the real minimum wage would be 8.7 percent one year after it assumes office, 20.5 percent higher after four years, and 34.2 percent higher eight years being in power (Figure 4).

In contrast, we find no evidence that leftist governments expand cash transfers, both conditional and unconditional, more than non-leftist government. CCTs were introduced or greatly expanded during these years; this expansion took place under leftist (e.g., in Argentina, Bolivia, and Brazil) and non-leftist presidents (e.g., in Colombia and Mexico). While this is in line with studies showing that both right- and leftist presidents were equally likely to implement CCTs (Brooks, 2015; Diaz-Cayeros et.al, 2016), our findings cast some shadow on analyses suggesting these transfers were more generous or progressive under the Left (cf. Garay, 2016).

Of course, we cannot test all the potential policy channels through which the Left may induce a contemporaneous reduction inequality. In particular, we cannot tell which of the policies that the Left is more likely to implement causes the “leftist premium” in inequality reduction that we identified in the previous section. Similarly, there may be other policies ignored so far by the policy literature affecting inequality, or policies that affect inequality contemporaneously could interact in complex ways. That said, our analysis suggests both that inequality declines more under the Left and that the Left implements a range of policies that are likely to impact inequality in the same equalizing direction.

Robustness tests

Even if the parallel trend assumption holds, other factors could compromise our results. Below we assess the robustness of our results to varying samples, measurement choices, and inclusion or exclusion of control variables. Figure 5 plots the coefficient estimates for our leftist government indicator for several alternative specifications.

Dependent Variable	Panel (a): Static Model						Panel (b): Dynamic Model					
	Ln(CCT/ GDP)	Ln(UCT/ GDP)	Ln(Social Pensions)	Ln(Minimum Wage)	Ln(Total Revenues / GDP)	Ln(Taxes on rents capital gains income and Profits/GDP)	Ln(CCT/ GDP)	Ln(UCT/ GDP)	Ln(Social Pensions)	Ln(Minim um Wage)	Ln(Total Revenues / GDP)	Ln(Taxes on rents, capital gains, income and Profits/GDP)
Left ¹	-0.433 [0.605]	1.325 [0.787]	0.842 [0.998]	0.052 [0.097]	0.042 [0.042]	0.074 [0.096]	-0.042 [0.066]	-0.312 [0.238]	0.204* [0.109]	0.044** [0.018]	0.021** [0.008]	0.030 [0.023]
Ln(ToT) ²	2.157** [0.919]	-1.330 [2.743]	-3.131** [1.062]	0.056 [0.147]	0.038 [0.040]	0.208* [0.116]	0.334 [0.392]	0.588 [1.526]	- [0.266]	0.024 [0.028]	0.035** [0.018]	0.079*** [0.022]
Ln(Trade/GDP) ³	-0.074 [0.817]	-1.861 [1.242]	-0.610 [0.843]	0.085 [0.159]	0.207** [0.073]	0.458*** [0.149]	-0.223*** [0.055]	0.417* [0.245]	-0.073 [0.115]	-0.011 [0.007]	0.002 [0.007]	-0.016* [0.009]
Ln(High skilled/Low skilled) ⁴	0.304 [0.860]	1.656 [2.412]	-2.509 [1.567]	0.315 [0.269]	-0.012 [0.117]	-0.126 [0.181]	0.000 [0.062]	0.407** [0.167]	0.281** [0.137]	-0.003 [0.012]	-0.007 [0.005]	-0.004 [0.010]
Lagged dependent variable							0.755*** [0.043]	0.593*** [0.137]	0.772*** [0.057]	0.961*** [0.039]	0.966*** [0.015]	0.906*** [0.044]
Observations	141	105	121	257	261	261	131	95	110	257	261	261
R-squared	0.799	0.578	0.845	0.733	0.922	0.853						
Country FE	YES	YES	YES	YES	YES	YES	NO	NO	NO	NO	NO	NO
Period FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Arellano-Bond test for AR(1)							0.129	0.0901	0.195	0.106	0.0294	0.0432
Arellano-Bond test for AR(2)							0.724	0.974	0.279	0.908	0.620	0.293

Clustered standard errors at country level in brackets.

*** p<0.01, ** p<0.05, * p<0.1

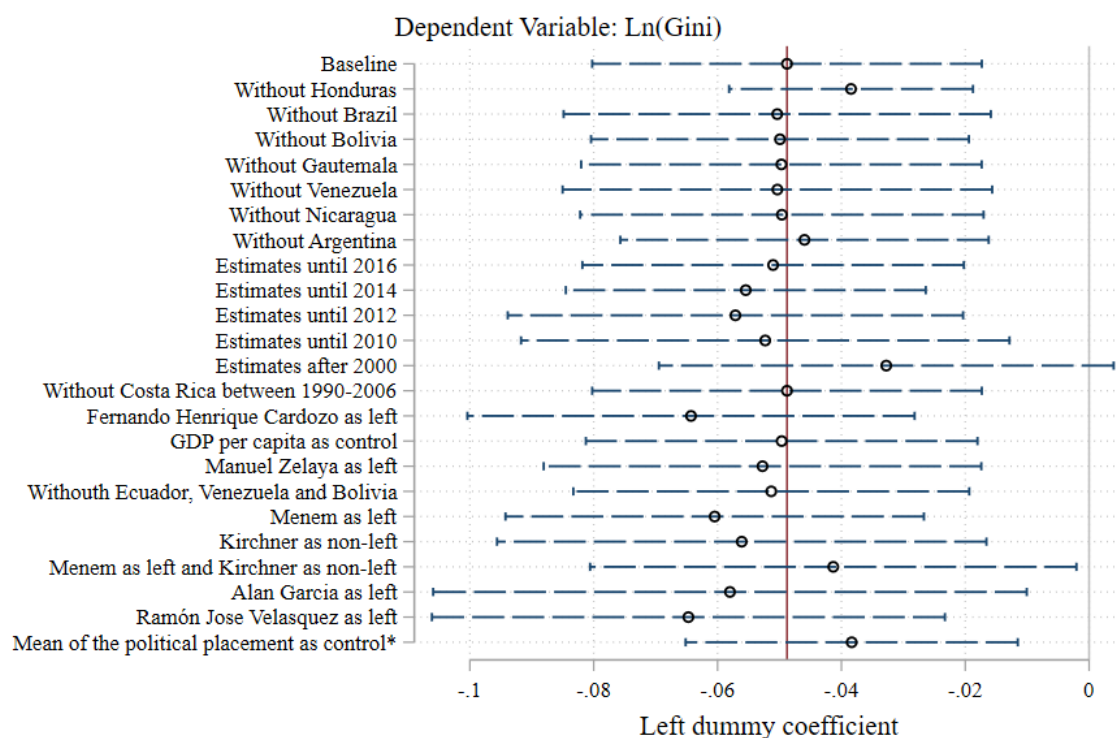
Note 1: Left is equal to missing after left-governed countries go back to being governed by a non-left government.

Note 2: Ln(ToT) is the logarithm of Terms of trade for each country.

Note 3: Ln(Trade/GDP) is the logarithm of the ratio between all trade and GDP for each country.

Note 4: Ln(High skilled/Low skilled) is the logarithm of the ratio between high skilled and low skilled workers.

Table 4. The Effects of Left on Transfers, Social Pensions, Minimum Wages, and Taxes



Notes: The black circle represents the point estimate of the Left dummy coefficient for each one of the sub-samples specified in the y-axis. The horizontal blue dashed line shows the 95 percent confidence interval. The vertical solid line shows the value of the estimate in our preferred specification. The GDP per capita growth comes from the World Bank and it is the index of the GDP per capita based on constant local currency. We use as control variables the terms of trades, trade openness, and the ratio of high skilled to low-skilled workers.

