Can fiscal rules affect income inequality?

An empirical investigation for Latin America

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Abstract

Implementing fiscal rules has become a widespread mechanism to achieve better control over macroeconomic aggregates and improve fiscal sustainability. However, while the analysis of the budgetary effects of fiscal rules is well documented, its redistributive dimension has been explored to a lesser extent. This paper analyses the effect of implementing fiscal rules on income inequality in four Latin American countries (Brazil, Chile, Colombia, and Mexico). Using the synthetic control approach, I find evidence that the implementation of fiscal rules is not likely to result in increased levels of income inequality. This result is robust to different measures of income inequality. Further, with a country-specific analysis of the economic and legal design of the enforced fiscal rules, I show that consistency with the economic framework in force is essential and best explains the lack of social costs. Overall, the results suggest that any economic stigma that may prevent countries from implementing fiscal rules because of unwanted side effects on income inequality is unwarranted.

KEYWORDS: Fiscal rules, Inequality, Latin America, Synthetic control

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1 Introduction

The implementation of fiscal rules has increased rapidly both in advanced and emerging economies since the 1990s. This long-lasting constraint on fiscal policy has helped address increasing debt levels and financing costs through numerical limits on budgetary aggregates (Lledó et al., 2017). They can also serve other objectives such as containing government size and supporting inter-generational equity (Berganza, 2012). The reasons for adopting a fiscal rule are diverse and depend on several factors such as the objectives to be achieved, for example, they can be implemented to help in the economic consolidation processes or as a final step of the same, or during bad (normal) times to gain (conserve or increase) fiscal space. However, regardless of their motivations, in most cases, the design and implementation of the rules are silent on the composition of the adjustment needed to comply. Given that in their nature they constrain fiscal policy aiming to reduce government deficits and debt accumulation, they can end up affecting public investment and creating incentives to cut spending with long-term pay off[1]. The fact that fiscal rules are silent about the composition of the adjustment has led to the economic stigma that its implementation can breed social costs derived from the unwanted side-effects on investment, long-term growth and inequality. For instance, it has been shown that cuts in public investment can lead to higher income inequality in developing countries (Furceri and Li, 2017) and higher prices in infrastructure services affecting mainly poor people relative to the rich (Cavallo and Daude, 2011).

Research on fiscal rules mainly encompasses analysis of its effect on macroeconomic aggregates and its ability to achieve fiscal discipline, focusing on their budgetary effect. The study of its distributional effects has been discussed to a lesser extent. This paper focuses on the analysis of possible social costs through income inequality. More specifically, I ex-

[1]The reasoning behind this is linked with the distributional and growth-enhancing potential of public investment. For instance, the bias in spending composition results in reducing capital expenditure often because it is more admissible than reducing current expenditure (see Ardanaz and Izquierdo (2017)), which in turn affects growth and welfare.

plore whether the implementation of fiscal rules has been inconsistent with the inequality reduction strategies of governments in four Latin American countries (i.e. Brazil, Chile, Colombia and Mexico). The special approach in income inequality is because historically, Latin America (LA) has been characterized by high levels of inequality, and several of its countries have disparities in income distribution that are among the highest in the world (see ECLAC (2019)). Being inequality a first-order problem in the agenda of Latin American countries, it is worth investigating the effects of fiscal policy tools in this matter.

Broadly, fiscal rules have represented a whole revolution for controlling large macroeconomic aggregates since they are considered a successful strategy to strengthen fiscal consolidation because they fight the deterioration of public finances. They are desirable because they contribute to creating fiscal discipline (Kopits and Symansky, 1998). In emerging market and developing economies such as Latin America, fiscal rules have been as well adopted as a response to create fiscal space and provide a credible medium-term anchor for public finances, but also at times of fiscal crisis or debt distress. Further, it is also a region that has been characterized by its procyclical bias that contributes to macroeconomic volatility, increases fiscal vulnerability, hampers growth, and destabilizes welfare outcomes. In this regard, fiscal rules have also helped, in some cases, with a transition towards countercyclical policies, especially by seeking to facilitate the operation of automatic stabilizers and enhance credibility (Perry, 2003). However, its implementation can also be affected by the intrinsic characteristics of the region's economies, such as difficulties to stabilize public expenditure, significant development needs, and a volatile macroeconomic environment (Eyraud, Lledó, Dudine, and Peralta, Eyraud et al.).

This paper focuses on four Latin American countries: Brazil, Chile, Colombia and Mexico. This choice is motivated by several factors. First, these four economies have represented

around 71.6 per cent of the GDP of the region[2]. Second, they have implemented different types of fiscal rules (or combination of rules) around the same time (the early 2000s). This allows capturing the heterogeneity created by the different kinds of fiscal rules and each country's economic and political environments. Third, part of the motivation for these countries to adopt fiscal rules reflects intrinsic features of the region, such as fighting procyclicality, reducing the volatility of natural resource rents, and increasing political commitment in the conduct of fiscal policy. Fourth, these four countries have registered similar levels of inequality. On the one hand, the Gini index for Brazil, Chile, Colombia and Mexico before taxes and transfers in 2014 was about 0.599, 0.518, 0.515 and 0.472, respectively. These values are relatively high relative to the average for some other Latin American countries[3] which is about 0.46. On the other hand, another measure of inequality is the Palma Ratio, which can be read as how much income earns the richest 10 per cent over the poorest 40 per cent. While for Brazil, Chile, Colombia and Mexico, the Palma ratio is about 3.38, 3.28, 3.93 and 2.99, respectively, the average ratio for some Latin American countries is 2.7, meaning that the reachest 10 per cent of these economies earn almost three times the income of the poorest 40 per cent, highlighting a big difference relative to the chosen countries. Finally, data availability mostly on inequality was sufficiently large and complete for carrying an analysis of this kind for these countries.

In this way, the analysis of distributional effects of fiscal rules in a region like LA is highly conditioned by the nature of its fiscal outcomes. It can be argued that the nature of fiscal policy has been traditionally procyclical (Ardanaz and Izquierdo (2017), Gavin et al. (1996), Perry (2003)), which in turn has contributed to macroeconomic volatility, depression on investment in real and human capital, increased fiscal vulnerability, and also hampers growth,

[2]Total Annual Gross Domestic Product (GDP) at current prices in dollars from 1990 to 2018 (CEPALSTAT Databases)

[3]Simple average of the market Gini index of Argentina, Bolivia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Panama, Paraguay, Peru, Uruguay.

affecting the poor[4]. In addition, the persistent high volatility in the region, combined with political economy problems faced by governments, cause the fiscal policy to tend to consecutive deficits over time, which also threatens fiscal sustainability. Hence, the implementation of fiscal rules has been urged to help with this fiscal indiscipline situation and create fiscal space and achieve macroeconomic stability. Yet, suppose the adjustment is too severe. In that case, it can lead to high economic and social costs over time due to the systematic bias against public investment resulting in higher inequality, that at the same time is another source of macroeconomic imbalances.

In fact, inequality in emerging economies is deepened by the public investment bias and the side-effects on long-term growth since they both have distributional effects, and LA is no exception. Income distribution is one of the many ways to measure inequality, and it is also the one that this paper focuses on. However, the concept of inequality encompasses several approaches; it can be identified in economic or social terms, leading to other inequality measures, such as gender inequality, wealth inequality, and inequality of opportunity. In essence, it refers to how resources are distributed, or more precisely, unevenly distributed. Given that it is problematic on moral, ethical and economic grounds, a wide variety of research and policies are focused on narrowing the disparities in the region. Both academic and policy fields have been devoted to these issues by assessing policies aiming at reducing inequality[5]. In this regard, fiscal policy has approached this issue by studying how different policies and instruments can help achieve redistributive objectives. However, the relationship between fiscal rules and inequality going beyond implementing the usual fiscal tools remains unexplored.

This paper contributes to the literature by exploring whether the implementation of fiscal

[4]In addition to the negative effect that procyclicality has on long-term growth, it affects the poor breeding higher levels of poverty when they do not have enough human capital to adapt downturns in labour markets, or finding ways to smooth consumption. Similarly, procyclicality also creates a perverse relation between volatility and poverty, education and income distribution (Perry, 2003)

[5]See Alesina and Perotti (1996); Ardanaz et al. (2019); Bértola et al. (2015); Bértola and Williamson (2017); Junquera (2017); Kacef and Bárcena Ibarra (2011)

rules has increased inequalities or not. To know whether the fiscal rules adopted in these four Latin American countries had redistributive effects in terms of inequality, we have to ask ourselves what would have been the level of inequality in the absence of such policies. Therefore, the methodology is based on the construction of a counterfactual for each of these countries (Brazil, Chile, Colombia and Mexico) from 1980-2015. This is the first time, to my knowledge, that this technique has been applied to study the links between the different types of fiscal rules and income inequality. Using the synthetic control method proposed by Abadie and Gardeazabal (2003) I find evidence that implementing fiscal rules in these countries has not necessarily affected income inequality levels. This result is robust to different measures of inequality. On the contrary, the results suggest that the type of fiscal rule and its design and implementation in each country best explain the absence of possible effects on inequality or other social costs (mostly because governments are constitutionally bound to respect certain types of public investment). This paper's results are also consistent with those studies that find the implementation of fiscal rules desirable as long as their design respects (or even protects) the allocation of resources to provide public services, often established in the countries' Constitution.

The remainder of the paper is organized as follows. Section 2 presents the literature review. Section 3 provides a brief review on the extent of how fiscal policies have affected income inequality. Section 4 presents the methodology and data used. Section 5 contains the core of the new empirical evidence on the links between income inequality and fiscal rules implementation. Section 6 address some robustness checks, while Section 7 draws some concluding remarks.

2 Literature Review

Fiscal rules have a significant effect on fiscal performance, and its assessment has been focused on its budgetary impact. There is a consensus in the literature about the effectiveness of fiscal rules in constraining fiscal policy. That is why usually, their analysis is on the impact they can have on variables such as the fiscal balance and debt, spending or income ratios (Cottarelli et al., 2009; Schaechter et al., 2012; Lledó et al., 2017; Caselli et al., 2018; Eyraud, Lledó, Dudine, and Peralta, Eyraud et al.). Because the economy of each country conditions the adjustment needed to comply with fiscal rules, another strand of the literature has focused on the implementation of fiscal rules on emerging markets and developing economies highlighting differences in its performance between economies (Kopits, 2004; Combes et al., 2019; Ardanaz et al., 2021). For instance, research on fiscal rules and fiscal performance in Latin America includes procyclicality, political economy and political commitment, natural resources rents and volatility (Berganza, 2012; Ardanaz et al., 2019)

Regarding the analysis of the possible social costs that the relationship between fiscal rules and the different types of social costs it can breed, several factors should be considered. For instance, the inflexibility and/or the inefficiency of spending play an essential role in determining how much public investment can be affected. If so, it becomes relevant to design policies that protect spending composition, especially in fiscal adjustment periods. In the same lines, changes in the income distribution need to be considered and treated within the socio-economic context in which they take place. Given that fiscal policy remains a redistribution tool, there is a vast literature linking fiscal policy and income inequality in both academic and policy fields (Bastagli et al., 2012; Clements et al., 2015). Nevertheless, the existence of social costs varies across countries and economies. For instance, some work has been done for Europe on the links between fiscal rules and welfare spending (Penner, 2001); expenditures on social protection (Nerlich and Reuter, 2013); the ratio of social transfers

to government consumption (Dahan and Strawczynski, 2013); and crowding-out effects on health care subsidies (Braendle and Colombier, 2016). Although there is no consensus in the literature about fiscal rules' social consequences, most of these works find a negative effect. Conversely, Ardanaz et al. (2021) show that for advanced and emerging economies, fiscal rules are a tool to counteract the bias against public investment if in its design fiscal policy is flexible enough, so governments can preserve investment, directly or indirectly, after unexpected shocks without penalizing capital expenditures.

Nevertheless, concerning the effects of fiscal rules on income inequality specifically, little has been investigated. Combes et al. (2019) highlight at least three transmission mechanisms through which this effect can transit. First, by affecting the fiscal balance, second, through fiscal consolidation programs, and third, by affecting procyclicality and governments' borrowing capacity. Although these mechanisms are not new in the literature, and fiscal rules and their design and implementation have been shown to affect various dimensions of fiscal policy, there is no consensus in the literature on its effect on income inequality. On the one hand, Hartwig and Sturm (2019) try the hypothesis of whether, specifically, fiscal rules breed inequality focusing on European Union countries. With a set of fiscal rules dummy variables, they find that fiscal rules implemented for considerable consecutive periods significantly affected inequality (meaning that they raise income inequality). Conversely, Combes et al. (2019) study the impact of fiscal rules on inequality for developing countries finding that those that adopted fiscal rules registered a significant decrease in their inequality levels relative to countries that did not. Thus, the effect that the implementation of fiscal rules may have on inequality is unclear and may be linked to factors more specific to each country (or group of countries).

This paper adds to the literature in three ways. First, the previous work has focused on advanced and emerging economies. I study this link for Latin American countries and

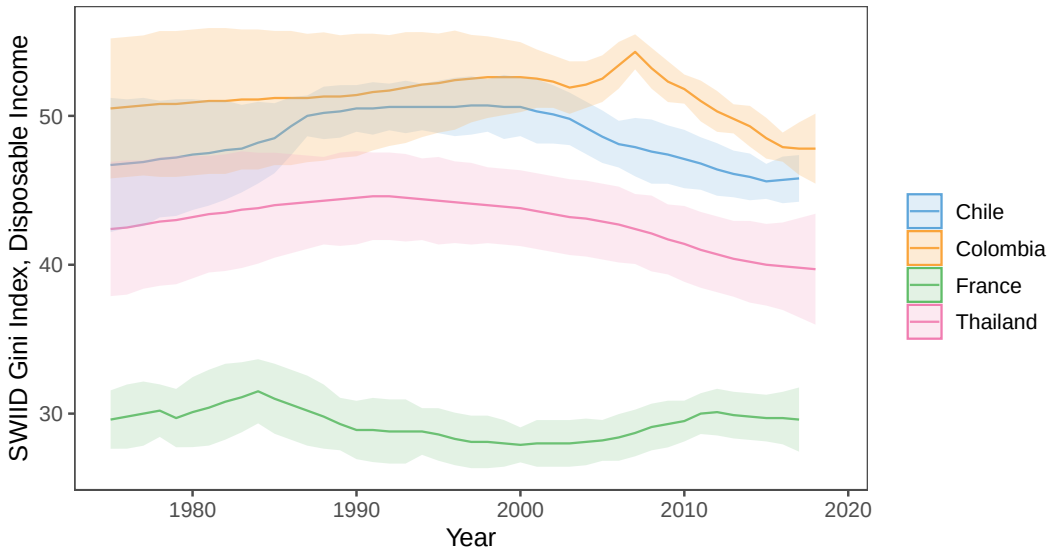
take into account their specific socio-economic characteristics. Second, In the context of LA, broadly, the redistributive role of fiscal policy and its effect on income inequality has focused on the traditional tools (e.g. taxes and transfers) analyzing their incidence on income redistribution (Bastagli et al., 2012; Goñi et al., 2008), on the effect of aggregate public revenues and public spending on income inequality (Clifton et al., 2017), and the positive role of fiscal policy on income distribution, in particular social spending, education, public investment, and progressive tax system (González and Martner, 2012). Here, I analyze the redistributive effect of fiscal rules as another tool of fiscal policy. Third, I study the effect of fiscal rules directly on income inequality using measures such as the Gini index, the Palma ratio and the Atkinson inequality measure. Finally, this paper highlights the fact that although it is not the main objective of fiscal policy, much less of fiscal rules, to reverse inequality, it is in its interest, as well as in its possibilities, to attenuate the high levels of inequality for a more smooth implementation of the fiscal policy itself especially in a region such as LA.

3 Inequality and the redistributive role of fiscal policy

Income inequality is one of the most obvious expressions of disparities in the region. While it has presented a decreasing trend, the panorama for the coming years remains pessimistic, where Gini index predictions by the ECLAC show an increase between 0,5 and 6 per cent relative to the previous year (see ECLAC (2020)). In terms of redistribution, it is possible to differentiate between *market income* inequality and *disposable income* inequality where the former refers to income before taxes and government transfers, and the latter refers to the income after government cash benefits have been received and direct taxes have been paid. One of the advantages of this distinction is that it allows seeing the impact of redistributive policies. The Gini index is the most frequently used statistic to measure the level of inequality in a distribution. It is a percentage ranging between 0 and 100, where 0 represents perfect

equality, while an index of 100 implies perfect inequality. The Standardized World Income Inequality Database (SWIID) developed by Solt (2020) provides comparable Gini index data across countries. Using simple averages for 2000-2018, the average Gini index for disposable income for the 37 OECD member countries is around 0.31, while for 16 LAC countries[6] is around 0.45, showing a significant difference between the two groups of economies. Similarly, Figure 1 shows the trajectory of the SWIID Gini index of the Disposable income over 1975-2019 for France, Chile, Thailand and Colombia, two high-income and two middle-income economies, respectively[7]. On the one hand, Colombia and Chile are the countries that maintained higher levels of income inequality over the period. On the other hand, France's inequality remained almost 20 points below while Thailand remained between France and the two Latin American countries.

Figure 1: Gini Index for disposable income, a comparison



Note: Solid lines indicate mean estimates; shaded regions indicate the associated 95% uncertainty intervals.
Source: Standardized World Income Inequality Database v9.0 (Solt 2020).

As stated in the *World Development Report 2006*[8], Africa and Latin America have the world's highest levels of inequality based on both income and expenditure Gini indices. In-

[6]The list includes Antigua and Barbuda, Argentina, Brazil, Chile, Colombia, Costa Rica, Dominica, Ecuador, Grenada, Mexico, Panama, Peru, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Uruguay. The choice of countries is related to data availability.