* The data comes from Latinobarometro

Figure 5. Stability in the point estimates of the difference in difference estimator

We start by analyzing the consistency of our results when we reclassify countries whose ideological denomination is not clear cut. First, we evaluate whether our results change when we code several presidencies – Cardoso (1994-2002) in Brazil, Menem (1989-1999) in Argentina, Zelaya (2006-2009) in Honduras, Humala (2011-2015) and Alan Garcia (2006-2011) in Peru, and Ramón Jose Velasquez (1993-1994) in Venezuela – as leftist. For instance, while Cardoso’s *Partido da Social Democracia Brasileira* (PSDB) is often classified as center-right in the political science literature, Cardoso himself has a long history as a leftist public intellectual. Zelaya, in turn, was elected under the banner of a traditional party, the *Partido Liberal*, but soon after taking office he aligned himself and his policies with the “Pink Tide”

presidents. Our results do not change when we re-classify these governments and include them as part of the Left. They also remain unaltered if we code the Kirchner governments (2003-2015) as non-Left. Our results are also robust to varying the threshold we use to transform Baker and Greene's index into our dummy Left/non-Left variable (Appendix A13).

Secondly, we vary the sample by separately excluding several countries. We exclude Guatemala because we have no data for the 1990s and Honduras because it excludes non-labor incomes in the 1990s. We also run the analysis without Brazil because up to 2003 it excluded the rural North from its household surveys. Until 1997, Bolivia measured inequality only in urban areas, so we also run a regression without Bolivia. We exclude Venezuela because it only has data up to 2006. We run our regression without Argentina because it measures inequality only in urban areas (little over sixty percent of the population). Finally, we exclude from our sample observations from predominantly gas and oil exporting countries: Bolivia, Ecuador, and Venezuela. In all these cases, our results remain largely the same.

Another concern is whether the effect of Left incumbency on inequality depends on governments having a large fiscal space. To account for this, we take two steps. First, we re-run our models including real GDP per capita as a control variable. In addition to this, we interact the Left dummy with the terms of trade variable. This analysis suggests that Left governments are associated with declining inequality over all the potential values of terms trade for which there is common support in the data. While Left governments seem more redistributive under more favorable terms of trade, the moderating effect of trade on the order of magnitude of the effect of the Left is not very large. The coefficient for Left is negative, statistically significant at 5%, and the point estimates remain very similar to the baseline estimation (red solid line) across a wide range of terms of trade levels (Figure A1 in Appendix).

Although many of the policies through which governments affect redistribution do not require congressional approval (e.g., raising the level of the minimum wage), having a solid

majority in Congress may allow leftist presidents to implement more ambitious redistributive programs. We consider two alternative measures for the strength of the president in the legislative branch: the share of seats controlled by the government's party and the government's majority/minority margin. Again, we present separate models controlling for these variables and also perform an interaction analysis between these variables and Left incumbency. Indeed, while the effect of Left is inequality-reducing and significant across the range of these variables, our results suggest that governments with more legislative support cause a larger decline in inequality (See Appendix, Figure A3).

We also account for changes in the ideological position of the electorate using voters' position on the left-right scale, using data from Latinobarometro between 1995 and 2017. If voters moved to the left in Left-governed countries, changes in inequality could simply reflect an increased demand for redistribution, rather than changes in the ideology of governments. Our results are unchanged after controlling for the average predisposition of voters in these countries.

Finally, we explore the consistency of our main findings by changing how we code our treatment variable. In the main analysis, we dropped observations from leftist countries after the Left is replaced by a non-leftist president. The rationale for this is to avoid any contamination from "treated" countries to the "control" group, potentially inducing endogeneity – e.g., if the performance of leftist governments affects posterior decisions by a non-Left government. Indeed, social policies are often hard to deactivate by succeeding administrations, but most governments have some capacity to change the policies established by previous administration; so, it might be interesting to assess what happens when we allow "treated" observations to return to "control" group. To explore these possibilities, we recode our main variable in two ways: we code all observations equal to 1 after a country elects a left-wing government, regardless of what happens later; and we code observations according to

which government is in office that year – i.e., we code Left-governed countries with a zero in the government ideology variable once the Left is voted out of office. Table A9 in Appendix presents the results of the estimates for the three definitions. In all cases, our findings remain strikingly similar. Inequality declines, the total tax revenues increase, and the income shares of the first seven deciles also increase with a simultaneous decrease in the income share of the top 10%.³⁶

Concluding remarks

The *Pink Tide* explains why inequality fell faster in some Latin American countries than others during the first decade of this century. While the equalizing effect of the Left in more advanced economies is well documented in the literature, our results are novel in two ways. First, previous attempts to estimate the effect of government partisanship on inequality focus on the long-term electoral power of the Left. By contrast, we focus on contemporaneous effects of government ideology on inequality. Our study suggests that government policy – increased taxation, higher minimum wages and more generous direct transfers for the old – can have a contemporaneous positive impact on income equality. Second, there is an overwhelming consensus among regional experts that fiscal systems in the region are largely regressive (e.g., Holland 2018; Huber et al. 2006; Huber et al 2008; Ross-Schneider y Soskice 2009; Magaloni et al. 2016). Several scholars have also expressed skepticism about the capacity of Left parties to assist the poor and engage in “broad” redistribution (e.g., Holland and Schneider 2017; Schneider and Soskice 2009). Instead, we show that leftist administrations reduced inequality while simultaneously expanding both tax collection and public spending. In fact, this expansion was probably progressive, not regressive.

³⁶ The effect of the Left on total tax revenues becomes statistically significant for the static model under these alternative treatment definitions.

Was this redistribution sustainable? In the past, short-term improvements in the terms of trade fueled the implementation of redistributive fiscal policies that proved unsustainable in the long run (Dornbusch & Edwards, 1991). Similar “time-consistency” concerns may affect the legacy of the *Pink Tide*. Argentina is a case in point: the Kirchner couple expanded taxation drastically, raised the minimum wage, and expanded direct transfers. But, when commodity prices fell and external conditions worsened, the country faced several economic crises and rising poverty levels as a result of recurrent fiscal deficits. Other economies faced similar crises triggered by persistent fiscal deficits, including Brazil, Ecuador, and most notably Venezuela. In fact, inequality started to rise in some countries after 2012, while in the others the declining trend was smaller or nonexistent (Lustig, 2020). The decline in inequality that we document, however, was large (larger than the rise in inequality that took place in the 1990s) and, to some extent, unexpected (as suggested in the preceding paragraph).

In spite of the pervasive decline in inequality, several countries in Latin America continue to be among the most unequal in the world even if they were governed by the Left for a prolonged period of time: for example, Brazil and Chile. Furthermore, our analysis is based entirely on inequality trends measured with data from household surveys. We know that these surveys do not capture top incomes well. There is some evidence that when surveys are corrected for upper tail issues, the top income shares do not follow the pattern observed with household surveys. WID.World reports trends corrected for upper tail issues. Based on the results presented in this database, while the corrected Gini coefficient continued to show a decline for the period 2000-2012, the share of the top 10% and 1% grew at an average of 0.01% and 0.65%.³⁷ This suggests that the Left does not seem to have an impact on the concentration

³⁷ See <https://wid.world/es/series/>.

of income at the very top. However, further research is needed including assessing whether the results are robust to alternative correction methods beyond the one utilized by WID.World.

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Appendix for *The Pink Tide and Inequality in Latin America*

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A1. Alternative Data

Data on income inequality is often missing for some countries and years. We test the robustness of our results using the SWIID database. SWIID relies on the following data sources: OECD Income Distribution Database, the Socio-Economic Database for Latin America and the Caribbean generated by CEDLAS, and the World Bank, Eurostat, the World Bank's PovcalNet, the UN Economic Commission for Latin America and the Caribbean, national statistical offices around the world, and other sources. The Gini coefficients provided by SWIID are imputed and its main objective is to reach the maximum comparability of inequality data across countries and years. We obtain strikingly similar results, showing that the Left lowers the Gini index in both static and dynamic model.