[7]Following World Bank's country classification by income leveL

[8] World Development Report 2006: equity and development. Washington, D.C.: World Bank Group.

equality can be drawn from differences in life chances across nationality, race, gender, and social groups, and its consequences go beyond how bad it is on social and ethical grounds. On the economic aspect, the World Bank highlights the strong link between development and inequality and emphasizes the effects of unequal opportunities when markets are imperfect. Latin America is not the exception for imperfect markets where inequality not only intensifies wasted productive potential and inefficient allocation of resources but hinders sustainable development, innovation, productivity increases and environmental sustainability. Besides, one of the distinctive features of the region is the complex framework in which inequalities of socioeconomic origin intersect with gender, territorial, ethnic, racial and generational inequalities.

According to Goñi et al. (2008), there are several reasons why high inequality can retard development and prosperity, but mainly in the creation of vicious cycles of stagnation and poverty. In the sense that higher income inequality means higher poverty, different implications must be considered, especially for growth. On one side, high poverty can be a source of underdevelopment traps that can prevent the poor from contributing to the growth process. On the other side, it dulls the efforts to reduce poverty by weakening the impact of aggregate income growth. From a macroeconomic point of view, inequality itself not only hinders growth but is also the source of various macroeconomic imbalances in contributing to the increase in inflation (Beetsma and Van Der Ploeg, 1996) and poverty (Ravallion, 1997), as well as affect the quality of institutions (Alesina and Rodrik (1994); Alesina and Perotti (1996)).

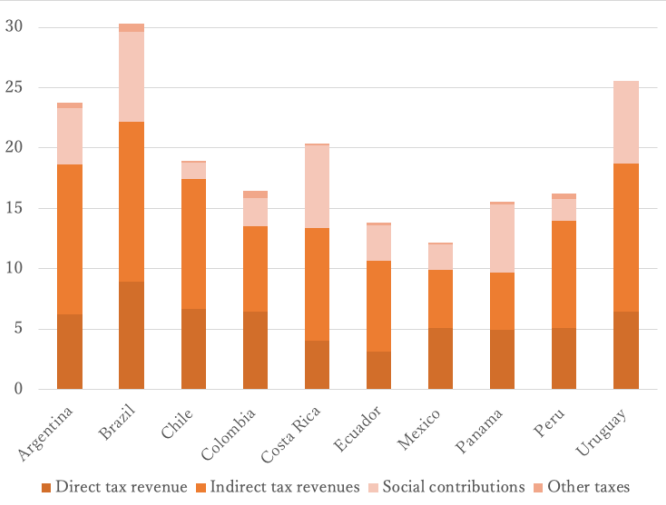
Fiscal policy in LAC has been an essential tool for redistribution. A significant number of scholars have worked on the effects of taxes and transfers on inequality for countries in the region (see Bastagli et al. (2012); Clements et al. (2015); Clifton et al. (2017); González and Martner (2012); Goñi et al. (2008)). Although these tools have positive effects, the

composition of public expending and the lower levels of tax revenues limits the extent of fiscal redistribution. Figure 2 depicts the composition of tax revenues for some LA countries where the primary source of tax revenues are indirect taxes. This fact may appear as a fiscal redistribution problem because indirect taxes usually amount to increase revenue and overlooks equity being potentially regressive (IMF, 2017). The highest tax collection as a percentage of GDP[9] is from Brazil (22.8%), while the lowest is from Panama (9.9%). On the contrary, compared to advanced economies, tax collection is higher, amounting to 33.2% (simple average for 35 OECD countries).

Likewise, the same behaviour is observed in public expenditure and, using simple averages, OECD exceeds LA countries almost three times (around 29.6% against 10.5%, respectively), and where the most significant differences are in social protection, health and education, as is shown in Figure 3. The sharp differences in the composition of taxes and public spending for LA and OECD countries explain the level and the effect of redistributive fiscal policy. For instance, this effect is much restricted in LA countries due to low levels of both taxes and transfers (Bastagli et al., 2012). As shown in Figure 4, the gap between inequality in the market and disposable income is not too wide. The behaviour of the indices is very heterogeneous between countries. It also shows significant gaps in the data, especially for the Caribbean countries.

[9]Total Tax Revenue excluding social contributions

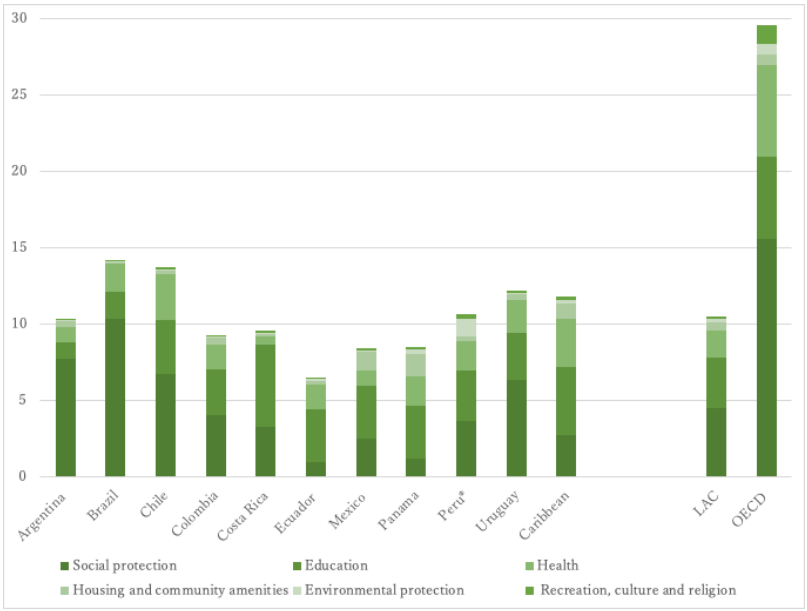
Figure 2: Composition of Tax Revenues, 1990-2017
(Percent of GDP)



Source: own elaboration based on CEPALSTAT Databases

Note: Institutional coverage for Caribbean countries is central government, for all other countries it is general government

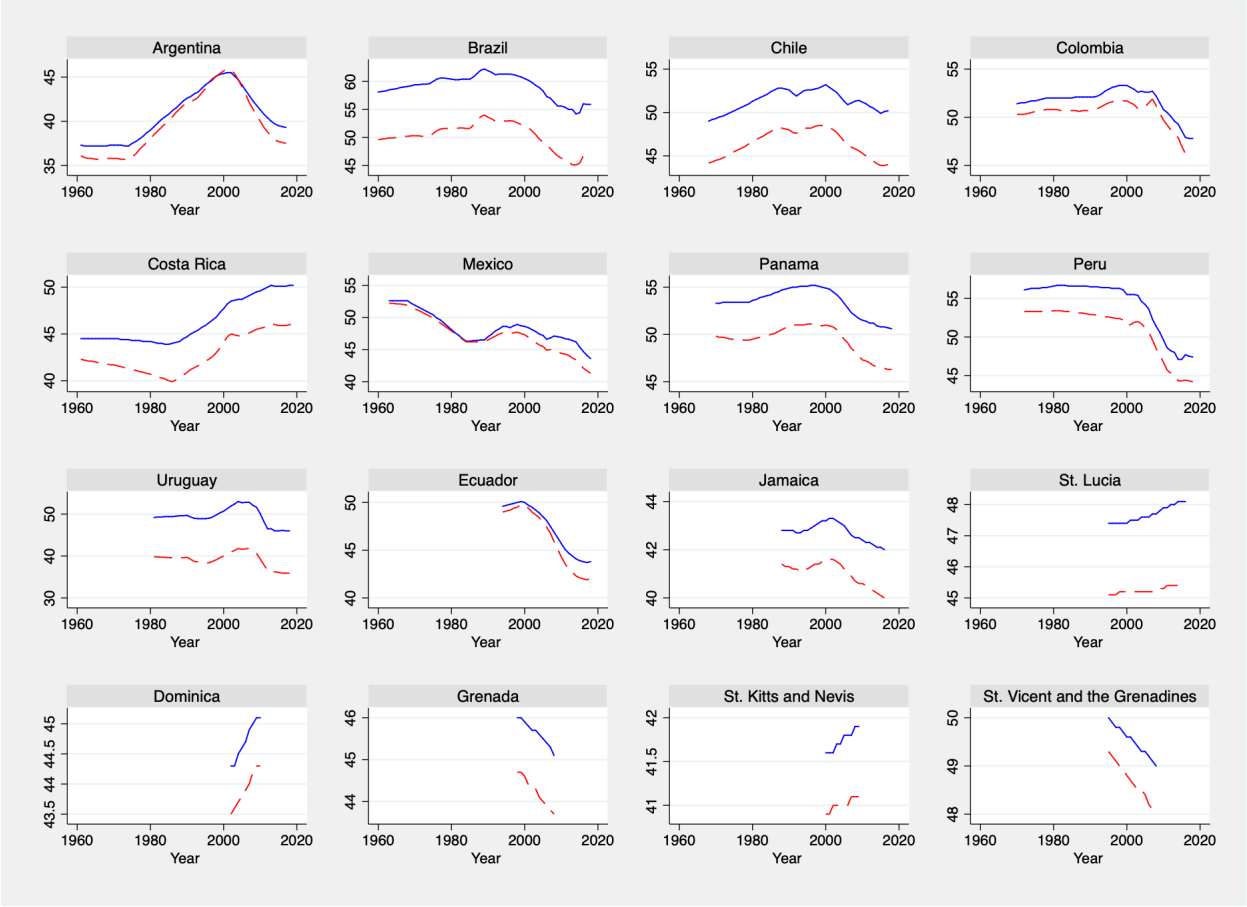
Figure 3: Public expenditure according to the classification of the functions of government, 1990-2018
(Percent of GDP)



Source: own elaboration based on CEPALSTAT Databases and OECD Data

Note: Institutional coverage extends only to the central government; Institutional coverage for Peru* is general government

Figure 4: Market and net Gini Indices, 1960-2019



Source: own elaboration based on SWIIFT Database

Note: The blue line denotes the market income inequality index, while the red dashed line corresoponds to the disposable income inequality index.

Nevertheless, Figure 4 also reflects a decreasing trend in disposable income inequality. Table 1 show that in all these countries, except Argentina, Costa Rica and St. Lucia, inequality has decreased. In terms of change, Costa Rica appears as the worst performer on average given that its Gini index increased by nearly 5 points during the whole period, followed by St. Lucia that has experienced an increase in recent years. In the same line, Argentina experienced a pronounced rise of nearly 8 points between 1975 and 1995, although they managed to reduce the high levels it reached. Over the nearer term, these three countries appear as worst performers with 4.7, 0.4 and 1.7 point increases, respectively, in their Gini index.

On the other hand, Peru managed to reduce its Gini index by around 9 points throughout the period considered, moving towards significantly greater equality. Similarly, Brazil and Mexico also managed to reduce their Gini indices by approximately 5 and 7 points, respectively. Despite excluding one of the countries that has achieved a significant decrease in the recent period, such as Ecuador, due to lack of data, the region's average shows a decreasing trend in its alarming inequality levels captured by the disposable income Gini index.

Table 1: Gini Index Values by Country, 1975-2015

	Gini coefficient			Absolute change			Relative Change (%)		
Country	1975	1995	2015	1975-1995	1995-2015	1975-2015	1975-1995	1995-2015	1975-2015
Argentina	36	43.7	37.7	7.7	-6	**1.7**	1.07	-0.69	**0.10**
Brazil	50.7	52.9	45.4	2.2	-7.5	-5.3	0.22	-0.71	-0.23
Chile	45.5	48.2	43.9	2.7	-4.3	-1.6	0.30	-0.45	-0.08
Colombia	50.6	51.5	47	0.9	-4.5	-3.6	0.09	-0.44	-0.16
Costa Rica	41.2	42.1	45.9	0.9	3.8	**4.7**	0.11	0.45	**0.25**
Mexico	49.9	47.7	42.8	-2.2	-4.9	-7.1	-0.22	-0.51	-0.32
Panama	49.5	51.1	46.5	1.6	-4.6	-3	0.16	-0.45	-0.13
Peru	53.3	52.6	44.3	-0.7	-8.3	-9	-0.07	-0.79	-0.38
Uruguay*	-	38.3	36.1	-	-2.2	-	-	-0.29	-
Jamaica*	-	41.2	40.1	-	-1.1	-	-	-0.13	-
Ecuador*	-	49.1	42.1	-	-7	-	-	-0.71	-
St. Lucia *	-	45.1	45.5	-	**0.4**	-	-	**0.04**	-
LAC (simple average**)	47.1	48.7	44.2	1.6	-4.5	-2.9	0.17	**-0.47**	-0.14

Source: Own elaboration using Solt (2020)
* Incomplete or unavailabe data for 1975-1995.
** Excluding Uruguay, Jamaica, Ecuador and St.Lucia.

A large part of the literature has been devoted to understanding this reversal in the trend where a decrease in inequality is evident in different measures and not only in disposable and market income. Amarante and Prado (2017) evince an interesting survey of some of these studies and highlights that among the factors that may explain the recent decrease in inequality in the region are: demographics, adult income (more specifically earnings), the reduction of the wage gap between high-skill and low-skill workers, as well as the dynamics of the labour market, the commodity price boom for some countries, the political dynamic, among others. Although these have been significant advances in policy matters that are

beneficial for the region, unfortunately, situations such as COVID-19 have highlighted that these efforts have not been sufficient.

The effects of this pandemic exposed that the vulnerable population of Latin America is large and several structural problems of the economic model and the shortcomings of social protection systems. In May 2020, ECLAC presented a special report on COVID-19, which estimates the short and long-term social impact of the health crisis. It states that it would increase around 4.4 and 2.6 percentage points when it comes to poverty and extreme poverty, which means 28.7 and 15.9 million additional people, respectively. On the other hand, inequality will grow in all the countries of the region, projecting increases in the Gini index of between 0.5% and 6.0% (ECLAC, 2020). This situation underscores the importance of fiscal matters and governments' actions to alleviate the sanitary crisis's effects and avoid a sharp reversal in the trend of inequality levels.

On the other hand, taxes and transfers are not the only fiscal policy tools, nor are they the only ones that have redistributive effects. Decisions about public spending and tax collection also have to do with how they are designed and depend on the restrictions that governments face. In pursuit of fiscal discipline, LA has been implementing fiscal rules in the last two decades as part of the transition to more sustainable public finances and to deal with the regions' high economic volatility. Nonetheless, the inequality levels in the region may pose a threat to fiscal consolidation policies, as reflected in the social unrest that characterized the 2018-2019 mobilizations. Under the current context of slow growth, fiscal policy needs to be oriented towards smoothing cyclical fluctuations and correcting the cycle's features that harm growth and affect the productive structure (ECLAC, 2018). Along with the regions' political economy problems, one of the most significant challenges for fiscal consolidation is also to take into account social stability since the implementation of these policies is easier when there is the political will to continue with the established rules. Given the economic

volatility that the region faces, the possibility of abandoning the implementation of its fiscal rules or of using its escape clauses is very likely.

According to Dahan and Strawczynski (2013), fiscal rules commonly constrain macroeconomic aggregates that can alter government spending in an unintended way. As mentioned above, fiscal rules are silent about the composition of fiscal adjustment needed to comply, resulting in higher taxes or leading to an unfavourable composition of spending affecting critical social outcomes. This possible outcome is very harmful in a region with high development needs since the decisions that governments make about the budget can be disadvantageous in terms of long-term economic growth. Furthermore, fiscal policy decisions can affect not only disposable income inequality but also market income inequality. For instance, public spending on health and education can help reduce market income inequality mainly in the attempt to provide equal opportunities. Unlike redistributive tools, they can promote both growth and equity (IMF, 2017) and enhance human capital and productivity, also in line with the region's significant development needs. These levels being low enough, along with social protection, they might continue to be subject to cuts in adjustments, intentional or not, in government spending on compliance with fiscal rules. In this way, it is contradictory to see that given the levels of inequality in the region, fiscal policies may overlook social stability, causing an effect of *crowding-out* on public spending, altering its composition.

The developments mentioned above can be approximated with income inequality, mainly because it is a measure sensitive to the fiscal policy's decisions since it can capture the redistributive effect of such policies. In this way, the following sections empirically study the impact that the implementation of fiscal rules may have on inequality.

4 Assesing the impact of fiscal rules in Latin America: methodology and data

To explore the effect of the implementation of fiscal rules on income inequality, I use the Synthetic Control Method (SCM). This method was proposed by Abadie & Gardeazabal (2003) to address counterfactual questions involving only one treated unit and a few control units, advocating for the use of data-driven procedures to construct suitable comparison groups. In this way, a combination of units (in this case, countries) often provides a better comparison for the unit exposed to the intervention (in this case, the adoption of a rule) that any single unit alone. In this way, the *synthetic control* is meant to reproduce the income inequality level that *would have been observed* in the absence of fiscal rules and serving to size the effect of the rule.

4.1 Methodology

To create the *synthetic control*, the method uses a weighted average of other potential control units (commonly referred to as the donor pool[10]), with weights chosen so the resulting *synthetic control* reproduces the values of a set of pre-defined criteria related to income inequality levels before the implementation of a fiscal rule. The following exposition is based on Abadie et al. (2010, 2014) contextualized for this paper's empirical exercise. The observed outcome variable refers to income inequality and is denoted by Y_{it}. Consider a set of countries $i = 1, ..., J + 1$ and periods $t = 1, ..., T$, where country i implements a rule at $T_0 \in (1, T)$ (the remaining J countries act as potential controls in the donor pool). The observed outcome for country i at time t is,

[10]This expression is used by Abadie et al. (2010) and is borrowed from the statistical matching literature to refer to the set of potential controls. In this case, the donor pool contains the countries with no fiscal rule, which in time serve as potential units to construct the *synthetic control*

$$Y_{it} = \begin{cases} Y_{it}^{NFR} & \text{in the absence of Fiscal Rule} \\ Y_{it}^{FR} \equiv Y_{it}^{NFR} + \alpha_{it} S_{it} & \text{in the presence of a Fiscal Rule} \end{cases} \tag{1}$$

and

$$S_{it} = \begin{cases} 1 & \text{if } t > T_0 \text{ and } i = 1 \\ 0 & \text{otherwise} \end{cases}$$

where Y_{it}^{NFR} is the outcome for country i at time t in the absence of the intervention. Conversely, Y_{it}^{FR} denotes the observable outcome when the fiscal rule is in place. The binary indicator variable S_{it} denotes the rule's implementation, taking the value 1 and zero otherwise when indexing the treated country to be $i = 1$. α_{it} is the effect of the rule for country i at time t. Thus, country i is exposed to the rule in periods $T_0 + 1$ to T and $\alpha_{it} = Y_{it}^{FR} - Y_{it}^{NFR}$ is the effect of the intervention for country i at time t. For any treated country, Y_{it}^{FR} is observable and what is needed is to estimate the counterfactual Y_{it}^{NFR}. In simpler words, the level of income inequality of the country that implemented a fiscal rule *had not implemented it.*

To estimate the *synthetic control*, suppose that Y_{it}^{NFR} is given by the following factor model,

$$Y_{it}^{NFR} = \delta_t + \theta_t Z_t + \lambda_t \mu_i + \epsilon_{it} \tag{2}$$

where δ_t is an unknown common factor constant across states, Z_j is a $(r \times 1)$ vector of observed covariates (not affected by the intervention), θ_t is a $(1 \times r)$ vector of unknown parameters, λ_t is a $(1 \times F)$ vector of unobserved time-varying common factors, μ_i is a $(F \times 1)$ vector of unknown unit specific factors, and ϵ_{it} are the unobserved transitory shocks at the state level with zero mean.

Additionally, consider a $(J \times 1)$ vector of weights $\mathbf{W} = (w_1, ..., w_{J+1})'$ such that $\{w_j \geqslant 0 | j = 2, ..., J+1\}$ and $\sum_{j=2}^{J+1} w_j = 1$. Each value of the vector $\mathbf{W}$ represents a weighted average of the control countries and, hence, a potential *synthetic control*. Abadie et al. (2010) show that, there exist $\mathbf{W^*} = (w_2^*, ..., w_{J+1}^*)'$ such that,

$$Y_{it}^N = \sum_{j=2}^{J+1} w_j^* Y_{jt} \quad \text{and} \quad Z_1 = \sum_{j=2}^{J+1} w_j^* Z_j \tag{3}$$

which represents the pre-intervention matching with respect both to the outcome variable and the pre-defined criteria or covariates (henceforth referred to as predictors). In this way, the treatment effect at time $t \in \{T_0 + 1, ..., T\}$ can be estimated by

$$\hat{\alpha}_{1t} = Y_{it} - \sum_{j=2}^{J+1} w_j^* Y_{jt} \tag{4}$$

with $t \in \{T_0 + 1, ..., T\}$. The sum on the RHS of (4) is simply the weighted average of the observed outcome of the control countries for the post-treatment period with weights $\mathbf{W^*}$. The procedure to obtain $\mathbf{W^*}$ is discussed in Abadie et al. (2010). Finally, equation (4) is an unbiased estimate of the effect of implementing a fiscal rule over income inequality of country $i = 1$ for the pre-treatment periods.

4.1.1 Inference using Synthetic Control Method

To assess whether the synthetic country is a sound counterfactual and how well it mimics the treated country before the treatment, $\mathbf{W^*}$ must meet both conditions in equation (3). Abadie et al. (2010) propose an optimization so that the distance between the treated country and its synthetic counterpart is minimized, taking into account the predictors in Z.

Let X_1 be the vector of pre-treatment variables aimed at matching the treated country as closely as possible. Let X_0 be the matrix where each column of the matrix is a vector of the same pre-treatment variables for each potential donor country. The synthetic control algorithm chooses $\mathbf{W^*}$ such that it minimizes the distance

$$\|X_1 - X_0 W\| V = \sqrt{(X_1 - X_0 W)' V (X_1 - X_0 W)} \tag{5}$$

where V is a symmetric, positive semi-definite and a diagonal matrix. This expression is commonly optimized by using a mean square prediction error (MSPE). Abadie et al. (2010) use the MSPE of the outcome variable to measure the fit (or lack thereof) between the path of the outcome variable for the treated country and its synthetic counterpart, defined as:

$$RMSPE = \sqrt{\frac{1}{T_0} \sum_{1}^{T_0} \left(Y_{1t} - \sum_{j=2}^{J+1} w_j^* Y_{jt} \right)^2} \tag{6}$$

Using this expression is possible to assess whether the observed income inequality of the treated country before implementing a fiscal rule is well replicated or not by its synthetic counterpart.

4.1.2 Placebo Tests

On the one hand, comparative case studies' main concern is how reliable the estimated counterfactual is. In this case, with the certainty that the synthetic control manages to replicate the trajectories in the pre-treatment period precisely, it can be trusted that the difference found in the post-treatment period is capturing a significant treatment effect. On the other hand, it cannot be ruled out that the difference observed (if any) in the post-treatment period may be due to an unforeseen event. For instance, that would lead to biased estimations if one or more countries in the donor pool face a significant idiosyncratic shock that might affect their outcome variable during the post-treatment period.

In the context of the SCM, Abadie and Gardeazabal (2003) introduce a placebo study to produce quantitative Inference in comparative case studies. The idea of the placebo test (also known as falsification test) is similar to the classic framework of permutation inference and consists of systematically check that the estimated impact of the treatment is not driven

by other factors, or by chance, on the control sample. In other words, this means applying the SCM to every potential control (to all the other countries in the donor pool, see Appendix D). The placebo test will assess whether the treated country's estimated impact is large relative to the one estimated for any other country chosen at random.

An MSPE value is obtained for each country when carrying out the placebo test. These values allow making quantitative Inference at least in two different ways. The first way is to calculate the difference between the MSPE of the country and its synthetic counterpart for the entire period. This gap is expected to be zero (or close to zero) for the pre-treatment period, meaning that the synthetic control can reproduce the outcome variable's actual values. On the contrary, the post-treatment period gap is expected to be large, thus denoting a divergence of both trajectories (real and synthetic) and a possible treatment effect. When comparing the gap for all countries at the same time, it is expected that the gap for the treated country relative to the potential controls will be the one most noticeable.

A second way is to calculate the ratio of post/pre-intervention MSPE and look at their distribution. In this context, the greater the ratio of the treated country relative to the others, the greater the effect of implementing the fiscal rule. Again, the post/pre ratio for the treated country is expected to stand out, confirming that such a large effect is not achievable if one were to assign the intervention at random in the data. Finally, with this distribution, it is possible to calculate a sort of p-value compatible with the conventional statistical significance tests.

4.2 Data

The effect of fiscal rules on inequality is analyzed empirically in four different countries: Brazil, Chile, Colombia, and Mexico. As mentioned above, and in line with the SCM, the outcome variable is income inequality, and the intervention is the implementation of

a fiscal rule. On the one hand, the Gini index is used to measure income inequality (or redistribution). Specifically, it is used the Gini index of *the disposable net income* from the Standardized World Income Inequality Database (SWIID) developed by Solt (2020) due to its high level of compatibility between countries. Data provided in SWIID is largely used in research on inequality. It attempts to standardize Gini estimates from existing primary resources of inequality data such a the Luxembourg Income Study (LIS) and the data set prepared by Deininger and Squire (1996) for the World Bank. The SWIID includes Gini estimates for disposable and market income inequality for 198 countries from 1960 to 2019, allowing to examine income inequality changes for most countries.

On the other side, Fiscal Rules information is obtained from the IMF Fiscal Rules Dataset 2016 (Schaechter et al., 2012), which includes information about national and supranational fiscal rules across IMF country members from 1985 to 2015. Fiscal rules have in common as the main principle to obtain consistency with the governments' intertemporal budget constraint and take various forms depending on their target (numerical targets, signalling a commitment to fiscal sustainability or stabilization) the type of constraint they seek to implement over fiscal aggregates. Following the standard classification proposed by the IMF[11], it is possible to distinguish four fiscal rules: (i) Debt rules (DR); (ii) Budget Balance rules (BBR); (iii) Expenditure rules (ER); and (iv) Revenue rules (RR). However, Revenue Rules are excluded due to their uncommon implementation in the Latin American region. Instead, Golden Rule types are taken into account, if any, where public investment or other priority items are excluded from ceilings or restrictions. Fiscal rules can be enforced by the government or other entities close to the government but with a certain level of independence to guarantee compliance. Control bodies also seek to ensure that the credibility and accountability of implementing the rules are not undermined. Institutional arrangements are normally configured in Medium-term budget frameworks (MTBFs) and Fiscal Councils. The

[11] see Kopits and Symansky (1998), Schaechter et al. (2012)

former strengthens the temporal consistency of fiscal policy and is considered to be part of the government. The latter refers to a council composed of experts in macro-fiscal matters that operates independently and constantly monitors fiscal policy application. Table 2 summarize the type of rule and the year of implementation across the countries included in the analysis. It also specifies details of each rule's design, such as coverage or the existence of scape clauses, if any.

Table 2: Summary of Fiscal Rules

		Key characteristics (start date in brackets if different from implementation)					
Country	**Type of National Rule (start date in brackets)**	Statutory basis	Coverage	Formal Enforcement Procedure	Independent Body sets Budget Assumptions	Independent Body monitors Implementation	Well-specified Escape Clauses
Brazil	Debt Rule (2000)	Statutory	General Gov.	Yes	No	No	Yes
	Expenditure Rule (2000)	Statutory	General Gov.	Yes	No	No	Yes
Chile	Balance Budget Rule (2001)	Political Commitment (2001), Statutory (2006)	Central Gov.	No	Yes	No (2001), Yes (2013)	No
Colombia	Expenditure Rule (2000)	Statutory	Central Gov .	No	No	No	No
	Balance Budget Rule (2011)	Statutory	Central Gov.	No	No	No	Yes
Mexico	Balance Budget Rule (2006)	Statutory	Central Gov.	Yes	No	No	Yes
	Expenditure Rule (2013)	Statutory	Central Gov.	No	No	No	No

Source: Fiscal Rules at a Glance (Bova et al., 2017), selected countries

The donor pool consists of 194 countries included on the IMF World Economic Outlook for 2019. However, a typical SCM analysis is feasible when a unit (or more) exposed to an intervention can be compared to other units that were not exposed to the same intervention. In this way, all those countries that had implemented a fiscal rule were dropped. Finally, in order to create the *synthetic control* information about predictors is needed (vector Z_t in equation (2)). Most importantly, the relationship between the predictors and the donor pool countries' outcome variable must be similar to that relationship in the treated country.

In the same way, these predictors should affect outcomes in countries both before and after treatment. However, they should not be affected directly by the treatment.

Hence, the predictors chosen were identified to impact inequality or redistribution in the empirical and theoretical literature, focusing on the Latin American context. Macroeconomic, institutional and development variables are included (see table Table 11 in Appendix). Because of the countries confirming the donor pool, data availability is constrained by the Gini Index and these predictors. In this way, macroeconomic variables include the logarithm of GDP per capita, unemployment and inflation as in González and Martner (2012); trade openness as used in Lee et al. (2013) and in Montecino (2011); aiming to capture specific features of the region, natural resource revenues are included as in Cornia (2014) and in Loayza et al. (2013); furthermore variables on macroeconomic indicators such as current account balance or gross capital formation are included following analyses done in Ardanaz et al. (2019) and in Caselli et al. (2018). Regarding institutional variables, political economy stability and democratic institutions play an important role. Thus government effectiveness, voice accountability and an index of public stability[12] are included following González and Martner (2012) and Cornia (2014). Finally, variables related to development across countries showed to have an impact on inequality are total population as found by Streeten (1993), Campante and Do (2007), and Roine et al. (2009); life expectancy at birth, labor force participation and dependency rate as deployed in Cornia (2014). Similarly, lack of education has also been suggested as part of determinants of income inequality as in Cornia et al. (2004) and Roser and Cuaresma (2016).

Table 3 presents some descriptive statistics for the treated countries and those included in the donor pool. Regarding the outcome variable, it is observed that the mean of the 23 donor countries is 40.79 and is significantly lower relative to the one in Brazil, Chile, Colombia and

[12]This index is given by (1/2)*political stability + (1/2)* the rule of law, as in González and Martner (2012)

Mexico. On the one hand, this reflects the fact that Latin America is one of the world's most unequal regions when it comes to a measure such as the Gini Index. On the other hand, this warns that this will be reflected in the results as it could be challenging to find a combination of countries that can replicate exactly these levels of inequality. Regarding the main set of predictors, smaller gaps are observed, which means that these variables have behaved similarly to the selected countries during this period. This is also supported by the fact that the donor pool countries are similar according to the World Bank classification of economies. In this way, the sample is composed mainly of upper-middle and lower-middle economies.

Table 3: Descriptive Statistics

	Donor pool (23 countries)					**Mean**			
	N	**mean**	**max**	**min**	**sd**	**Brazil**	**Chile**	**Colombia**	**Mexico**
Disposable income Gini	805	**40.79**	59.70	25.60	7.186	50.72	47.16	50.75	46.20
Market income Gini	805	**44.16**	68.60	22.20	8.23	59.43	51.98	52.12	47.38
Main set of predictors									
GDP per capita	570	8.70	10.55	6.47	0.85	9.43	9.68	9.23	9.75
Unemployment	552	8.42	33.47	0.49	6.21	8.02	7.97	12.03	4.02
Inflation	764	22.19	49.17	-2.42	9.65	19.80	22.79	20.67	22.28
Trade	769	67.36	149.45	6.32	30.61	21.15	59.64	33.83	44.63
Total natural resources rents	773	5.21	53.63	0.00	6.89	3.04	10.63	4.95	5.75
Current account balance	746	-3.48	28.71	-65.03	5.96	-1.74	-2.73	-2.29	-1.82
Gross capital formation	770	5.45	28.58	-22.93	6.43	2.84	4.62	3.62	2.57
Government Effectiveness	361	-0.20	1.57	-1.53	0.66	-0.07	1.21	-0.15	0.22
Voice and Accountability	361	-0.35	1.34	-1.86	0.70	0.45	1.03	-0.24	0.16
Public stability index	368	-0.37	1.31	-2.09	0.62	-0.16	0.93	-1.13	-0.52
Total Population	805	16.71	21.03	12.44	1.65	18.91	16.49	17.42	18.35
Life expectancy at birth	805	65.12	81.72	37.08	8.62	68.90	75.21	71.88	72.44
Labor force participation rate	575	59.21	79.14	39.25	10.35	64.15	57.63	67.52	60.19
Age dependency ratio	805	69.55	109.04	34.76	18.69	57.94	53.51	62.24	70.07
Average years of primary schooling	155	3.32	5.99	0.64	1.33	3.41	5.02	3.75	3.01

Source: Own elaboration

Finally, the complete dataset comprises data on fiscal rules (Schaechter et al. (2012))

and income inequality (Solt (2020), WDI (World-Bank, 2014)). The pretreatment period over which the predictors will be averaged ranges between 20 and 26 years, while the post-treatment period ranges from 8 to 14 years (both pre/post-treatment periods depend on the year of implementation of the fiscal rule in each country). Only one rule was selected as a treatment per country unless two rules had been implemented simultaneously. Otherwise, the selected rule was the first on its implementation. Considering that the Gini Index mostly constrains data, the final dataset comprises 27 countries, including the treated countries (see Appendix for details) and covers the period 1980-2014.

5 Results

This section presents the results of the empirical exercise. The SCM was conducted separately for each of the treated countries but using the same control countries in the donor pool. Each government has implemented a different type of rule (or combination of rules) that allows taking into account the heterogeneity created by the different kinds of fiscal rules and each country's economic and political environments. In this way, the rules considered are an Expenditure Rule (ER) in 2001 for Colombia; a combination of a Budget Balanced Rule (BBR) with a Golden Rule in 2006 for Mexico; a Budget Balance Rule (BBR) for Chile in 2001; and a combination of an Expenditure Rule (ER) with a Debt Rule (DR) in 2000 for Brazil.

What is observed for all countries is that there is a positive, although statistically insignificant, effect of implementing fiscal rules on income inequality, suggesting a lack of causal impact. Table 4 shows the main results for each country. Panel A shows some estimation statistics related to the Root Mean Squared Prediction Error (RMSPE) that are common for all the countries, and Panel B shows the countries used in the construction of the counterfactuals (synthetic countries) in each case, with their respective weights. Regarding the

Estimation Statistics, first, the pre-intervention RMSPE (how good the SMC replicates the treated country's behaviour) is small both for the treated and control countries. To the extent that the method manages to minimize the difference between the treated unit and its synthetic counterpart before the intervention, the post-treatment period's effect is more reliable. In this way, it is not only sought that the error is as small as possible but that the RMSPE of the treated unit is the smallest relative to the countries included in the donor pool. More specifically, this can be observed when, after obtaining the errors for each of the 24 control countries in the placebo tests, they are organized from smallest to largest. In a rank of 24 countries between the treated unit and the control units, the treated unit is expected to be among the first positions. What is observed in the counterfactual analysis is that in most cases, this does not occur.

Second, by looking at the distribution of the post/pre-intervention RMSPE, it is expected for the treated unit to have the largest ratio (organizing them from smallest to largest). This ratio can become large either because the pre-RMSPE is very small (for the reasons explained before) or because the post-RMSPE is very large. In the same way, the method tries to minimize the error in the pre-treatment period. A large error in the post-treatment period suggests the existence of a treatment effect. In this case, the treated unit is expected to be in the last positions (out of 24 countries). This result is observed for Chile and Colombia, however, not for Brazil or Mexico. Because the forces of this ratio can lead to mixed results, a final inference exercise is to calculate a sort of p-value. This value is the Donnor Probability which is the probability of obtaining a post-pre RSPE ratio as large as the treated if one assigns the intervention at random in the data. While this p-value is related to the conventional values of statistical significance (one, five and ten per cent), it is observed that the results are not significant for Brazil, Chile, Colombia or Mexico.