Dependent Variable	<i>Ln(Gini)</i>	
Model	<i>Static</i>	<i>Dynamic</i>
Left ¹	-0.033** [0.012]	-0.006** [0.003]
Ln(ToT)	-0.039 [0.036]	0.000 [0.002]
Ln(Trade/GDP)	-0.055 [0.054]	0.001 [0.001]
Ln(High skilled/Low skilled)	-0.052 [0.042]	-0.001 [0.001]
Observations	261	260
Country FE	YES	YES
Period FE	YES	YES

Clustered standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Note 1: Left is equal to missing after left-governed countries go back to being governed by a non-left government.

Note 2: Left is equal to 1 after the first year of a left government.

Table A1. The Effect of Left on Inequality Using SWIID data

A2. Placebo Check

Here present results for a “placebo” test: we assign a placebo treatment four years before the Left came to office and drop country-observations with a leftist government from our sample. As expected, the placebo treatment does not have a statistically significant effect on inequality.

Dependent Variable	Ln(Gini)	Ln(Share of income top 10%)	Ln(Share of income 4,5,6 & 7 decile)	Ln(Share bottom 20%)	Ln(Share 90 cent/Share 10 cent)	Ln(CCT/GDP)	Ln(Social Pensions)	Ln(Minimum Wage)	Ln(Total Revenues / GDP)	Ln(Taxes on rents capital gains income and Profits/GDP)
Left placebo ¹	-0.026 [0.016]	-0.030* [0.016]	0.024 [0.018]	0.093 [0.072]	-0.102 [0.093]	0.105 [0.147]	0.610 [0.581]	-0.401 [0.385]	-0.032 [0.050]	0.030 [0.028]
Ln(ToT) ²	-0.066** [0.031]	-0.071* [0.039]	0.073* [0.040]	0.212** [0.084]	-0.247** [0.114]	3.203*** [0.428]	-4.680** [1.326]	-3.350** [1.119]	0.324 [0.187]	0.053 [0.044]
Ln(Trade/GDP) ³	-0.019 [0.048]	-0.032 [0.061]	0.034 [0.056]	-0.064 [0.125]	0.037 [0.162]	1.383* [0.708]	-1.428 [2.794]	-1.086* [0.578]	-0.124 [0.118]	0.204** [0.078]
Ln(High skilled/Low skilled) ⁴	-0.044 [0.055]	-0.032 [0.071]	0.042 [0.064]	0.173 [0.149]	-0.197 [0.170]	-1.529* [0.821]	3.081 [1.635]	1.688 [1.528]	-0.170 [0.123]	-0.026 [0.169]
Observations	157	153	153	153	153	75	50	51	163	163
Country FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Period FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
R2 Adjusted	0.748	0.719	0.720	0.764	0.758	0.774	0.237	0.946	0.666	0.918

Clustered standard errors at country-level in brackets.

*** p<0.01, ** p<0.05, * p<0.1

Note 1: The placebo treatment is assigned four periods before the Left takes office and we drop the effectively treated country-year observations.

Note 2: Ln(ToT) is the logarithm of Terms of trade for each country.

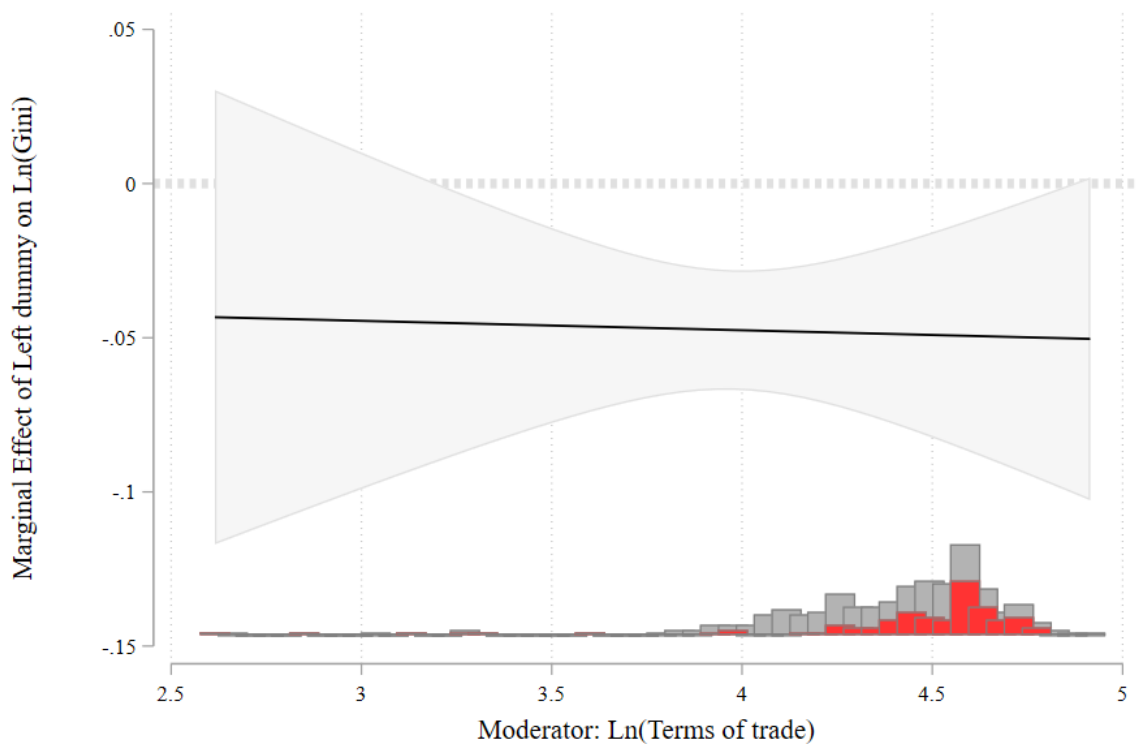
Note 3: Ln(Trade/GDP) is the logarithm of the ratio between all trade and GDP for each country.

Note 4: Ln(High skilled/Low skilled) is the logarithm of the ratio between high skilled and low skilled workers.

Table A2. The Effect of the Placebo Treatment on Inequality and Policy

A3. Terms of trade and conditional effect of left governments

Figure A1 shows the moderating effect of the Left across levels of the Terms of trade variable. The histogram in the figure shows the distribution of “treated” (red) and “untreated” (grey) observations across different values of the terms of trade variable. For most of the range with sufficient data, the coefficient of Left is negative and significant.



Notes: The black solid line represents the linear marginal effect of Left incumbency on the log of the Gini index at each point of the moderator variable, $\text{Ln}(\text{Terms of trade})$. The red bars represent the distribution of Left governments and the grey bars the non-Left governments across the moderator variable.

Figure A1. The Marginal Effect of Left on Inequality Over Terms of Trade

A4. Long-run Effects of Left

Table A3 shows results for the cumulative effect of being governed by the Left after one, four, and eight years.

Dependent Variable	Ln(Gini)	Ln(Share of income top 10%)	Ln(Income share middle deciles 4 to 7)	Ln(Share of income bottom 20%)	Ln(Income share centile 90/Income share centile 10)	Ln(CCT's)	Ln(UCT's)	Ln(Social Pensions)	Ln(Real minimum wage)	Ln(Total tax revenues as % of the GDP)	Ln(Total tax revenues on rents income profits and capital gains as % of the GDP)
Left effect one year after	-0.0216** (0.00926)	-0.0280** (0.0112)	0.0256*** (0.00993)	0.0457** (0.0193)	-0.0649** (0.0256)	-0.0742 (0.116)	-0.496 (0.354)	0.361* (0.195)	0.0869** (0.0345)	0.0405** (0.0164)	0.0573 (0.0438)
Left effect four years after	-0.0478** (0.0200)	-0.0596** (0.0236)	0.0530*** (0.0201)	0.0958** (0.0393)	-0.134*** (0.0516)	-0.130 (0.205)	-0.709 (0.454)	0.649* (0.368)	0.205** (0.0817)	0.0962** (0.0386)	0.124 (0.0952)
Left effect eight after	-0.0738** (0.0300)	-0.0877** (0.0347)	0.0759*** (0.0284)	0.139** (0.0558)	-0.191*** (0.0726)	-0.159 (0.252)	-0.759 (0.468)	0.808* (0.481)	0.342** (0.141)	0.162** (0.0643)	0.188 (0.145)
Left effect in the long-run	-0.138** (0.0564)	-0.136** (0.0576)	0.108*** (0.0417)	0.205** (0.0823)	-0.269** (0.107)	-0.172 (0.276)	-0.765 (0.469)	0.895 (0.567)	1.147 (1.206)	0.610** (0.311)	0.319 (0.275)

Clustered standard errors in parentheses

* p<0.1 ** p<0.05 *** p<0.01

Table A3. Long-run Effects of Left on Inequality and Policy

A5. Extended results

In the following links we present the results for all the subsamples in Figure 2 for each one of our dependent variables using both models (static and dynamic).