The remainder of the section is dedicated to analyzing each case for the four selected

countries. It gathers the essential aspects of each fiscal rule and the context in which they were implemented. By analyzing four different countries, it is also possible to study the heterogeneity that derives from the implementation of fiscal rules in income inequality, given that each country has adopted a different rule (or a combination of rules). Besides, some insights are presented about the economic stigma that each rule can give rise to, and it is argued from the results why this stigma is unwarranted.

Table 4: Synthetic Control Method Estimates of the Impact of Fiscal Rules on Disposable Income Gini

	Brazil	Chile	Colombia	Mexico
Panel A: Estimation Statistics				
Pre-Intervention RMSPE [1]	0.633	0.248	0.140	0.521
RMSPE median (donor pool)	0.242	0.246	0.191	0.329
Pre-intervention RMSPE rank	19	14	6	14
post/pre intervention RMSPE ratio rank[2]	15	19	22	5
Donnor probability [3]	41.67	25.0	12.50	83.33
Panel B: Donor Pool weights				
Bangladesh	0	0	0	0
Barbados	0	0.048	0.134	0
China	0	0	0.044	0
DominicanRepublic	0	0	0	0
Egypt	0	0.268	0	0
Ghana	0	0	0	0
Guatemala	0.583	0.179	0	0.565
Honduras	0	0.198	0.263	0
Jordan	0	0	0	0
Kazakhstan	0	0	0	0
Korea	0	0	0	0
Malawi	0	0.166	0	0
Mauritania	0	0	0	0
Moldova	0	0	0	0
Morocco	0	0	0	0
Philippines	0	0	0	0
SierraLeone	0	0	0	0
SouthAfrica	0.333	0.14	0.495	0.08
Sudan	0	0	0	0
Thailand	0.084	0	0	0
Tunisia	0	0	0	0
Turkey	0	0	0	0.277
Ukraine	0	0	0.064	0.078

Pre-intervention periods: Brazil (1980-1999), Chile (1980-2001), Colombia (1980-2000), Mexico (1980-2005): [1] RMSPE refers to root mean square prediction error; [2] post/pre RMSPE ratio rank is the position where the country is located with respect to the donnor countries (the higher the better); [3] Donor probability is the probability of obtaining a post-pre RSPE ratio as large as the threated if one were to assign the intervention at random in the data

5.1 Colombia

Colombia (the Republic of) is a state-organized in the form of a single, decentralized Republic with autonomous subnational divisions. It defined as Subnational Governments (SNGs), the departments and Capital District of Bogota (33), municipalities (1101) and indigenous territories (817). The 1991 Constitution sought a type of decentralization that supported the efforts to increase the legitimacy and governability and increase the coverage and quality of public goods and services. With this spirit, it established in articles 356 and 357 a schedule for progressive increases in the major transfers to departments (the *Situado Fiscal*) and the municipalities (the *Participaciones Municipales*, PM), so that ultimately they were to comprise 46.5 per cent of the total revenue of the Central Government (CG). Although the scheme of transfers has been reformed several times through the years, it has always prevailed that SNGs should mainly use these transfers to improve local services (education, health, potable water, culture and sports, among other services). SNGs also benefit from transfers coming from the extraction of nonrenewable resources. Apart from it, SNGs own resources come from regulating property taxes, fines and penalties. However, own-source revenues finance less than half of their total expenditures (Chaparro et al., 2004)

Fiscal rules are implemented to support this decentralization process and strengthen central governments' control over subnational debt. The first law *(Ley 358 de Semáforos)* was passed in 1997 and aimed to condition the indebtedness of SNGs to their solvency. This Law revealed some of the decentralization process gaps, especially in local governments' fiscal responsibility. Due to the lack of administrative capacity and dependence on the central government's high transfers, this Law was ineffective as many highly indebted local governments continued to have access to new debt. However, taking this institutional design as a starting point, two new laws were implemented: Law 617 of 2000 and Law 819 of 2003, which helped reinforce local governments' fiscal management. The former is the *Ley de*

Responsabilidad Fiscal Territorial (LRF), it set limits on public spending for SNGs, and it also limited, partly, CN's current expenditure. While the latter is the *Ley de Responsabilidad Fiscal* and it applied to all levels of government, including rules (mostly of qualitative type) to propitiate transparency through the *Marco Fiscal de Mediano Plazo (MFMP)*. This report contains the fiscal framework with clear macroeconomic and fiscal objectives and is presented and discussed in Congress together with the annual budget.

Because the LRF imposed a long-lasting constrain on expenditures, it is considered, by the IMF, as the first fiscal rule implemented in Colombia (Schaechter et al., 2012). As mentioned before, it set limits on spending for both CG and SNGs, and this is why it is considered an Expenditure Rule (ER). Most specifically, on one side, it limits CG's current expenditure growth using the inflation target established by the Central Bank as a measure. In this way, the increase in spending must be less than 50 per cent of the inflation target, and payroll expenses must be less than 90 per cent between 2000 and 2005. On the other side, the limits for operating expenditures of the SNGs are conditioned to the categorization established by the Law (the classification takes into account freely disposable revenues and population). Considering the results of the *Ley de Semáforos* and the economic crisis at the end of the 1990s, this Law's objective was to clean up the subnational fiscal administration whose situation had deteriorated. Later in 2011, Colombia also implemented a Budget Balance Rule (BBR) to manage the income and royalties of commodities better and incorporate fiscal sustainability. In this sense, the rule aims to ensure fiscal discipline and strengthen the countercyclical fiscal policy. However, for this paper and the study period, the fiscal rule analyzed for Colombia is the expenditure rule defined by the LRF; thus, the treatment period starts from 2000.

Table 5 shows the countries and their respective weights used to construct Synthetic Colombia for the outcome variable. This convex combination of countries from the donor

pool are the ones that most resemble Colombia regarding the level of income inequality and the predictor variables. In this way, the weights indicate that the trends of the actual values for Colombia's variables before implementing the fiscal rule are best reproduced by a combination of Barbados, China, Honduras, South Africa and Ukraine. The balance in the pre-treatment characteristics between Colombia and Synthetic Colombia and the prediction errors are described in Appendix C.

Table 5: Country weights in Synthetic Colombia

Country	Weight	Country	Weight
Bangladesh	-	Mauritania	-
Barbados	0.134	Moldova	-
China	0.044	Morocco	-
DominicanRepublic	-	Philippines	-
Egypt	-	SierraLeone	-
Ghana	-	SouthAfrica	0.495
Guatemala	-	Sudan	-
Honduras	0.263	Thailand	-
Jordan	-	Tunisia	-
Kazakhstan	-	Turkey	-
Korea	-	Ukraine	0.064
Malawi	-		

Figure 5 shows the SCM results for introducing an expenditure fiscal rule in Colombia in 2000. It displays the disposable net income Gini index for Colombia and its Synthetic counterpart during 1980-2014. The visual inspection of the trajectory for income inequality shows a good fit given that the Synthetic is very similar to actual Colombia before the treatment. Focusing on the post-treatment period, in both cases for Colombia and its correspondent Synthetic, the level of inequality presents a decreasing trend. The estimate of implementing the fiscal rule on income inequality is the difference between both actual and Synthetic Colombia after the implementation of the rule (vertical dashed line). A priori, based on the gradually widening gap in the income Gini between Colombia and its Syn-

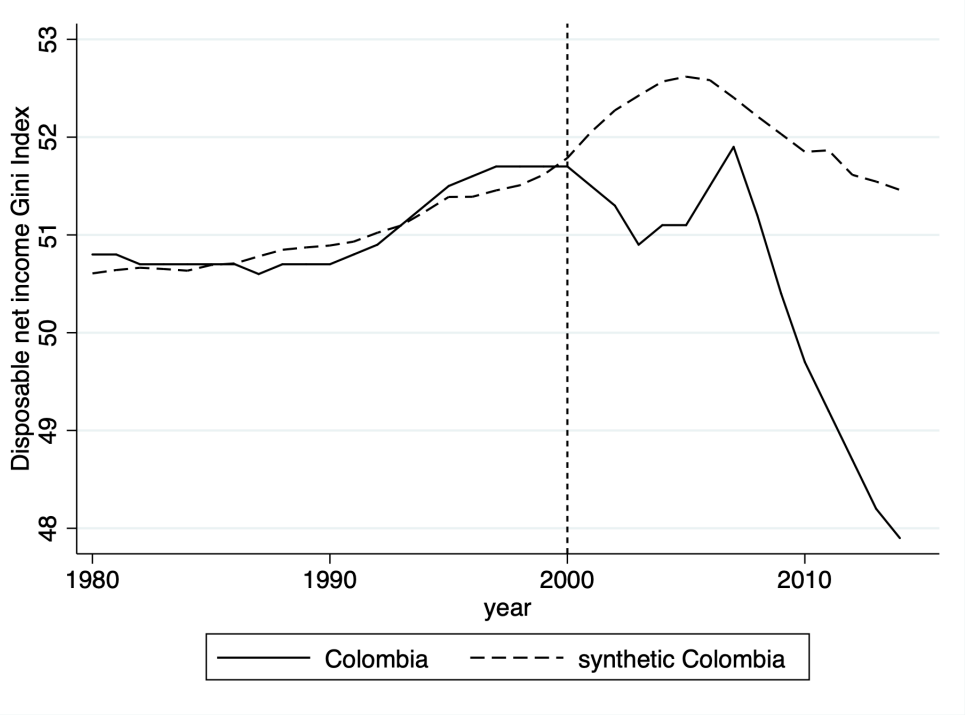
thetic counterpart, shows a positive effect of the fiscal rule on income inequality, meaning that the level of inequality would have remained higher not been implemented the fiscal rule.

As mentioned before, placebo tests are used to evaluate the significance of the estimates. In this context, they aim to verify *how often we can obtain a gap as large as that of Colombia if another country is chosen at random*. To answer this question, the SCM is applied to each country in the donor pool (see details in Appendix). To obtain significant evidence of a positive effect on income inequality from implementing an ER in Colombia, the gap estimated for Colombia must be unusually large relative to the gaps for the countries that did not implement a fiscal rule. Figure 6 displays the pre-intervention and the post-intervention gaps between actual values and their synthetic counterparts for Colombia and all the other countries in the donor pool obtained from the placebo test. The black line denotes the gap estimated for Colombia, while the grey lines show the gap for each country in the donor pool and its respective Synthetic version.

On the one hand, Figure 6 shows a good fit over the pre-treatment period. This result is also observed from the preintervention mean squared prediction error (MSPE) in Colombia[13] that is about 0.0196. The pre-intervention median MSPE among the donor states is about 0.036, which is also small and indicates that the SCM can provide a good fit for the income inequality over the pre-treatment period.

[13]the average of the squared discrepancies between income inequality in actual and Synthetic Colombia during the pre-treatment period

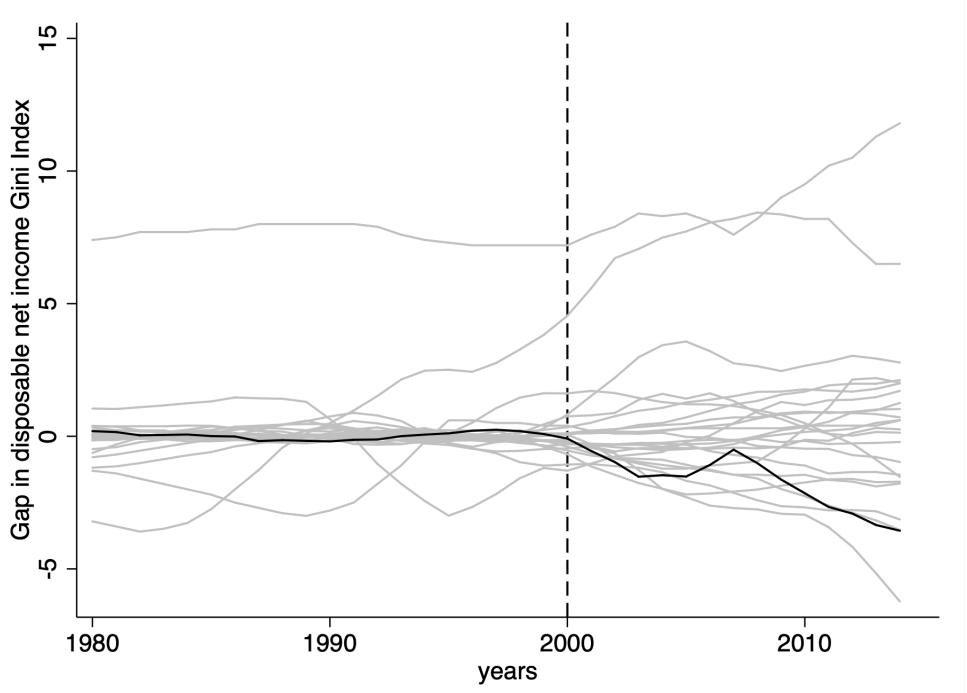
Figure 5: Synthetic Control Method Estimates for the Fiscal Rule in Colombia



However, the gap for Colombia in Figure 6 does not stand out from its respective placebo counterparts, suggesting a lack of causal impact. To confirm this result, I follow the inference method proposed by Abadie and Gardeazabal (2003) which excludes the countries where the method can't reproduce well enough the time series of income inequality. For instance, Figure 6 shows that a convex combination of control countries fails to reproduce the level of income inequality for some countries. The country with the worst fit in the pre-treatment period is South Africa, with an MSPE of 58.307. It is not a surprise that no combination of states managed to reproduce the level of income inequality of South Africa because it is the country with the highest income inequality levels over the pre-treatment period. To avoid that the estimated effect in the post-treatment period is created artificially by lack of fit rather than by implementing the fiscal rule, the countries with a pre-intervention MSPE beyond a certain level are excluded. Abadie and Gardeazabal (2003) propose to exclude countries with pre-intervention MSPE of more than 20, 5 and 2 times the MSPE of the treated country.

Figure 7 only considers the 16 countries that present a fit as good as Colombia in the period 1980-1999, that is, countries with an MSPE not higher than twice the MSPE for Colombia. Once again, the gap in Colombia does not stand out and confirms the lack of causal impact. This finding suggests no effect on the level of income inequality related to the intervention, and the divergence observed between the two lines in Figure 5 in the post-treatment period cannot be explained by the implementation of the expenditure fiscal rule. On the one hand, this result can appear to be contradictory because ER can affect the government size (Schaechter et al., 2012) or directly constrain government spending, which can affect the spending designed to reduce inequality. On the other hand, the design of the rule itself best explains why this belief is not maintained.

Figure 6: Disposable net Income Gini gaps in Colombia and placebo gaps in all 23 control countries

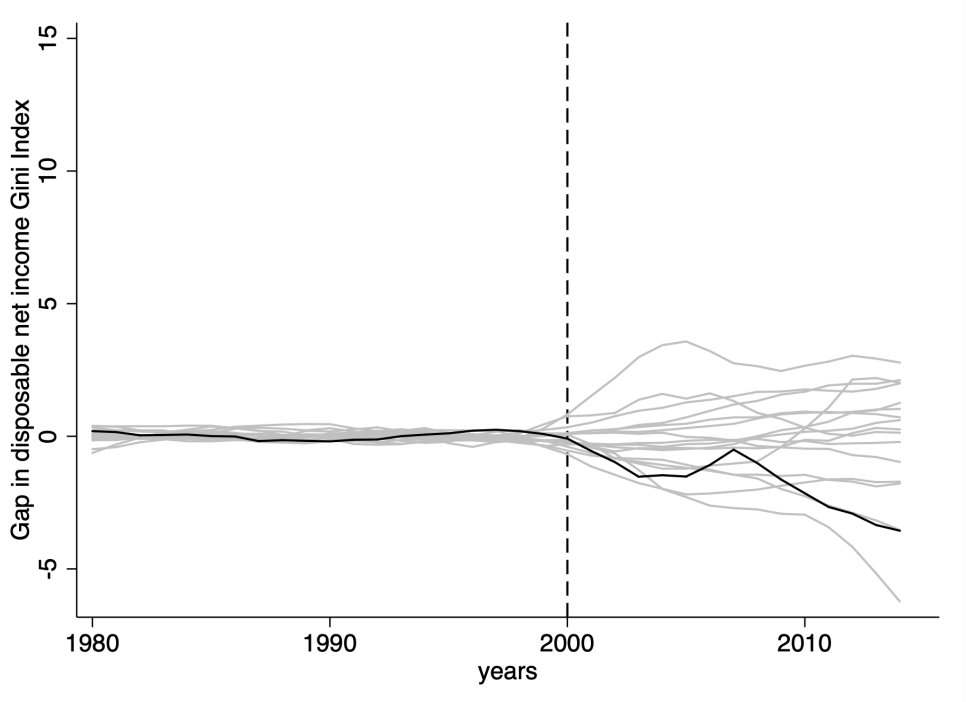


Fiscal ER are designed to set limits on total, primary, or current spending. While they are easy to communicate, monitor and allow for economic stabilization, they can also lead to spending allocation changes. The main problem with fiscal rules is that they are silent

about the composition of the fiscal adjustment needed to comply, and expenditure rules are not the exception. In this context, the 1991 Constitution specifies that through the scheme of transfers, the CG guarantees resources for the SNGs. Hence, in their autonomy, they can ensure their functions and thus the provision of local services.

On the one hand, they cannot cover any debt. On the other hand, the Constitution emphasizes the improvement in the provision of local services linked to economic development in the sense that the strengthening of investment in education, health, infrastructure and rural development can create more favourable conditions (Jaramillo-Pérez, 2001). In this way, this is the first thing that must be guaranteed under the available resources and cannot be altered.

Figure 7: Disposable net Income Gini gaps in Colombia and placebo gaps in 16 control countries (discards states with pre-interventon MSPE two times higher than Colombia)



In this way, the resources allocated to economic development and social needs are not directly affected by the expenditure fiscal rule; consequently, the results of implementing an

ER are not significant because of the legal framework, the design and the implementation. On the contrary, the ER contributed to the financial stability of SNGs, and it regulated and set spending limits. Furthermore, to maintain these results, it would be ideal for monitoring two aspects constantly. First, the involvement of local interest groups in spending decisions so accountability is enhanced. Second, the composition and degree of flexibility of operating expenses, since if it is inflexible to a great extent, the allocation of the budget can result in cuts against investment in a situation where, a priori, it is already determined how the government allocates the largest amount of the national budget.

5.2 Mexico

According to its Constitution, Mexico (officially the United Mexican States) is a representative, democratic and republic federation. On the administrative division side, three government levels are established: the Federal Union, the State governments and Federal District (32) and the Municipal Governments (2457). All federations are autonomous and have the power to govern themselves according to their laws as long as they do not contradict the federal Constitution's principles. In this way, they have autonomy in regulating and directing their economic policies, social development, and the administration of their resources and collection of taxes. On the economic side, the Mexican public finances have been characterized as vulnerable to oil shocks and the business cycle, which have undermined stability and growth (primarily due to its strong reliance on highly volatile revenue). Several reforms have been implemented over the years to deal with commodities shocks and the economic cycle. These reforms involve all government levels and revolve around fiscal discipline to improve the efficiency of the budget process, fiscal responsibility, and the transparency of spending.

The administration of fiscal policy considers the autonomy of subnational governments and is designed based on their capacity and needs. In addition to this, designed policies need

Congress's approval, which considers the limits on net borrowing founded on the projections of each respective government's fiscal balance. Likewise, each state government requires approval about net borrowing from each separate state congress. The Constitution also specifies a Golden Rule over the current balance for the federal government and subnational governments (SNGs), restricting borrowing to only finance public investment. In turn, SNGs are restricted from incurring liabilities from foreign entities or in foreign currency. At the procedural level, the borrowing of SNGs, including Mexico City, is conditioned federal transfers (known as *Participaciones*) to monitor the evolution of public debt from SNGs. This obligation means that *Participaciones* are used as collateral, and in a situation in which an SNG defaults, its federal transfers are used for debt repayment (Conesa et al., 2004).

The Oil industry plays a fundamental role in the Mexican economy. In 1938, the sector's nationalization gave place to creating the state-owned firm *Petróleos Mexicanos (PEMEX)*. At this time, the Federal Commission of Electricity (CFE) was also formed, and together with PEMEX, they have incorporated different economic and social achievements among their objectives, such as major infrastructure projects including housing and hospitals. Besides, the management of national oil companies is relevant because of its potential source of income. In 1974, PEMEX became an oil export company, therefore a powerful source of revenues of the Mexican state (Ramírez-Cendrero and Paz, 2017). For Mexico, oil-related revenues account for 30-40 per cent of total budget revenue over the studied period, shifting from a public company to an important participant in economic dynamics.

Since 1998 Mexico has included in the annual Federal Expenditure (FE) contingent procedural fiscal rules to deal with unexpected shocks, improve fiscal discipline, and avoid permanent deficits. In 2006, the New Budget and Fiscal Responsability Law *(Ley de Presupuesto y Responsabilidad Hacendaria, LPRH)* was adopted. The IMF considered this law the first fiscal rule implemented in Mexico because it created a binding commitment for the

government in the medium-term. It relies on three pillars: the medium-term expenditure framework, the fiscal balance target, and response to oil price fluctuations.

On the first element, the government is required to design a long-term quantitative framework with projections for the next five years, different from the requirements of previous administrations that presented a medium-term fiscal plan only for the first year. The law also requires identifying income sources to cover new laws that imply higher expenses and promotes transparency by promoting accountability in the selection of investment projects and allocation of subsidies. Second, concerning the fiscal target, as it is a Balanced Budget Rule (BBR) that targets the cash balance, more specifically, it establishes a zero fiscal target for the public sector balance and includes not only the central government but the social security system, and key public enterprises such as PEMEX and CFE. Following Berganza (2012), the zero deficit target specified by the rule can be written as follows,

$$G - T(P^*, Y^*) = 0$$

G refers to public sector expenditure; T refers to public sector revenue; P^* accounts for the oil price parameter in the budget, which is a reference price set by a formula that considers past and future prices.[14] In this regard, the oil price is determined technical rather than politically. Finally, Y^* accounts for the expected output. The design of the rule includes escape clauses to incur deficits, provided a clear path to return to the equilibrium is specified.[15] Third, about the oil prices, the law also formulates clear guidelines for the distribution of oil surpluses in the form of reserve funds and investment. In this way, taking into account possible extra revenues (ER) (either on the side of oil prices or level of output),

[14]It assigns a weight of one quarter to past oil prices (average oil price of the last ten years) and a weight of three quarters for future prices. Expenditure smoothing can be affected by the high weight put on the short-term future prices, allowing a rapid rise in public expenditure even when it does not aim to isolate expenditure completely from oil revenue fluctuations.

[15]This clause has been invoked in exceptional circumstances in 2010, 2011 and 2012 as a consequence of the global financial crisis, allowing for a temporary deficit.

the rule can be specified as

$$G - T(P^*, Y^*) - ER(P - P^*, Y - Y^*) = 0$$

Unanticipated revenue gains are used to save or dissave in response to these fluctuations. On the one hand, extra revenues might be used to face nonprogrammable budget overruns, and on the other hand, it is to be allocated between several stabilization funds and state-level investment projects up to a ceiling of $1\frac{1}{2}$ per cent of GDP. Any subsequent excess is to be used for investment projects and pension reform costs. On the other hand, in case of a situation where the current oil price is below its reference level, the law allows to make use of stabilization funds but once exhausted, fiscal tightening is required.

In this way, Mexico's treatment period starts in 2006, the year that the BBR defined by the LPRH. The effects for Mexico are less clear, and I didn't find an effect related to the implementation of the fiscal rule. This result is expected as long as the Golden Rule protects investment expenditure. Table ?? shows the countries and their respective weights to construct Synthetic Mexico for the outcome variable. Among these countries, we find Guatemala, South Africa, Turkey and Ukraine, meaning that a linear combination of them best reproduces the trends of Mexico's actual values. The balance in the pre-treatment characteristics between Mexico and Synthetic Mexico and the prediction errors are included in Appendix C.

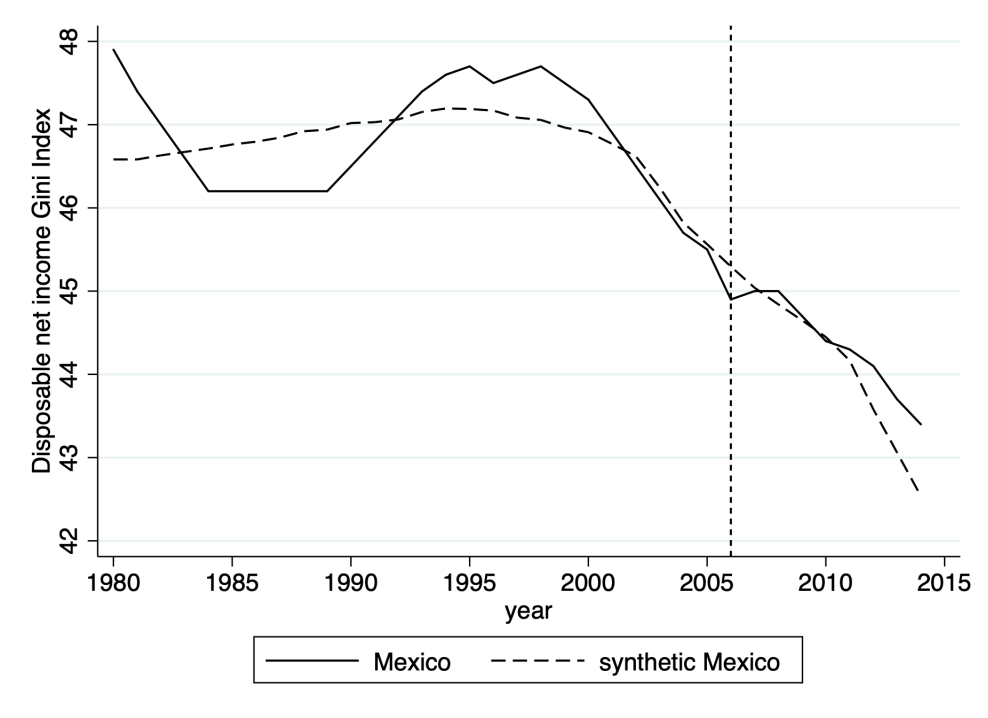
Table 6: Country weights in Synthetic Mexico

Country	Weight	Country	Weight
Bangladesh	-	Mauritania	-
Barbados	-	Moldova	-
China	-	Morocco	-
DominicanRepublic	-	Philippines	-
Egypt	-	SierraLeone	-
Ghana	-	SouthAfrica	0.08
Guatemala	0.565	Sudan	-
Honduras	-	Thailand	-
Jordan	-	Tunisia	-
Kazakhstan	-	Turkey	0.277
Korea	-	Ukraine	0.078
Malawi	-		

Figure 8 shows the SCM results for implementing the BBR in Mexico in 2006. It displays disposable net income Gini for Mexico and its Synthetic counterpart during the period 1980-2014. Unlike the case of Colombia, the fit is not so evident at first glance. However, the difference between the two trajectories does not appear to be statistically significant by visual inspection of the graph. This outcome is supported by the Root Mean Squared Prediction Error (RMSPE) level between actual Mexico and its synthetic during the pre-treatment period. When implementing the SCM, ideally, the two trajectories follow each other closely in the pre-treatment period so that the divergence of them after implementing the fiscal rule can represent the effect of the treatment. What is observed for Mexico in the post-treatment period is that in both cases, income inequality decreases with a significant reduction of the Gini throughout the entire period. Still, a possible effect occurs only from 2010 when both trajectories diverge (instead of 2006, the vertical dashed line). A priori, Figure 8 shows a neutral effect of the fiscal rule on income inequality, meaning that the rule's implementation did not affect the level of income inequality. However, from 2010 higher levels of actual income inequality are observed relative to the synthetic levels, which leads to the question

of whether the effect of the fiscal rule is positive.

Figure 8: Synthetic Control Method Estimates for the Fiscal Rule in Mexico

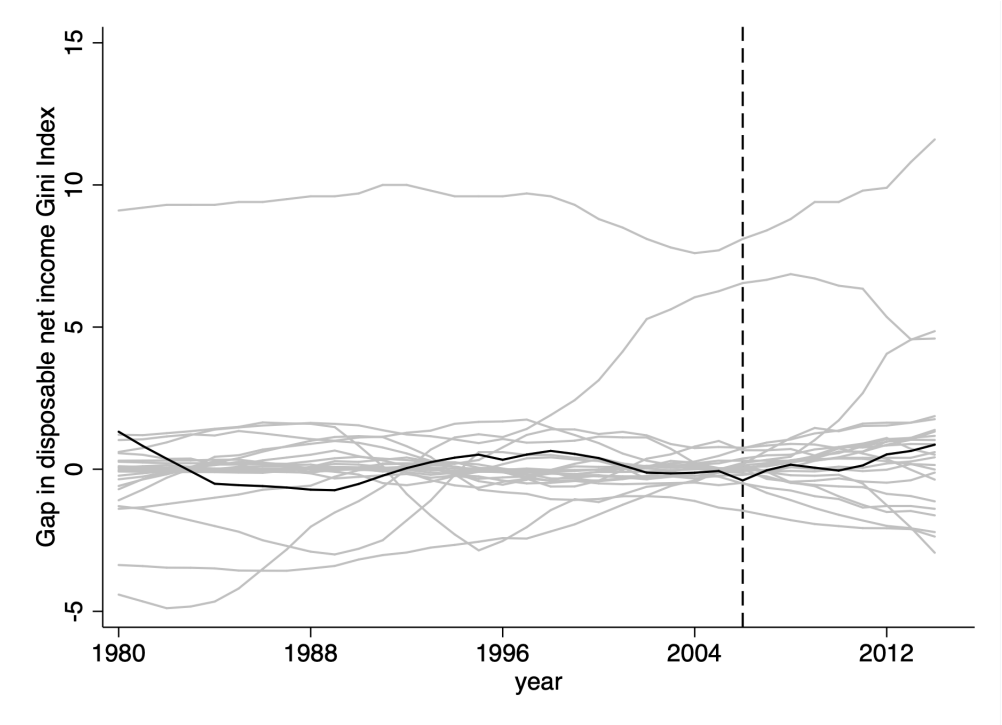


The global financial crisis hit the Mexican economy, creating the need for fiscal reforms around this period (2008-10). Indeed, fiscal stimulus measures were adopted during these years, and the escape clauses were invoked, which means that the fiscal rule was not in place. These measures included transfers to low-income families, increase in public investment and injection of additional credit channelled primarily through the state-owned development banking system (Berganza, 2012). For this purpose, the LPRH was adapted so from 2009, investments made by PEMEX through the scheme PIDIREGAS[16], were excluded from the balance and excluded from the BBR. This change sought to boost investment oil projects and the inclusion of all PEMEX's investment projects as budgetary investment. If the rule

[16]Proyectos de Inversión de Infraestructura Productiva con Registro Diferido en el Gasto Público (PIDIREGAS), are investment mechanisms used in the energy sector since 1995. They have been used for the development of public infrastructure through the participation of private initiative by the Federal Commission of Electricity (CFE) and *Petroleos Mexicanos* (PEMEX). These projects are characterized by their strict regulatory framework for their approval, execution, and monitoring relative to other budget projects. Commonly they are investment projects under the order of public entities for which during its construction expenses do not impact public finances. Still, public spending is affected once these projects come into operation as the payment of obligations begins.

had been in place in 2010, the divergence between the two trajectories should be interpreted in such a way that the observed effect of the fiscal rule on income inequality is negative, meaning that if it had not been implemented, the levels of inequality would have remained at a lower level.

Figure 9: Disposable net Income Gini gaps in Mexico and placebo gaps in all 23 control countries

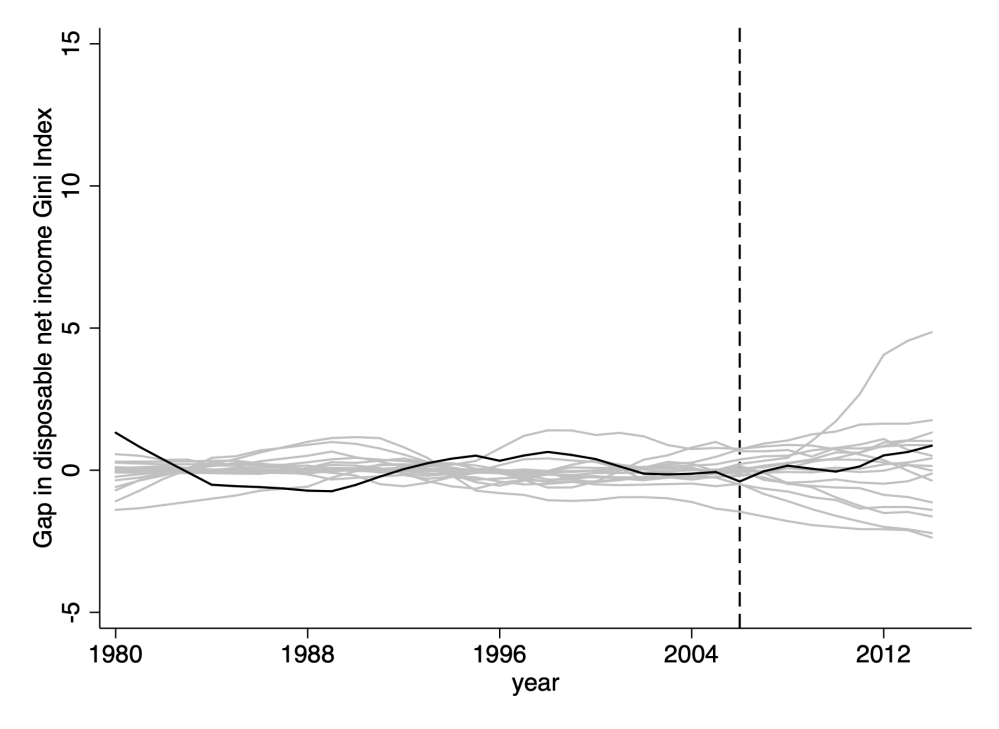


In this fashion, placebo tests seek to evaluate the estimates' significance in both cases, namely, a neutral or a negative effect. The process is the same as explained above. Figure 9 displays the pre-intervention and the post-intervention gaps between actual values and their synthetic counterparts for Mexico and all the other countries in the donor pool obtained from the placebo test. The black line denotes Mexico's gap, while the grey lines show the other countries' gap. It is observed that the gap for Mexico does not stand out relative to other countries. In the same line, the pre-intervention mean squared prediction error (MSPE) in Mexico is about 0.271. While the pre-intervention median MSPE among the donor countries is about 0.108, which is smaller, yet it indicates that the SCM can provide a good fit for the

income inequality over the pre-treatment period. This comparison of MSPE explains why Mexico's gap does not stand out from its respective placebo counterparts and confirms the initial result of no causal impact.

For more accuracy, I cleaned Figure 9 by excluding the countries where the method can't reproduce well enough the time series of income inequality. Here, there is also South Africa's case for which there is no convex combination that reproduces its level of income inequality and has an MSPE of 85.02. By doing so, it is possible to avoid that the estimated effect in the post-treatment period is created artificially by lack of fit rather than by implementing the fiscal rule. Figure 10 only considers the 16 countries that present a fit as good as Mexico in the period 1980-2005, that is, countries with an MSPE not higher than twice the MSPE for Mexico. Once again, the gap in Mexico does not stand out and confirms the lack of causal impact. Ultimately, these results suggest that an effect derived from implementing a BBR in Mexico on income inequality cannot be verified.