Table A4. Extended results for the static model

[STATIC EXTENDED RESULTS](#)

Table A5. Extended results for the dynamic model

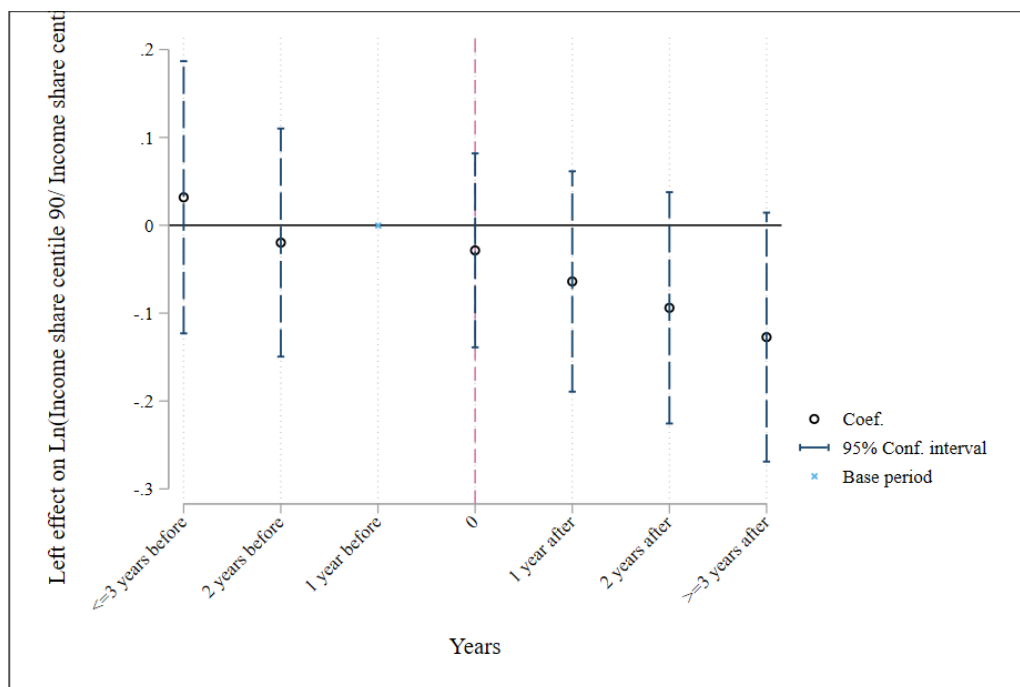
[DYNAMIC EXTENDED RESULTS](#)

A6. Parallel Trend Tests

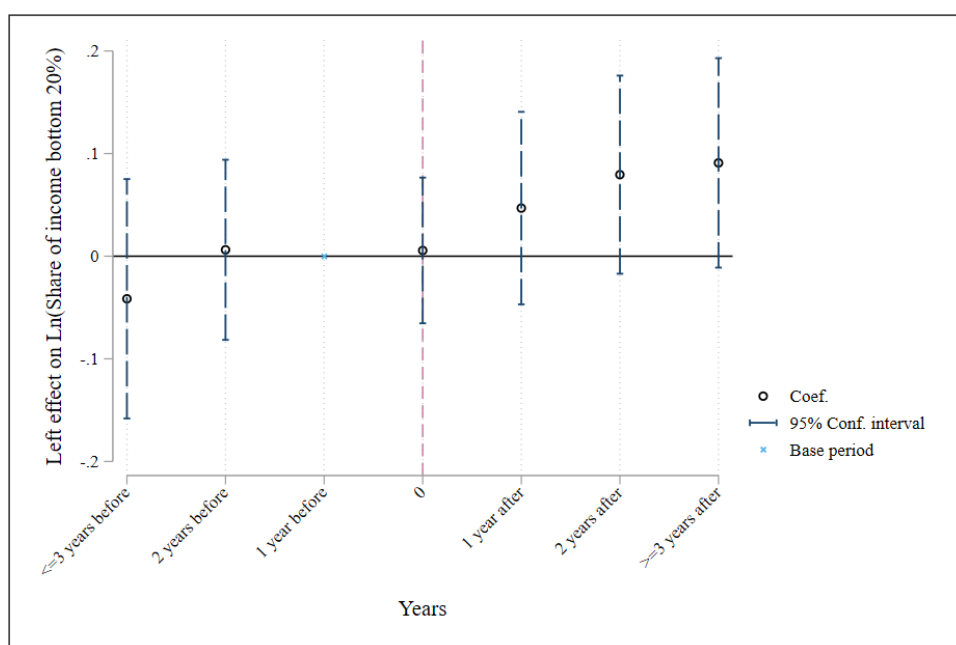
Below we show plots for the parallel trend regression tests for all our dependent variables. In all cases, each coefficient corresponds to the change in the natural logarithm of the dependent variable to the change one year before the leftist government begins, relative to the base period. The red dashed line represents the year where the Left government begins. The regression controls for the level of the terms of trade, the ratio between total trade and the GDP, and the ratio between high skilled and low-skilled workers.

Figure A2. Parallel trend assumption: Results for all variables

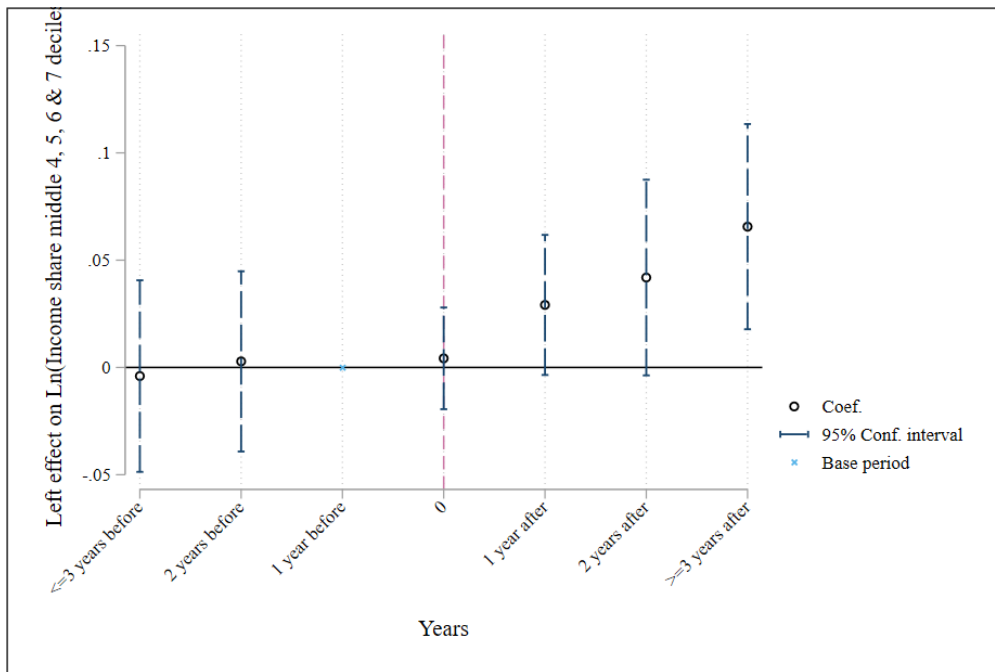
Panel 1. Income share centile 90 over income share centile 10