Figure 10: Disposable net Income Gini gaps in Mexico and placebo gaps in 16 control countries (discards states with pre-interventon MSPE two times higher than Mexico)



As mentioned above, Mexico's rule targets the traditional public sector balance (which includes liabilities associated with social security institutions and subnational governments). It has led to a reduction of fiscal deficit and debt levels and has also served to build credibility. In this sense, the BBR has contributed to achieving its objectives. Regarding the effect that a BBR can have on income inequality, it is important to consider that these rules are not designed to constraint or affect the total government spending in their nature. In this way, the observed effect might be neutral or even favourable. However, as argued in the literature, fiscal rules can be silent in the adjustment needed to achieve budgetary targets. For instance, even in the case of a zero deficit target, governments may do what they can to comply, and this is what can open a possible channel to affect spending or investment for social purposes.

The Mexican case shows that the efforts to bring down the levels of income inequality

have not been affected by implementing the fiscal rule. The Constitution has supported this by establishing a Golden Rule that protects investment. However, it has not been the only mechanism since the BBR only targets the cash balance that excludes revenues oriented to long-term contracts linked to development (PIDIREGAS). However, there are a couple of things to keep in mind to maintain these results. On the one hand, long-term fiscal policy must reduce dependence on oil revenues, as this would help reduce vulnerability to these shocks. In this way, the vicious circle mentioned in the introduction would be closed.

On the other hand, it has been observed that the BBR has led to pro-cyclical results, which can significantly reduce the government's fiscal space in the face of prolonged adverse shocks. For this reason, several analysts suggest that the government adjust accumulation to the economic cycle. Finally, strengthening the institutional transparency framework can avoid creative accounting situations in which many projects can be registered as an investment when they are not and benefit from excluding the limits imposed by the rules.

5.3 Chile

Chile (the Republic of) is a unitary presidential constitutional Republic divided into regions (15) and municipalities (345). Mining plays an essential role in the Chilean economy and is the main economic activity in many regions. Copper is Chile's main commercial product since it concentrates a large part of the world's mineral reserves and has managed to position itself as one of the world's largest copper producers. Due to this, copper prices and their cyclical changes strongly affect the country's fiscal revenues. Fiscal policy has constantly sought to adjust the price of copper in the medium term to better estimate structural revenues to face this situation. The development of an institutional framework for fiscal policy has been strongly linked to copper, which has started with the adoption of the Copper Revenue Stabilization Fund (*Fondo de Estabilización de los Ingresos del Cobre*) in 1985. This fund's existence implicitly acted as a fiscal rule that contributed to its later explicit adop-

tion (Cerda and Larraín, 2019). In this was the good macroeconomic performance of the last decades had been linked to this since it has made it possible to stabilize public spending and contribute to the achievement of primary surpluses for long periods.

Unlike Colombia's and Mexico's fiscal rules, Chile's rule was not introduced initially as a Law. It was instead introduced in 2000 by the incoming government as part of its commitment to macroeconomic stability. Ricardo Lagos initially implemented the rule by announcing that a structural balance rule would be followed during his government (2000-06). However, this announcement reflected more a norm and a non-binding commitment, which did not have any sanction in the case of non-compliance. The rule came into place in 2001, and although it was not always respected, it gave continuity to the government's commitment to budget stability. Until 2006, the rule was introduced as a Law supported by technical documents that included methodological calculations for its implementation. Given that fiscal discipline was in place, the rule was primarily institutionalized to consolidate these efforts.

On the budgetary side, the rule tries to fight against the procyclicality and helps to economic sustainability. It achieves its objective by protecting expenditure from cyclical fluctuations of real GDP and copper and molybdenum prices. As mentioned before, the rule sets up a cyclically adjusted target for the government at a surplus of 1% of PIB. The rule must take into account mainly cyclically adjusted revenues and public spending (R) to do so. In turn, within revenues, it is possible to distinguish between tax income (RTX) and income from natural resources (NRR) based upon the long-term price of copper. In this way, the cyclically adjusted balance (B^*) can be measured as follows:

$$B_t^* = R_t^* - G_t^* = (RTX_t^* + NRR_t^*) - G_t^* \tag{7}$$

Where $R*, B*$ and G are percentages of GDP. A star above a variable indicates it's a

cyclically adjusted value; all others are current values. By rewriting 7 the Chilean rule limits actual government spending to the cyclically-adjusted revenue net of the cyclically adjusted balance as follows

$$G_t = R_t^* - B_t^* \tag{8}$$

Nevertheless, to obtain these values, long-term estimations of trend GDP and cooper price are needed. The Ministry of Finance initially estimated them. However, shortly after the implementation of the rule, two independent councils were appointed by the government to safeguard the credibility of the estimates and enhance transparency[17].

Although these two councils are in place, the calculation for other variables is done by the Ministry of Finance. This situation causes the concentration of high discretionary power in the Ministry anyway. Furthermore, the rule does not establish sanctions for non-compliance. This circumstance is striking because it increases the government's discretion, which is counterintuitive when the policy decision is to implement fiscal rules. Besides, the rule does not specify escape clauses. Consequently, the objective of the structural balance on the surplus has been modified several times. Despite this, the rule has worked well since its implementation in 2001[18]. It went from being a commitment made by the government to a law that binds future governments to some extent. This commitment has contributed significantly to reducing procyclicality and the volatility of spending, output, interest rates, and the appreciation of the real exchange rate (Berganza, 2012).

Regarding the distributional effects of the rule, the SCM simulations suggest that its implementation has not significantly impacted Chile's income inequality path. The treatment

[17]The Advisory Committee for Trend GDP (ACTGDP) created in 2001 and the Advisory Committee for the Reference Price to Copper (ACRPC) created in 2003, for the projections of the two unobservable key variables, Trend GDP and Price to Copper respectively.

[18]For a more detailed analysis of the fiscal rule's budgetary effects, see Cerda and Larraín (2019); Piedrabuena et al. (2005); Caselli et al. (2018)

period for Chile started in 2001 when the rule was in place. Table 7 shows the countries and their respective weights used to construct Synthetic Chile for the outcome variable. In this way, the trends of the predictors' actual values before the implementation of the rule in Chile are best reproduced by a combination of Barbados, Egypt, Guatemala, Honduras, Malawi and South Africa. The balance in the pre-treatment characteristics between Chile and Synthetic Chile are described in Appendix C.

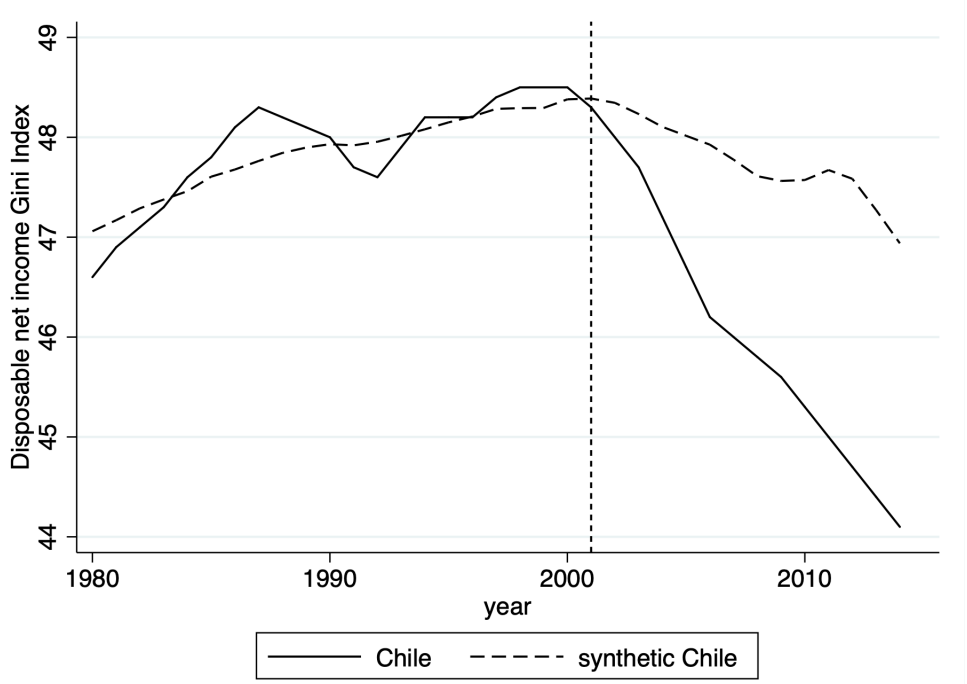
Table 7: Country weights in Synthetic Chile

Country	Weight	Country	Weight
Bangladesh	-	Mauritania	-
Barbados	0.048	Moldova	-
China	-	Morocco	-
DominicanRepublic	-	Philippines	-
Egypt	0.268	SierraLeone	-
Ghana	-	SouthAfrica	0.14
Guatemala	0.179	Sudan	-
Honduras	0.198	Thailand	-
Jordan	-	Tunisia	-
Kazakhstan	-	Turkey	-
Korea	-	Ukraine	-
Malawi	0.166		

Figure 11 depicts the SCM results for implementing the quantitative rule on structural balance in 2001 (vertical dashed line). It displays the disposable net income Gini for Chile and its Synthetic counterpart during 1980-2014. Visual inspection of both trajectories over the pre-treatment period shows a fair fit between Chile and its Synthetic. Conversely, the divergence of both trajectories is significantly notable in the post-treatment period. At this stage, there is a positive effect of the fiscal rule in Chile. Due to the growing gap between both paths, the level of income inequality would have remained at high levels had the fiscal rule not been implemented. Nevertheless, in both scenarios, the decreasing trend in

income inequality is maintained. Yet, because the rule does not distinguish between current and cyclically adjusted government expenditure, capital spending is not protected from the government's possible discretionary cuts, leading to a likely detrimental effect on public investment.

Figure 11: Synthetic Control Method Estimates for the Fiscal Rule in Chile



To evaluate the significance of the estimates and discard that the observed effect could be driven by chance, Figure 13 displays pre-and post-intervention gaps between actual values and its synthetic counterpart for Chile and all the other countries included in the donor pool. The black line denotes Chile's gap, while the grey lines represent the gap for countries in the donor pool. Furthermore, the MSPE in Chile is about 0.061, while the median for donor countries is about 0.055. These levels reveal an overall good fit over the pre-treatment period for almost all the countries. However, the black line for Chile does not stand out relative to the other lines suggesting a lack of causal impact. A more accurate result of the placebo test is obtained by removing outliers from Figure 12. Once again, the method fails

to reproduce income inequality levels for South Africa over the pre-treatment period with an MSPE of 75.68. Figure 13 removes the outliers and only considers the 18 countries that do not present an MSPE higher than two times the MSPE for Chile. What is observed now confirms that the gap in Chile does not stand out relative to the others suggesting that an effect derived from the implementation of a BBR in Chile on income inequality cannot be verified either.

Figure 12: Synthetic Control Method Estimates for the Fiscal Rule in Chile

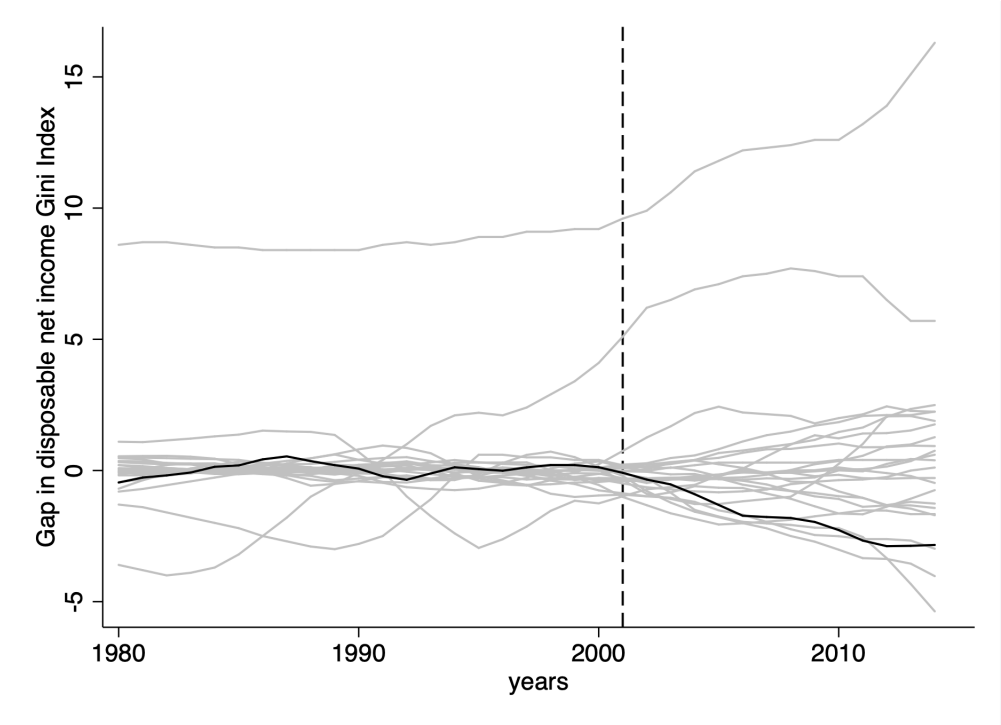
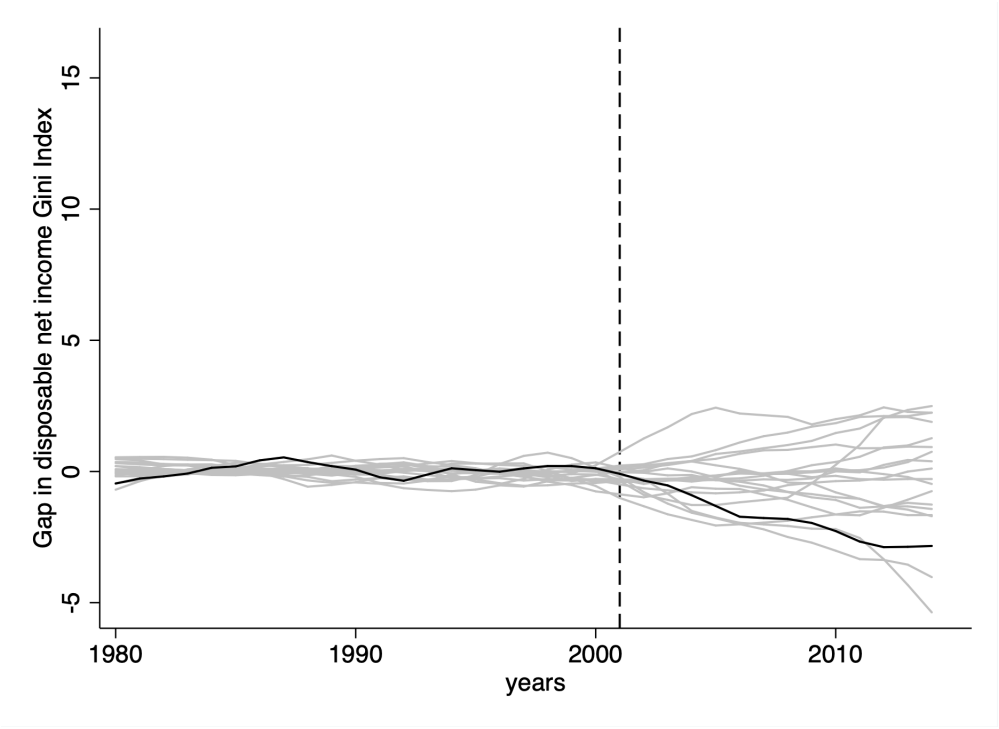


Figure 13: Disposable net Income Gini gaps in Chile and placebo gaps in 18 control countries (discards states with pre-interventon MSPE two times higher than Chile)



As mentioned before, BBR rules don't seek to affect total government spending, yet they can influence public investment. In this way, it can be unclear how its implementation can end up affecting income inequality. On one side, the rule does not seek to constraint government spending and therefore existing expenditures on social welfare (or spending related to reducing inequality levels). On the other side, the rule can affect public investment, which can be detrimental due to the bias abovementioned. Besides, in Chile's specific case, the cyclically adjusted balance (CAB) does not distinguish between current and capital expenditure by the government. Because adverse shocks can affect the government's cyclically adjusted stance, spending is not protected from discretionary cuts.

The counterfactual analysis shows, on the contrary, that income inequality has not been affected by the implementation of the fiscal rule. Public investment and expenditure dynamics can explain this result. On the one hand, public investment in Chile is low since

government investment does not include investment by public enterprises, and also because private-public partnerships perform well. On the other hand, the institutional framework has also contributed to independent public investment from fiscal revenue cycles. This result is in line with other findings such as in Fuentes et al. (2021) whereby implementing a DSGE model they show that under this BBR rule, public investment does not bear the brunt of an adjustment when facing a different type of negative shocks. On the expenditure side, Chile's fiscal framework has accounted for improvements in its efficiency and targeting of social spending, which has contributed to the implementation of social programs with better social safety nets with a moderate fiscal burden. Indeed, Chile's public expenditure has been one of the highest in the region, and even though the rule does not cyclically adjust public expending, the amount of social programs that depend on the economic cycle is low.

5.4 Brazil

Brazil (the Federative Republic of) is a federative republic with a presidential system. It is also the largest country in Latin America, and as shown in Section 2, one of the countries with the highest inequality levels of the region, but also the country with the highest level of public spending. The federation is divided at the state level (26 states and the Federal District) and municipal level (5570 municipalities), for a total of 5597 subnational governments (SNGs). Each state and the federal district has its Constitution, and the municipalities must comply with both of them. It is relevant to think of the territorial organization and the responsibilities of SNGs to understand the importance and effect of the reforms at the level of public finances. SNGs are significant economic and social actors as the federal Constitution guarantees its financial and administrative autonomy. In this way, the federal Constitution has achieved a high decentralization level of public spending by defining the tax base and compulsory transfers from the federal government to the SNGs. Apart from these mandatory transfers, tax revenue and another own-source revenue amount to more than half of SNGs revenue (OECD/UCLG, 2016). In turn, SNGs are responsible for providing public services

of local interest such as primary education, health and public security.

In counterbalance to this autonomy, the debt of SNGs was regulated by the Senate through resolutions and by the Central Bank through limits on domestic bank credits (Goldfajn and Guardia, 2004). Nevertheless, the debt held by SNGs started to grow as a consequence of both the looseness of the Senate in terms of debt rollover and debt service and the role of the federal government in bailing out insolvent debt. For this reason, after a series of bailouts in the mid-1990s, the federal government signed bilateral agreements with 25 or the 27 states to prevent SNGs from running excessive budget deficits. It is important to highlight that these agreements were significant in achieving fiscal discipline because the federal government made the SNGs commit to a fiscal adjustment program. The Senate approved this fiscal commitment and included some objectives related to income and expenses as well[19].

In 2000 the *Lei de Responsabilidade Fiscal e Finanas Publicas Municipais* (Fiscal Responsability Law, FRL) was adopted. The FRL gives continuity to the fiscal efforts made previously in terms of budgetary planning, execution, and reporting not only for the SNGs but for all three levels of government. In this way, multi-year primary balance targets are introduced for the non-financial public sector, binding for the current year but being only indicative for the next two years. It also sets two numerical fiscal rules for debt and expenditure. On the expenditure side, it aimed to limit personnel expenditure for states (and municipalities) at 50 per cent (at 60 per cent) of net current revenue (net of transfers t other levels of government). It also regulated permanent spending, which cannot be created without revenue increases or spending cuts. On the debt side, the Senate set limits for all the levels of government. Specifically, for state (and municipalities) debt cannot be 2 (1.2)

[19]Another important aspect of the debt restructuring agreements sought to eliminate the idea that the federal government would always bear the costs of excessive debt from the SNGs. In this sense, for the SNGs to be beneficiaries of the debt restructuring agreements, they had to use their revenue as a guarantee (tax revenue and grants and subsidies included). So in the event of default, the federal government would be entitled to withhold transfers or make use of the state's own bank account's revenue. (Goldfajn and Guardia, 2004)

times the net current revenue. Besides, to ensure its monitoring and compliance, a series of sanctions were established and escape clauses in extraordinary situations.

In this way, fiscal rules were implemented in 2000 to consolidate budgetary discipline in the federal states. The bilateral agreements with the majority of states were an important milestone in achieving this consolidation. From a fiscal point of view, this framework worked quite well for Brazil as the objectives were met from its implementation, generating enough fiscal space for Brazil to face the global financial crisis in 2008-09. Nevertheless, from a distributional point of view, the counterfactual simulations point to a positive, though statistically insignificant, effect of the rules on income inequality. Table 8 show the countries and their respective weights used to construct Synthetic Brazil. The combination of Guatemala, South Africa and Thailand are the most similar to Brazil regarding the level of income inequality and the behaviour of the predictor variables. The balance in the pre-treatment characteristics between Brazil and its synthetic counterpart is described in Appendix C. Figure 14 displays the trajectory for the disposable net income Gini Index for both Brazil and its Synthetic counterpart during the period 1980-2014.

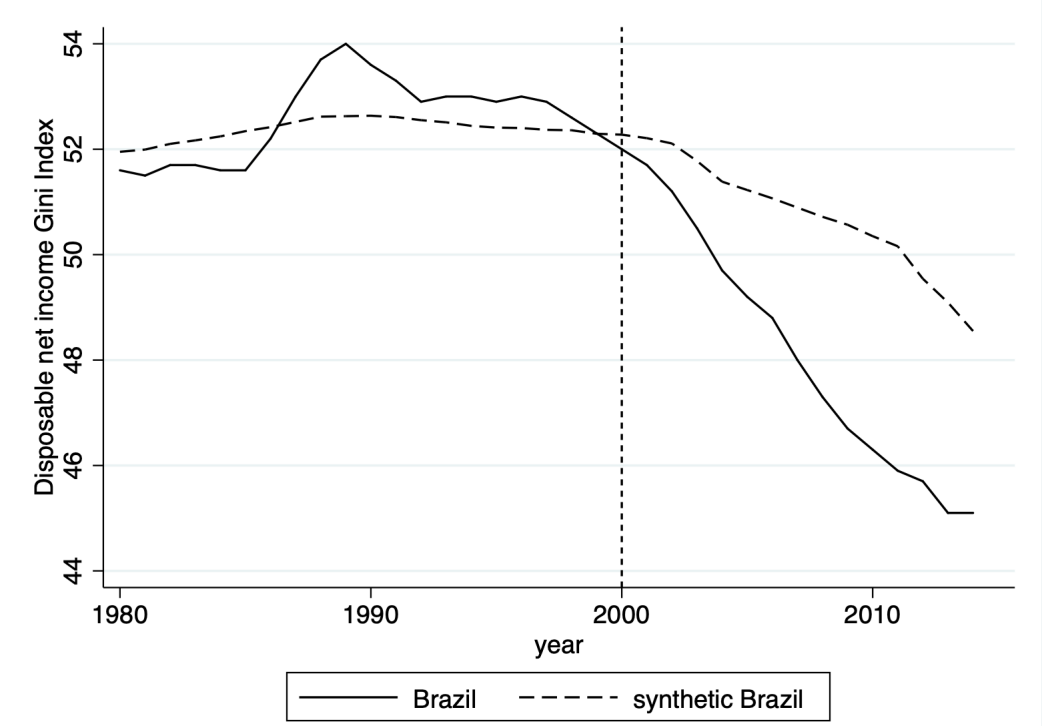
Because both fiscal rules were implemented in the same year, the treatment period started in 2000. The graph's visual inspection shows that Synthetic Brazil's trajectory does not appear to be significantly different from actual Brazil. However, Synthetic Brazil does not seem to capture the peak on the highest income inequality levels at the end of the 1980s, although it manages to replicate the decreasing trend afterwards. At this stage, similarly to the other countries, due to the divergence of both trajectories after the implementation of the fiscal rules in 2000, it is observed a positive effect of both fiscal rules on income inequality because the disposable net income Gini index would have remained in higher levels were not implemented the rules. The fact that all government levels reduced the amount of resources devoted to debt so they can be assigned to reduce inequality explains this positive effect. To

confirm that this effect is significant, Figure 15 shows the placebo test results. The black line denotes the gap estimated for Brazil, while the grey lines show the gap for the other countries both for the pre-and post-intervention periods. In this case, that the gap post-treatment for Brazil stands out in the post-treatment period. Indeed, the pre-intervention mean squared prediction error (MSPE) in Brazil is about 0.4. However, the median MSPE among the donor states is about 0.059, suggesting that the SCM provides a better fit for income inequality over the pre-treatment period for the donor countries.

Table 8: Country weights in Synthetic Brazil

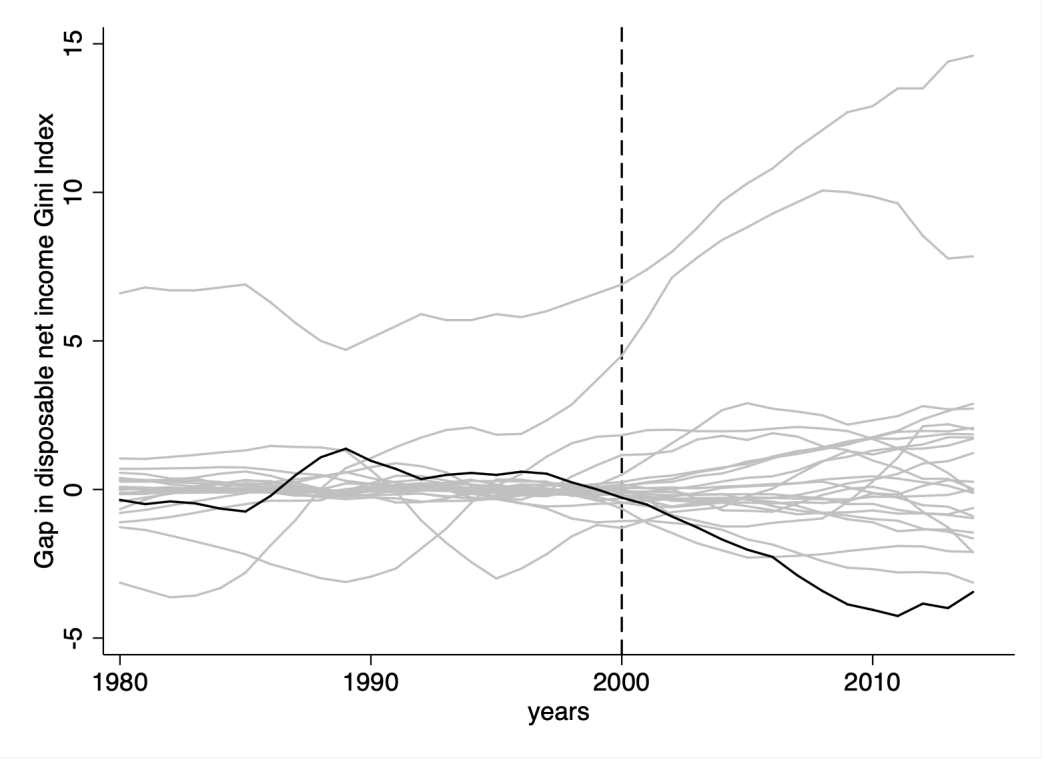
Country	Weight	Country	Weight
Bangladesh	-	Mauritania	-
Barbados	-	Moldova	-
China	-	Morocco	-
DominicanRepublic	-	Philippines	-
Egypt	-	SierraLeone	-
Ghana	-	SouthAfrica	0.333
Guatemala	0.583	Sudan	-
Honduras	-	Thailand	0.084
Jordan	-	Tunisia	-
Kazakhstan	-	Turkey	-
Korea	-	Ukraine	-
Malawi	-		

Figure 14: Synthetic Control Method Estimates for the Fiscal Rule in Brazil



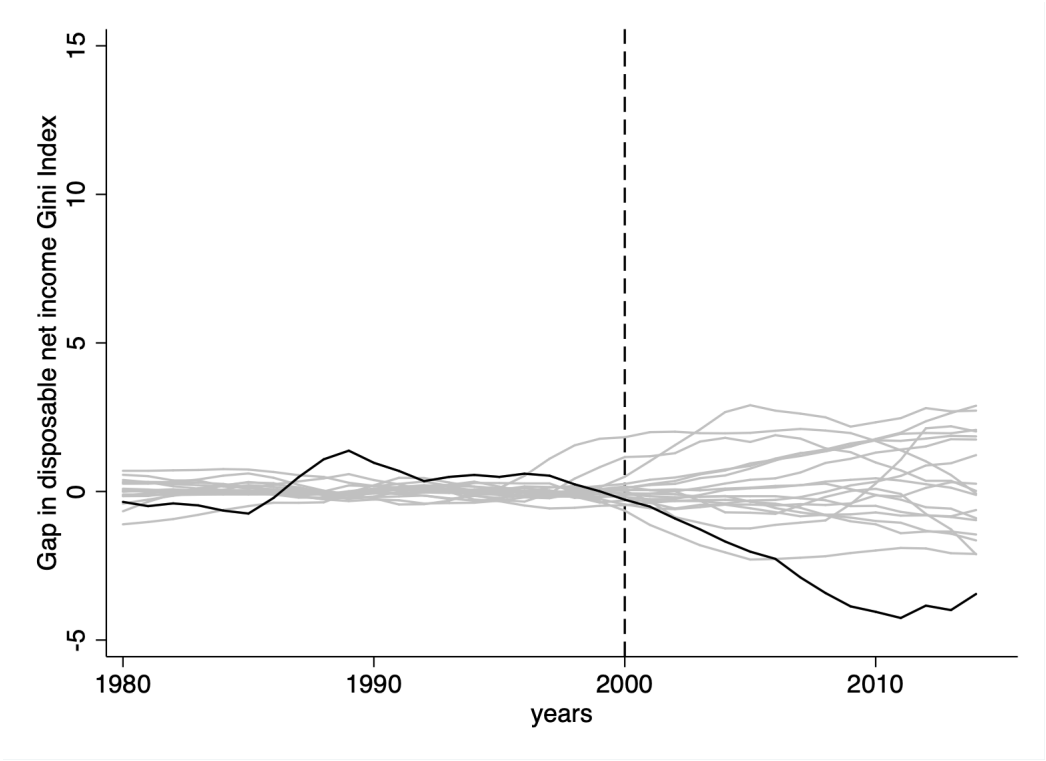
Even if Brazil's gap stands out relative to the other countries, the best fit for the donor countries prevents us from confirming any causal impact. Figure 16 depicts the placebo gaps and discards the outliers where the SCM cannot replicate well enough the time series of income inequality. For Brazil's case, it only takes into account 18 countries that have a fit as good as Brazil in the pre-treatment period. On one side, there is South Africa as an outlier with an MSPE of 36.77, and as was evidenced before, there is no convex combination that can reproduce the outcome variable in this case. On the other side, even if Brazil's gap stands out even after cleaning for the outliers, Brazil is not the country with the smallest pre-treatment MSPE neither the largest MSPE in the post-treatment period. This remark indicates that the observed effect is being created somewhat artificially than by implementing the rules. In this way, the impact of implementing a combination of DR with ER in Brazil on income inequality measured by the net disposable Gini index cannot be verified either.

Figure 15: Synthetic Control Method Estimates for the Fiscal Rule in Brazil



Brazil has implemented a combination of ER and DR, a common practice when multiple fiscal objectives are envisaged (Caselli et al., 2018). As mentioned above, the economic stigma comes from the silence in the paths to compliance. What is different from the other countries is that Brazil implemented their rules as a final step of fiscal consolidation rather than the initial step. While ER could harm inequality by reducing government spending or the government's size, the Brazilian rule is clear about which kind of expenditure is limiting (mostly spending related to payroll). Similarly, debt rules do not include clear operational guidance, and because of the limits that SNGs can meet to finance their needs, one could think about a negative effect as well. However, DR came into place as a culmination of a series of one-to-one agreements between the federal government and SNGs.

Figure 16: Disposable net Income Gini gaps in Brazil and placebo gaps in 18 control countries (discards states with pre-interventon MSPE two times higher than Brazil)



In this way, the fiscal framework, including the fiscal rules, led to a sound and permanent fiscal regime extended to all government levels. It has allowed the improvement of federal budget management by a successive generation of primary surpluses, which has freed up resources and led to a better spending composition, which in turn can increase spending designed to reduce inequality. The Brazilian case remains a good example of implementing fiscal rules at the end of a process of consolidation and debt restructuring, showing a positive, though statistically insignificant, effect on income inequality. The results suggest that no evidence bringing down income inequality has been affected by implementing the fiscal rule. On the contrary, an improved fiscal position can explain to some extent the decreasing trend on the net disposable Gini index.

6 Robustness

All inequality measures present some weaknesses. For instance, in some countries, surveys were undertaken during times when access to a large part of the territory and the population was complex (i.e. civil wars). Yet, they are presented as national surveys. On the other hand, comparability across countries is undermined by the differences between data reported on income and expenditure data and how it is collected and aggregated (deciles vs quantiles). Besides this, each measure should be judged by the job it does, considering how sensible each measure is to changes in the pattern of distribution, whether they capture absolute or relative wealth, or how they respond to changes in the overall scale of incomes, among others. This section investigates a number of robustness checks, including changes in income inequality measures and alternative datasets to ensure different ways to look at inequality. It is important to highlight that because of the countries included in the donor pool, data on inequality (as well as for the predictor variables) is scarce.

6.1 Market income Gini Index

The primary measure that has been used in this paper is the Gini index. On the one hand, due to the work of a large part of the literature, the Gini index has become both one of the most comparable measures between countries and one of the most used. On the other hand, it allows capturing the re-distributional effects of fiscal policy by differentiating between *market* and *disposable* income. This paper has focused on the latter, the net disposable Gini index from the Standardized World Income Inequality Database (SWIID) developed by Solt (2020). Nevertheless, because the inequality observed in Latin America extends to all types, and the perverse effects derived from the bias towards public investment, *market income* inequality can also be affected by the implementation of fiscal rules (before taxes have been collected and transfers have been made). For instance, it has been shown that spending on education and health can promote both growth and equity, and higher spending on these

reduces market income inequality (IMF, 2017). The SWIID also provides information about the market income Gini index, relying on the availability and high comparability that these data provide. The results using the market Gini as outcome variable are in Panel A of Table 9. The usual inference tests support the good fit for the model in the pre-treatment period. Moreover, results are insignificant with a high donor probability, suggesting that the positive effect of the implementation of fiscal rules does not change even before the re-distributional effect of fiscal policy through taxes and transfers.

6.2 An alternative dataset for the Gini Index

As mentioned above, the SWIID provides information on income inequality, especially on redistribution based on the net and market Gini index difference. Now, I test the results' robustness by using the Global Consumption and Income Project (GCIP) dataset, which includes other measures of income inequality different from the Gini Index. It is constructed from two separate datasets: The Global Consumption Dataset (GCD) and The Global Income Dataset (GID). This database's particularity is that it mixes and standardizes income and consumption surveys to compare inequality across countries and over time (Lahoti et al., 2016). This database provides information about the Gini index but does not differentiate between the net or market indices. In this way, the index presented in this database corresponds to the income distribution where no redistribution effect is yet evident. The results are in Panel B of the Table 9.

Similarly to market Gini from the SWIID, it is observed from the inference tests that the fit of the model is good and that the positive effect of the implementation of the fiscal rule on inequality is maintained. It is also observed that the donor probabilities are high, except for Brazil. For Chile, Colombia and Mexico, the results remain non-significant. In Brazil's case, the probability is 8.7 per cent, which is a significant result concerning traditional statistical significance measures. This result is in the same direction as those found previously and

offers evidence that the economic stigma derived from fiscal rules is unwarranted.

6.3 An alternative measure of inequality

One of the Gini index's main disadvantages is that it puts equal weight on all components of the income distribution. It is important to bear in mind that the measures of income inequality are constructed from its distribution. One of the biggest concerns (or even weaknesses) of these measures focuses on what part of the distribution is concentrated and how capable it is to capture changes in it, even if these changes are significant enough to change the measurement. Thus, the last two robustness checks consider measures that focus on other parts of the distribution, such as the Palma Ratio and the Atkinson Index. One of the problems that the SCM faces, in this case, is that income inequality in Latin America measured by the Gini index is very high relative to other countries. This situation can influence how the SCM builds the synthetic counterpart of each country.