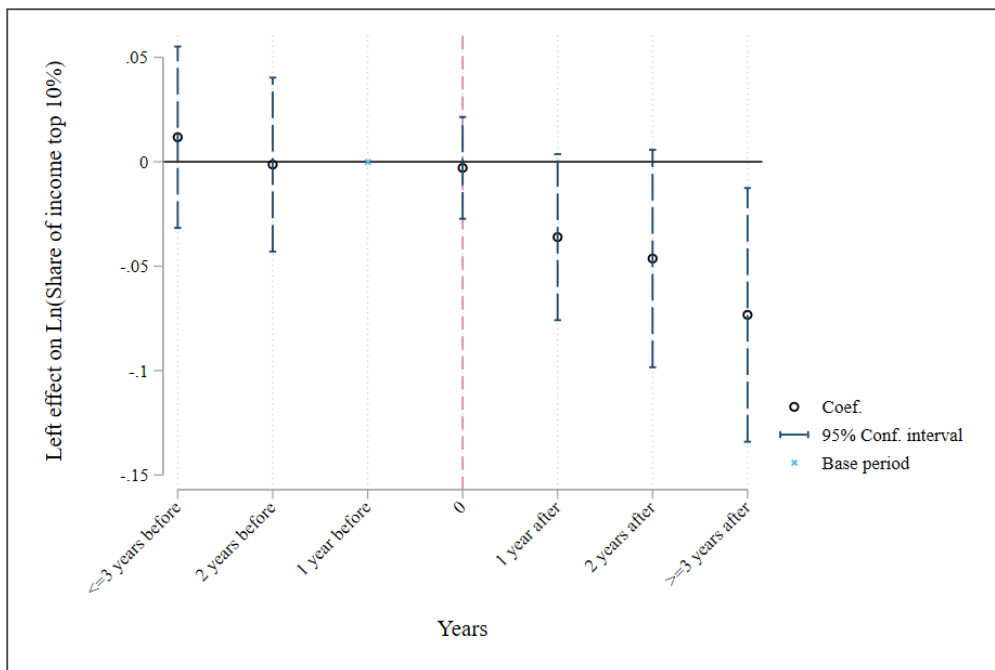
Panel 2. Income share bottom 20%



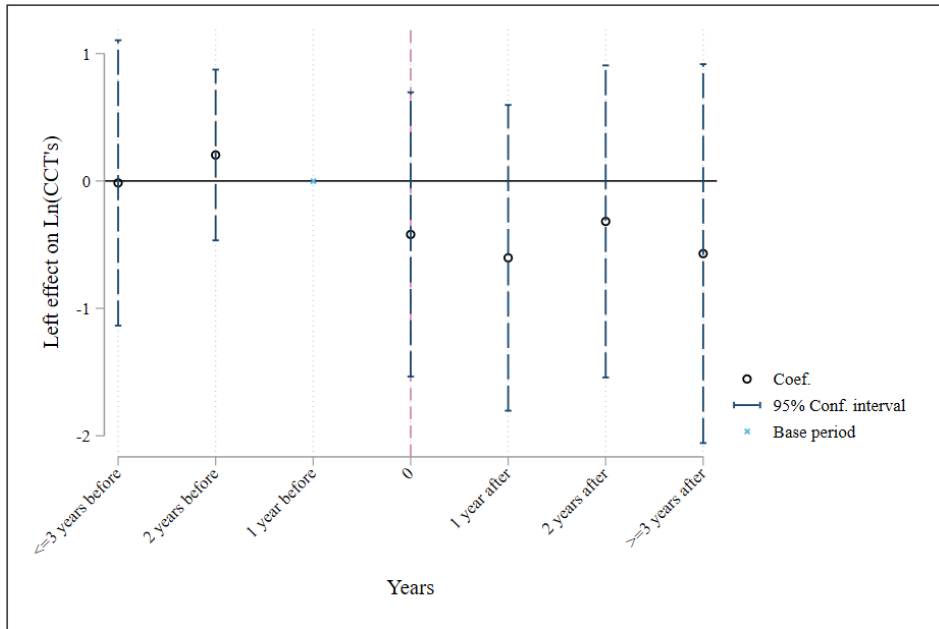
Panel 3. Income share middle deciles (4, 5, 6 & 7)



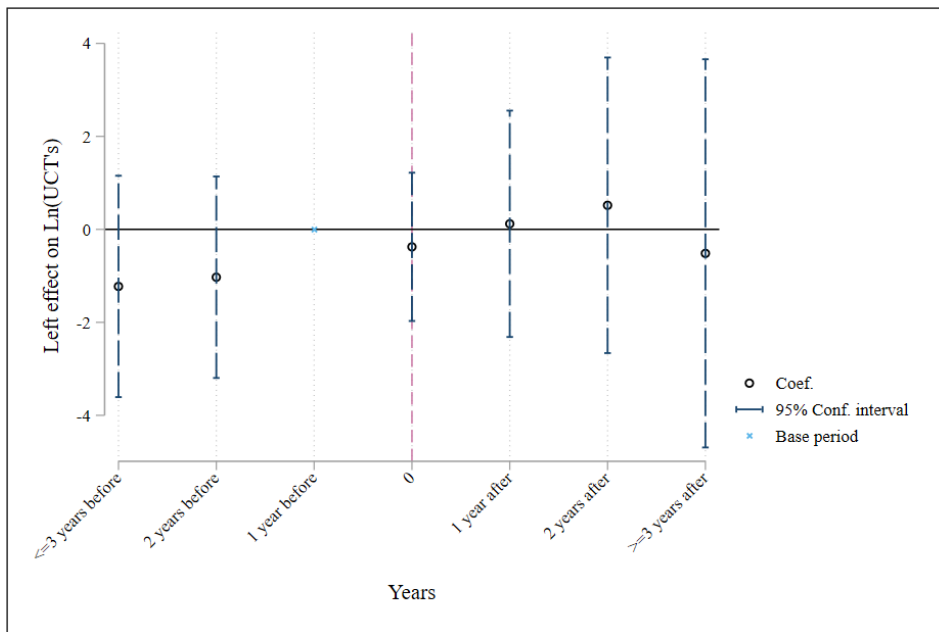
Panel 4. Income share top 10%



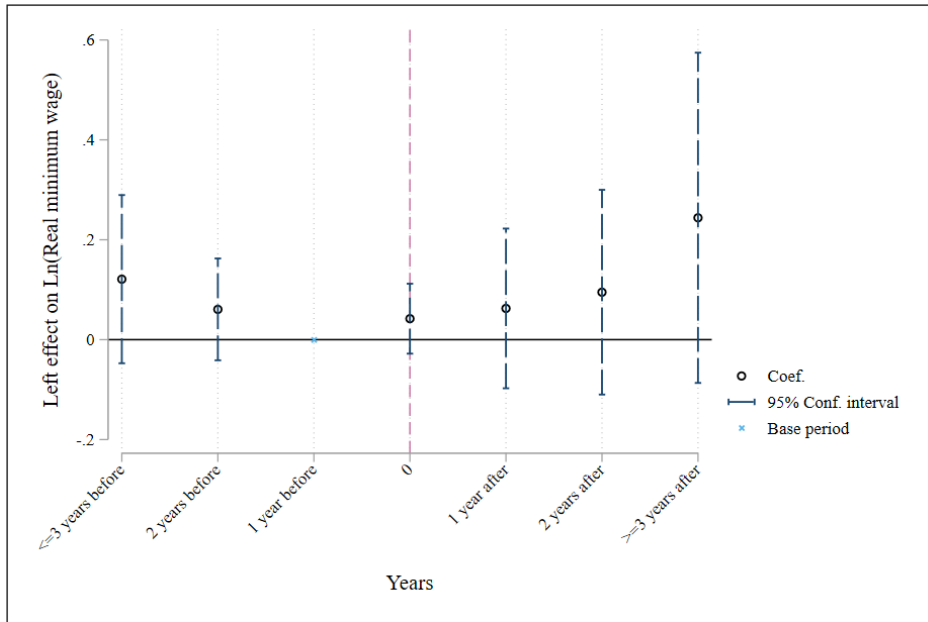
Panel 5. Conditional Cash Transfers



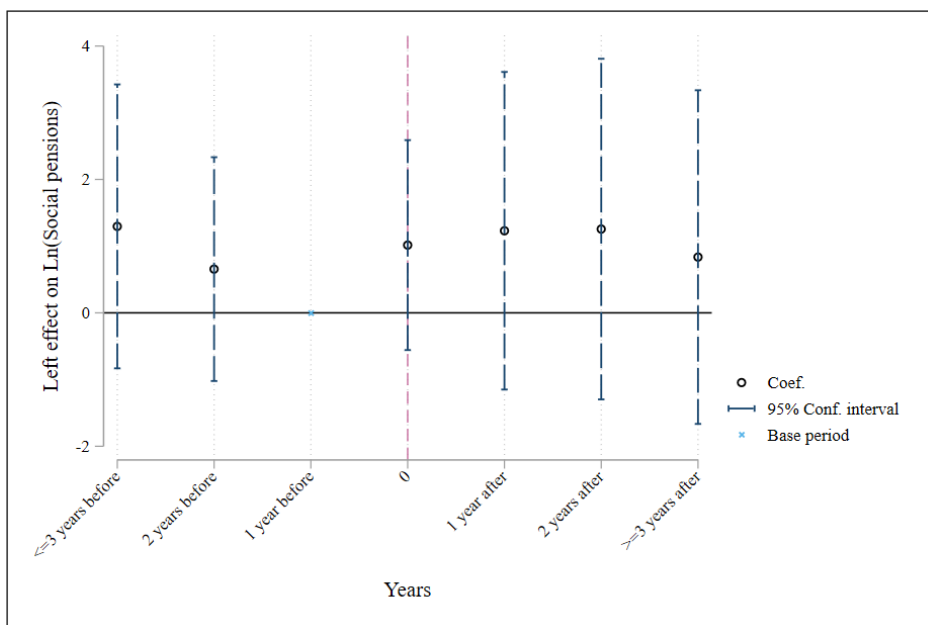
Panel 6. Unconditional Cash Transfers



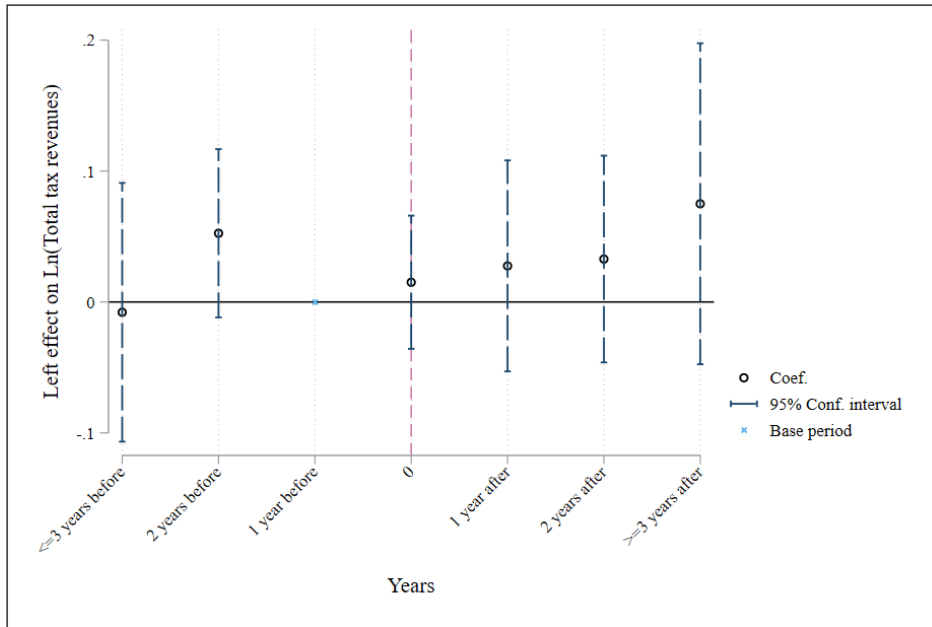
Panel 7. Real Minimum Wage



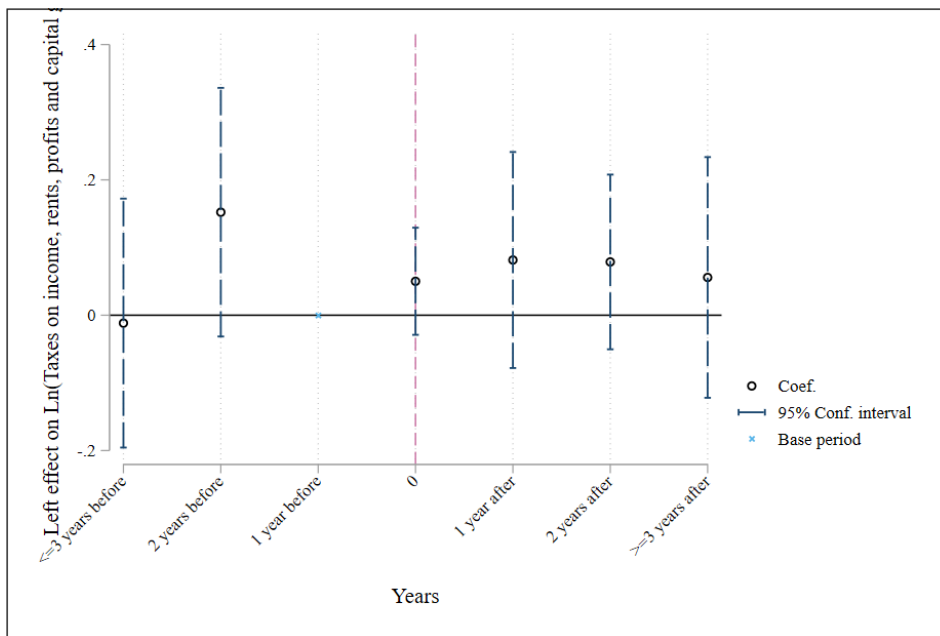
Panel 8. Social pensions as % of the GDP.



Panel 9. Total tax revenues as % of the GDP



Panel 10. Taxes on rents, income, profits and capital gains as % of the GDP.



A7. Data Availability

In the table attached, we present the data availability for each dependent variable used in our paper.

Table A6. Data availability

DATA AVAILABILITY

A8. Serial Correlation Test

As discussed in the paper, there are reasons to believe that there is serial correlation in our variables. In Table A7, we present the serial correlation test for the residuals of the static model for all the variables we use as outcome variables. As expected, we found one or higher order of serial correlation in all our variables. In the static model, we account for this issue by using clustered standard errors. However, serial correlation may also introduce bias in our point estimates. To account for this possibility, we estimate a dynamic model (using the difference and system generalized method-of-moments estimator) where we explicitly account for the potential serial correlation in the dependent variable.

P-value of the Ljung-Box serial correlation test on the static models for one to six lags											
Lags	Ln(Gini)	Ln(Real minimum wage)	Ln(Income share centile 90/Income share centile 10)	Ln(Income share middle 4, 5, 6 & 7 deciles)	Ln(Share of income bottom 20%)	Ln(Share of income top 10%)	Ln(CCT's)	Ln(UCT's)	Ln(Social pensions)	Ln(Total tax revenues)	Ln(Taxes on income, rents, profits and capital gains)
1	2.71E-16	9.1E-26	3.63E-16	1.7E-12	8.81E-16	1.22E-12	2.12E-07	0.000831	0.089165	1.74E-15	1.48E-09
2	8.99E-07	3.34E-17	1.02E-07	5.22E-05	1.38E-07	8.28E-05	0.220165	0.583201	0.89543	4.87E-07	0.000376
3	0.003714	5.92E-09	0.003741	0.003464	0.003877	0.01957	0.620727	0.10729	0.416347	0.002399	0.258878
4	0.105785	0.000417	0.177476	0.191408	0.184565	0.230255	0.279076	0.047321	0.008841	0.011991	0.118374
5	0.582337	0.465518	0.481091	0.746295	0.547396	0.900849	0.157511	0.00576	0.327329	0.27889	0.368366
6	0.467894	0.55319	0.606595	0.571085	0.484692	0.445756	0.123943	0.246358	0.738312	0.910165	0.389631

Notes: We test if the autocorrelation at each lag order is zero, but we allow for nonzero autocorrelations at lower lag orders. We run the test with the residuals of the static model.

Table A7. Serial correlation test for the residuals of the static model

A9. Computation of long-run effects

Our baseline dynamic model (excluding year fixed effects, w.l.o.g) is:

$$Y_{i,t} = \beta_0 + \beta_1 L_{i,t} + \rho Y_{t-1} + \epsilon_{i,t} \quad (1)$$

Henceforth, we will assume a transition to a left government in the period t . As a result, $L_{i,j} = 1 \quad \forall j > t$, hence $L_{i,t} = L_{i,t+s} = 1 \quad \forall s \geq 0$.

Now, one year after t , equation (1) would transform into:

$$Y_{i,t+1} = \beta_0 + \beta_1 L_{i,t+1} + \rho Y_t + \epsilon_{i,t+1} \quad (2)$$

Replacing equation (1) into equation (2):

$$Y_{i,t+1} = \beta_0 + \beta_1 L_{i,t+1} + \rho (\beta_0 + \beta_1 L_{i,t} + \rho Y_{t-1} + \epsilon_{i,t}) + \epsilon_{i,t+1} \quad (3)$$

Reordering equation (3) we get:

$$Y_{i,t+1} = \beta_0(1 + \rho) + \beta_1 L_{i,t+1} + \beta_1 \rho L_{i,t} + \rho^2 Y_{t-1} + \rho \epsilon_{i,t} + \epsilon_{i,t+1} \quad (4)$$

Given the transition since period t , $L_{i,t+1} = L_{i,t} = 1$ we can rewrite equation (4):

$$Y_{i,t+1} = \beta_0(1 + \rho) + \beta_1 (1 + \rho)L_{i,t} + \rho^2 Y_{t-1} + \rho \epsilon_{i,t} + \epsilon_{i,t+1}$$

Now if we repeat the process to Y_{t+2} , it is easy to derive the following expression:

$$Y_{i,t+2} = \beta_0(1 + \rho + \rho^2) + \beta_1 (1 + \rho + \rho^2)L_{i,t} + \rho^3 Y_{t-1} + \rho^2 \epsilon_{i,t} + \rho \epsilon_{i,t+1} + \epsilon_{i,t+2}$$

The coefficient $\beta_1 (1 + \rho + \rho^2)$ represents the cumulative effect of being governed by the Left 2 years after the beginning of the government. This example can be generalized for

any time horizon. If we want to estimate the cumulative effect T periods after the Left came to office, we can compute the following equation:

$$Y_{i,t+T} = \beta_0 \sum_{j=0}^T \rho^j + \beta_1 \sum_{j=0}^T \rho^j L_{i,t} + \rho^{T+1} Y_{t-1} + \sum_{j=0}^T \rho^{T-j} \epsilon_{i,t+j} \quad (5)$$

It is easy to derive the formula in footnote 25 to calculate “long-run” effects from equation (5). As $j \rightarrow \infty$ the summation $\sum_{j=0}^T \rho^j$ converges to $\frac{1}{1-\rho}$, given that it is a geometric summation. Also, given a finite value of $Y_{i,t-1}$ and, if the stability condition is satisfied ρ within the unit circle ($|\rho| < 1$), the term $\rho^{T+1} Y_{i,t-1} \rightarrow 0$. Similarly, $\sum_{j=0}^T \rho^{T-j} \epsilon_{i,t+j} = \rho^T \epsilon_t (1 + \rho^{-1} L^{-1} + (\rho^{-1} L^{-1})^2 + \dots + (\rho^{-1} L^{-1})^T)$, and when $T \rightarrow \infty$, $(1 + \rho^{-1} L^{-1} + (\rho^{-1} L^{-1})^2 + \dots + (\rho^{-1} L^{-1})^T) = \left(\frac{1}{1 - \rho^{-1} L^{-1}} \right)$, and $\rho^T \rightarrow 0$. As a result, the equation (5) when $j \rightarrow \infty$ converges to:

$$Y_{i,t+\infty} = \frac{\beta_0}{1-\rho} + \frac{\beta_1}{1-\rho} L_{i,t} \quad (6)$$

Now we can see that $\frac{\beta_1}{1-\rho}$ is the limiting value of an infinite iteration of the equation 1, and it represents the cumulative effect of the change from non-left to left.

A10. Additional Descriptive Statistics

Table A8 includes country-levels statistics disaggregated at the year level for the average Gini and GDP per capita indexes.

Table A8. Additional descriptive statistics

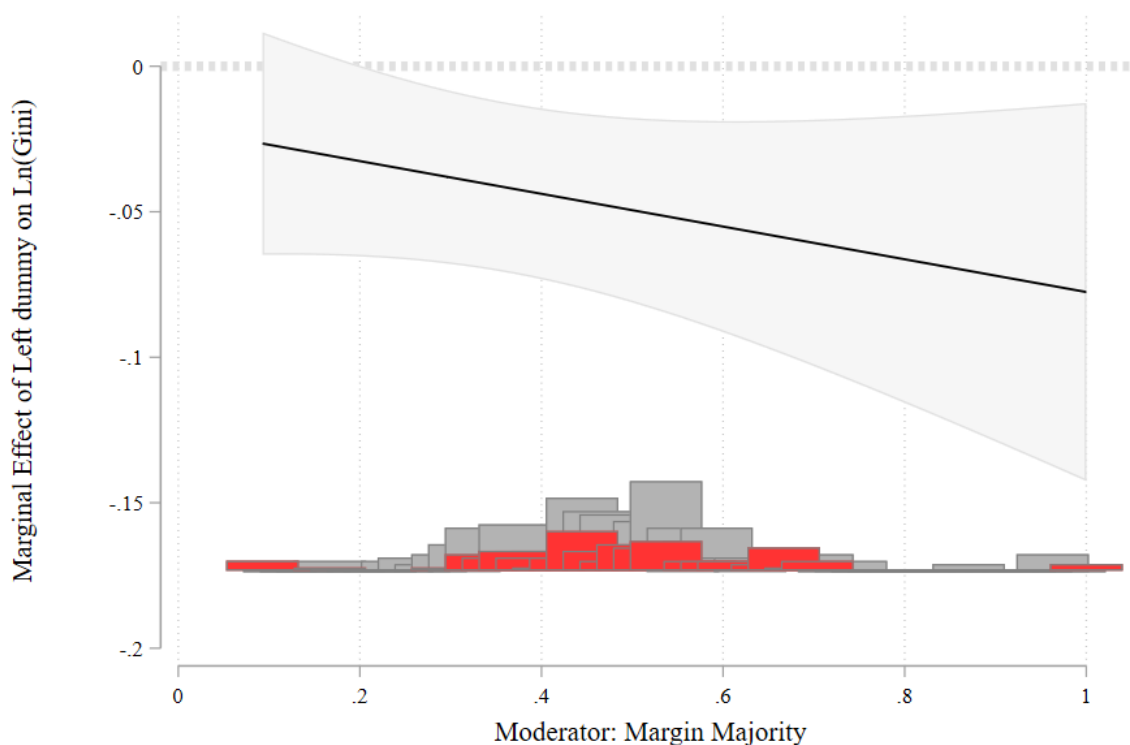
ADDITIONAL DESCRIPTIVE STATISTICS

A11. Legislative control of left governments

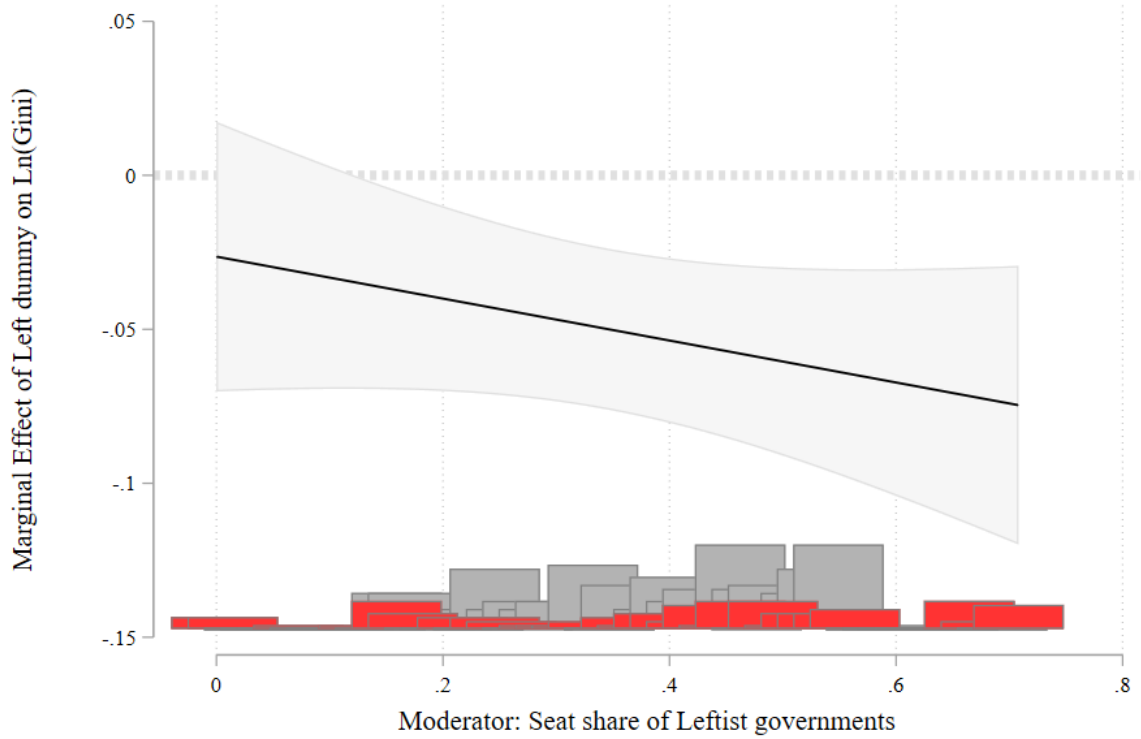
Figure A3 shows the moderating effect of the Left across levels of the control of the congress. The histogram in the figure shows the distribution of “treated” (red) and “untreated” (grey) observations across different values of the moderator variable. For most of the range with sufficient data, the coefficient of Left is negative and significant.

Figure A3. The Marginal Effect of Left on Inequality Over the Legislature
Control by the government

Panel 1. Moderator: Margin majority



Panel 2. Moderator: Seat share of the leftist governments



Notes: The margin majority is defined as the fraction of seats held by the government. It is calculated by dividing the number of government seats by total (government plus opposition plus non-aligned) seats. The seats share is calculated as total seats of the government divided by the total seats in the congress.

A12. Different definitions of left

In table A9 we present the results for static and dynamic model using different definitions of left. In the main analysis, we dropped observations from “treated” countries after the Left is replaced by a non-leftist president. Then in the two remaining definitions, we recode our main variable in two ways: we code all observations as treated after a country elects a left-wing government, regardless of what happens later; and we code observations according to which government is in office that year – i.e., we code Left-governed countries with a zero in the government ideology variable once the Left is voted out of office.

Dependent Variable		Ln(Gini)	Ln(Share of income top 10%)	Ln(Share of income 4,5,6 & 7 decile)	Ln(Share bottom 20%)	Ln(Share 90 cent/Share 10 cent)	Ln(CCT/GDP)	Ln(UCT/GDP)	Ln(Social Pensions)	Ln(Minimum Wage)	Ln(Total Revenues / GDP)	Ln(Taxes on rents capital gains income and Profits/GDP)
Static	Left baseline 1 ¹	-0.0488*** (0.0148)	-0.0484** (0.0180)	0.0424** (0.0157)	0.0885* (0.0481)	-0.115* (0.0616)	-0.433 (0.605)	1.325 (0.787)	0.842 (0.998)	0.0522 (0.0971)	0.0423 (0.0420)	0.0738 (0.0954)
	Left alternative 1 ²	-0.0582*** (0.0189)	-0.0618** (0.0218)	0.0553*** (0.0189)	0.124** (0.0562)	-0.157** (0.0720)	-0.885 (0.620)	0.870 (0.727)	0.132 (0.393)	0.0972 (0.117)	0.0927* (0.0493)	0.0408 (0.103)
	Left alternative 2 ³	-0.0522*** (0.0149)	-0.0571*** (0.0175)	0.0504*** (0.0144)	0.117** (0.0527)	-0.150** (0.0669)	-0.687 (0.528)	0.595 (0.587)	0.0839 (0.347)	0.138 (0.0922)	0.0800* (0.0458)	0.0369 (0.0906)
Dynamic (System GMM)	Left baseline 1 ¹	-0.0113** (0.00488)	-0.0148** (0.00596)	0.0137** (0.00536)	0.0243** (0.0104)	-0.0347** (0.0139)	-0.0423 (0.0661)	-0.312 (0.238)	0.204* (0.109)	0.0443** (0.0176)	0.0206** (0.00841)	0.0300 (0.0230)
	Left alternative 1 ²	-0.0110** (0.00472)	-0.0143** (0.00625)	0.0129** (0.00552)	0.0224** (0.00887)	- 0.0329*** (0.0124)	-0.0182 (0.0662)	-0.386 (0.280)	0.147* (0.0886)	0.0380* (0.0212)	0.0222*** (0.00752)	0.0237 (0.0200)
	Left alternative 2 ³	-0.0126*** (0.00485)	-0.0177*** (0.00608)	0.0149*** (0.00514)	0.0209** (0.00880)	-0.0294** (0.0115)	-0.0507 (0.0715)	-0.438 (0.318)	0.142* (0.0859)	0.0484** (0.0217)	0.0242*** (0.00795)	0.0355* (0.0209)

All regressions include the controls of our specification in equation (1). The static model includes country and year fixed effects. The dynamic model includes year fixed effects.

*** p<0.01, ** p<0.05, * p<0.1

Note 1: Left is equal to missing after left-governed countries go back to being governed by a non-left government.

Note 2: Left is equal to 1 after the first year of a left government.

Note 3: Left is equal to 1 when a left government is in office and 0 when a non-left government is in office.

Table A9. Robustness Checks: Left definition

A13. Coding of left definition

Our main independent variable is a dummy variable that reflects the ideology of the government. We classify governments as Left and non-Left using the updated ideology score developed by Baker and Greene (2011). This score is based primarily on an expert survey conducted by Wiesehomeier and Benoit (2009) (W-B) that asked respondents to locate parties on a general left-right dimension. Baker and Greene complement this dataset with information from Pop-Eleches (2009) (PE), Coppedge (1998), and their assessments. As we explain in the main text, we code parties with the value they receive the first time they enter Baker and Greene's sample and maintain that score throughout.

Pop-Eleches assigns to each party one of the following categories: left (L), center-left (CL), center (C), center-right (CR), and right (R). To assign a score, Baker and Greene match each party in this classification with the W-B score and impute the W-B missing scores with the mean score for each category (L, CL, C, CR, R) for the matched parties. The resulting mean value for each category are the following: L=5.7; CL=7.9; C=11.6; CR=15.0; R=16.7. In the main text, we code parties as Left if they have a score equal to or less than nine. This threshold separates the Nicaraguan government of Daniel Ortega, from the *Frente Sandinista por la Liberacion Nacional* (2007-present), a party with clearly leftist roots (with a W-B score of 8.55), from the Fernando De la Rúa administration (1999-2001), from the centrist *Alianza* between UCR and FREPASO in Argentina (9.05). To test the sensitivity of this classification, below we present results using different thresholds for the classification, using the score mean values from the match between Pop-Eleches and W-B classifications for L and CL, respectively.