The Palma ratio is the ratio of the top 10 per cent of the population's share of gross national income (GNI), divided by the poorest 40 percent of the populations' share of GNI (Cobham et al., 2013). The Palma ratio is based on the work of Gabriel Palma (Palma, 2006, 2011) and is very relevant for the Latin American case because of the way that the middle class and the oligarchies in the region have managed to appropriate a large proportion of the GNI. Similarly, Palma (2011) finds that the process of income polarization is similar across countries. This feature means that the synthetic counterpart's construction and the weights assigned to each country can vary significantly. The inference tests results are in Panel C of the Table 9. Once again, the results are held, suggesting a positive, although non-significant, impact of implementing the fiscal rules on the inequality measured by the Palma Ratio.

Likewise, the Atkinson index (or Atkinson's inequality measure) puts greater weight on the lower and end of the income distribution. However, it is mostly considered a welfare-

based measure of inequality as it indicates the percentage of total income that a given society would have to forego to have more equal shares of income between its individuals. The inference test using the Atkinson Index as the outcome variable are shown in Panel D of Table 9. The usual inference tests suggest a good fit of the SCM and present the same results as the benchmark findings, a positive but non-significant effect of implementing the fiscal rules for Brazil, Colombia and Mexico. Chile's results go in the same direction as in the previous exercises, and this time is significant at a 10 per cent level, providing evidence that fiscal rules do not necessarily negatively impact income inequality.

Table 9: Synthetic Control Method of the impact of Fiscal Rules on various income inequality measures

	Brazil	Chile	Colombia	Mexico
Panel A: Market Gini Index, SWIID				
Pre-intervention RMSPE [1]	0.899	0.282	0.124	0.605
RMSPE median (donor pool)	0.166	0.228	0.152	0.208
Pre-intervention RMSPE rank	21	15	7	17
post/pre intervention RMSPE ratio rank [2]	11	12	20	12
Donor probability [3]	58.33	54.17	20.83	54.17
Panel B: Gini Index, GCIP				
Pre-intervention RMSPE	0.014	0.01	0.037	0.019
RMSPE median (donor pool)	0.018	0.016	0.021	0.021
Pre-intervention RMSPE rank	9	7	14	11
post/pre intervention RMSPE ratio rank	22	15	9	20
Donor probability	8.7	41.66	65.21	20.83
Panel C: Palma Ratio, GCIP				
Pre-intervention RMSPE	0.397	0.17	0.794	0.159
RMSPE median (donor pool)	0.448	0.456	0.372	0.506
Pre-intervention RMSPE rank	11	5	18	3
post/pre intervention RMSPE ratio rank	21	18	5	19
Donor probability	16.66	29.16	82.61	21.74
Panel D: Atkinson Index, GCIP				
Pre-intervention RMSPE	0.034	0.009	0.043	0.012
RMSPE median (donor pool)	0.028	0.03	0.027	0.036
Pre-intervention RMSPE rank	15	3	15	4
post/pre intervention RMSPE ratio rank	5	22	9	20
Donor probability	83.33	8.7	65.22	17.39

Pre-intervention periods: Brazil (1980-1999), Chile (1980-2001), Colombia (1980-2000), Mexico (1980-2005)

[1] RMSPE refers to root mean square prediction error

[2] post/pre RMSPE ratio rank is the position where the country is located with respect to the donnor countries (the higher the better)

[3] Donor probability is the probability of obtaining a post-pre RSPE ratio as large as the threated if one were to assign the intervention at random in the data

7 Conclusion

This paper challenges the economic stigma that fiscal rules can breed unwanted side effects on inequality. This stigma is based on the fact that most fiscal rules are silent on the composition of the adjustment needed to comply. Similarly, because fiscal rules are considered part of consolidation processes where the bias towards public investment increases and the composition of spending oriented to cover developmental needs can be negatively affected. This paper's results have important policy implications as they contribute to a better understanding of how fiscal rules can be enhanced if desirable, focusing on the social costs rather than on its budgetary impact. By concentrating on income inequality, I studied the relationship between such inequality and fiscal rules in four Latin American countries, and I provide evidence of why this economic stigma is unwarranted.

Because fiscal rules affect significantly fiscal performance, its assessment has focused on its budgetary impact. Since fiscal rules are seen as consolidation processes, it is relevant to study how to protect investment and public spending during these periods. On the one hand, the implementation of fiscal rules is endogenous. Governments may implement rules to gain fiscal space and avoid an unsustainable economic environment, as well as they may be implemented when macroeconomic imbalances are already in place. Similarly, some other governments can adopt them to avoid the social costs that high fiscal indiscipline generates. For example, in Brazil's case, the amount of resources allocated to contain the high levels of debt could have been directed to social spending that in turn contributes to reducing the levels of inequality. Nevertheless, if the consolidation is too severe and ends up affecting investment or public spending, higher inequality levels can be generated. Which, in turn, breeds other types of economic imbalances. The main concern is that efforts to combat the region's high inequality levels are not affected in this process. This point is fundamental because inequality is structural and a source of macroeconomic imbalances.

Using the synthetic control method, I find evidence of a positive, although statistically insignificant, effect of implementing fiscal rules in four Latin American countries, suggesting a lack of causal impact. This result means that the different kind of fiscal rules implemented in these countries haven't affected income inequality negatively. On the contrary, by studying each case separately, I show that the type of rule implemented in each country best explains the lack of social costs, such as increased income inequality. Regardless of the kind of rule implemented in all countries, the same effect is observed. The rules' design is essential and best explains that the consolidation's impact is not transmitted via investment or public spending, therefore translating into social costs. In this way, the implementation of fiscal rules has not been inconsistent with the inequality reduction strategies in place.

The fight against inequality and poverty and the search for more just and inclusive societies and higher levels of well-being have been of such importance that they are configured as the first objective of the United Nations Sustainable Development Goals. In Latin America, the challenges associated with these objectives are characterized by their multi-faceted and structural nature and persistence (ECLAC, 2019). Inequality in the region is historical, structural and has been maintained and reproduced even in periods of growth and economic prosperity (see ECLAC (2019) and Bértola et al. (2015)). It is based on a highly heterogeneous and poorly diversified productive matrix and a culture of privilege that is a historical feature of the region. Inequality has become central to the economic debate, and now more than ever, it is relevant to use all possible tools to combat high levels of inequality. As mentioned above, this paper emphasizes the role of fiscal policy to impact inequality. Even though it is not the main objective of fiscal policy, much less of fiscal rules, it is in its interest and in its possibilities to attenuate the high levels of inequality.

Finally, this paper could be extended in several ways. First, it would be interesting to

investigate other social welfare measures for the outcome variable, such as investment in health or education. Second, there are potential applications at the regional or state level within countries, for instance, by examining fiscal measures' impact in federal states. Third, it could be interesting to consider how different income groups are subject to the shock by investigating household data.

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Appendix

Appendix A: Donor pool countries

The donor pool countries are those countries that did not implement any fiscal rule following the IMF Fiscal Rules Dataset 2016 (Schaechter et al., 2012), during the period 1980-2014.

Table 10: Donor countries: unexposed countries that were included in the SCM analysis

Bangladesh	Mauritania
Barbados	Moldova
China	Morocco
Dominican Republic	Philippines
Egypt	Sierra Leone
Ghana	South Africa
Guatemala	Sudan
Honduras	Thailand
Jordan	Tunisia
Kazakhstan	Turkey
Korea	Ukraine
Malawi	

Appendix B: Descriptive Statistics

Table 11: Variables description and data sources

Variable	Desciption	Source
Macroeconomic		
GDP per capita, PPP (constant 2017 international $)	GDP per capita based on purchasing power parity (PPP). PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates.	International Comparison Program, World Bank World Development Indicators database, World Bank Eurostat-OECD PPP Programme.
Unemployment, total (% of total labor force)	Unemployment refers to the share of the labor force that is without work but available for and seeking employment.	International Labour Organization, ILOSTAT database.
Inflation, GDP deflator (annual %)	Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy as a whole. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency.	World Bank national accounts data, and OECD National Accounts data files.
Trade (% of GDP)	Trade is the sum of exports and imports of goods and services measured as a share of gross domestic product.	World Bank national accounts data, and OECD National Accounts data files.
Total natural resources rents (% of GDP)	Total natural resources rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents.	Estimates based on sources and methods described in "The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium" (World Bank, 2011).
Current account balance (% of GDP)	Current account balance is the sum of net exports of goods and services, net primary income, and net secondary income.	International Monetary Fund, Balance of Payments Statistics Yearbook and data files, and World Bank and OECD GDP estimate.
Gross capital formation (% of GDP)	Gross capital formation consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories.	World Bank national accounts data, and OECD National Accounts data files.
Institutional		
Rule of Law: Estimate	Captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.	The Worldwide Governance Indicators, World Bank
Political Stability and Absence of Violence/Terrorism: Estimate	Measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.	The Worldwide Governance Indicators, World Bank
Government Effectiveness: Estimate	Captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.	The Worldwide Governance Indicators, World Bank
Voice and Accountability: Estimate	Captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and free media. Estimate gives the country's score on the aggregate indicator, in units of a standard normal distribution, i.e. ranging from approximately -2.5 to 2.5.	The Worldwide Governance Indicators, World Bank
Development		
Population, total	Is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship.	World Development Indicators database, World Bank
Life expectancy at birth, total (years)	Indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.	World Development Indicators database, World Bank
Labor force, total	Comprises people ages 15 and older who supply labor for the production of goods and services during a specified period. It includes people who are currently employed and people who are unemployed but seeking work as well as first-time job-seekers. Not everyone who works is included, however. Unpaid workers, family workers, and students are often omitted, and some countries do not count members of the armed forces.	Derived using data from International Labour Organization, ILOSTAT database
Age dependency ratio (% of working-age population)	Is the ratio of dependents (people younger than 15 or older than 64) to the working-age population (those ages 15-64). Data are shown as the proportion of dependents per 100 working-age population.	World Bank staff estimates based on age distributions of United Nations Population Division's World Population Prospects: 2019 Revision.
Barro-Lee: Average years of primary schooling, age 25+, total	Is the average years of primary education completed among people over age 25.	Robert J. Barro and Jong-Wha Lee: http://www.barrolee.com/

Source: World Bank Open Data

Appendix C: Pre-intervention Characteristics

Table 12: Pre-intervention Characteristics Comparison: Disposable Gini

Predictors	**Synthetic Brazil**	**Brazil**	**Synthetic Chile**	**Chile**	**Synthetic Colombia**	**Colombia**	**Synthetic Mexico**	**Mexico**
GDP per capita, PPP	8.89	9.30	8.39	9.44	8.92	9.11	9.04	9.71
Population, total	16.62	18.80	16.38	16.40	16.39	17.30	16.80	18.28
Unemployment, total (% of labor force)	11.76	7.39	9.74	6.81	18.79	11.48	6.93	3.66
Life expectancy at birth, total (years)	62.29	66.17	61.10	73.24	64.93	69.77	64.29	71.52
Age dependency ratio (% of working-age population)	86.39	64.84	86.89	57.14	76.19	68.14	81.29	75.06
Current account balance (% of GDP)	-2.54	-1.83	-3.32	-4.49	-1.15	-2.44	-2.69	-2.02
Gross capital formation (% of GDP)	2.60	2.43	4.02	4.86	3.61	3.13	2.72	2.72
Trade (% of GDP)	44.38	17.75	57.99	53.17	62.59	31.77	46.25	39.10
Total natural resources rents (% of GDP)	3.09	2.10	6.90	7.91	4.48	3.85	1.64	5.69
Barro-Lee: Average years of primary schooling, age 25+, total	2.22	2.59	2.66	4.83	2.69	3.69	2.76	2.71
Government Effectiveness: Estimate	0.04	-0.11	-0.15	1.22	0.38	-0.35	-0.30	0.21
Voice and Accountability: Estimate	0.18	0.29	-0.14	0.74	0.48	-0.43	-0.21	0.21
Public stability index	-0.57	-0.24	-0.31	0.80	-0.12	-1.20	-0.69	-0.38
Inflation, GDP deflator (annual %)	18.28	20.04	20.15	22.75	20.68	20.51	18.58	22.02
Labor force participation rate, total (%of total population ages 15+)	61.07	62.93	60.80	56.01	61.80	67.49	58.31	59.70
Gini SWIID prior to the treatment year	52.29	52.30	48.38	48.50	51.62	51.70	45.56	45.50

Table 13: Pre-intervention Characteristics Comparison: Gini Index, GCIP data

Predictors	**Synthetic Brazil**	**Brazil**	**Synthetic Chile**	**Chile**	**Synthetic Colombia**	**Colombia**	**Synthetic Mexico**	**Mexico**
GDP per capita, PPP	9.23	9.71	8.92	9.30	9.02	9.44	8.11	9.11
Population, total	17.54	18.28	16.76	18.80	16.30	16.40	17.34	17.30
Unemployment, total (% of labor force)	2.44	3.66	9.69	7.39	10.42	6.81	11.64	11.48
Life expectancy at birth, total (years)	69.07	71.52	63.27	66.17	69.43	73.24	59.86	69.77
Age dependency ratio (% of working-age population)	59.59	75.06	83.06	64.84	62.78	57.14	81.69	68.14
Current account balance (% of GDP)	-1.97	-2.02	-2.77	-1.83	-3.24	-4.49	-2.82	-2.44
Gross capital formation (% of GDP)	5.81	2.72	3.11	2.43	6.32	4.86	3.14	3.13
Trade (% of GDP)	68.69	39.10	47.60	17.75	78.46	53.17	38.76	31.77
Total natural resources rents (% of GDP)	1.12	5.69	2.66	2.10	3.76	7.91	3.83	3.85
Barro-Lee: Average years of primary schooling, age 25+, total	2.73	2.71	2.22	2.59	3.48	4.83	3.57	3.69
Government Effectiveness: Estimate	0.21	0.21	0.02	-0.11	0.48	1.22	-0.38	-0.35
Voice and Accountability: Estimate	0.20	0.21	0.18	0.29	-0.06	0.74	-0.66	-0.43
Public stability index	0.07	-0.38	-0.44	-0.24	0.35	0.80	-0.92	-1.20
Inflation, GDP deflator (annual %)	29.01	22.02	20.07	20.04	27.56	22.75	20.47	20.51
Labor force participation rate, total (%of total population ages 15+)	68.78	59.70	62.99	62.93	59.39	56.01	62.17	67.49
Gini GCIP prior to the treatment year	0.48	0.44	0.57	0.57	0.53	0.54	0.56	0.58

Table 14: Pre-intervention Characteristics Comparison: Atkinson Index, GCIP data

Predictors	**Synthetic Brazil**	**Brazil**	**Synthetic Chile**	**Chile**	**Synthetic Colombia**	**Colombia**	**Synthetic Mexico**	**Mexico**
GDP per capita, PPP	8.82	9.71	8.04	9.30	8.91	9.44	7.93	9.11
Population, total	18.28	18.28	18.12	18.80	15.73	16.40	17.63	17.30
Unemployment, total (% of labor force)	3.66	3.66	10.90	7.39	11.55	6.81	11.96	11.48
Life expectancy at birth, total (years)	68.91	71.52	60.87	66.17	67.43	73.24	61.90	69.77
Age dependency ratio (% of working-age population)	60.29	75.06	71.75	64.84	64.76	57.14	78.33	68.14
Current account balance (% of GDP)	-1.30	-2.02	-1.79	-1.83	-3.08	-4.49	-2.74	-2.44
Gross capital formation (% of GDP)	6.02	2.72	5.03	2.43	7.29	4.86	4.54	3.13
Trade (% of GDP)	65.64	39.10	41.49	17.75	74.08	53.17	36.46	31.77
Total natural resources rents (% of GDP)	3.13	5.69	6.10	2.10	4.11	7.91	3.07	3.85
Barro-Lee: Average years of primary schooling, age 25+, total	3.39	2.71	3.11	2.59	4.10	4.83	4.64	3.69
Government Effectiveness: Estimate	0.11	0.21	-0.11	-0.11	0.57	1.22	-0.60	-0.35
Voice and Accountability: Estimate	-0.10	0.21	-0.50	0.29	0.14	0.74	-1.43	-0.43
Public stability index	-0.12	-0.38	-0.34	-0.24	0.37	0.80	-1.20	-1.20
Inflation, GDP deflator (annual %)	28.85	22.02	26.53	20.04	23.99	22.75	22.51	20.51
Labor force participation rate, total (%of total population ages 15+)	67.76	59.70	64.93	62.93	59.44	56.01	57.35	67.49
Palma Ratio prior to the treatment year	3.35	3.32	4.36	4.37	5.50	5.53	4.81	5.41

Table 15: Pre-intervention Characteristics Comparison: Palma Ratio, GCIP data

Predictors	**Synthetic Brazil**	**Brazil**	**Synthetic Chile**	**Chile**	**Synthetic Colombia**	**Colombia**	**Synthetic Mexico**	**Mexico**
GDP per capita, PPP	8.82	9.71	8.04	9.30	8.91	9.44	7.93	9.11
Population, total	18.28	18.28	18.12	18.80	15.73	16.40	17.63	17.30
Unemployment, total (% of labor force)	3.66	3.66	10.90	7.39	11.55	6.81	11.96	11.48
Life expectancy at birth, total (years)	68.91	71.52	60.87	66.17	67.43	73.24	61.90	69.77
Age dependency ratio (% of working-age population)	60.29	75.06	71.75	64.84	64.76	57.14	78.33	68.14
Current account balance (% of GDP)	-1.30	-2.02	-1.79	-1.83	-3.08	-4.49	-2.74	-2.44
Gross capital formation (% of GDP)	6.02	2.72	5.03	2.43	7.29	4.86	4.54	3.13
Trade (% of GDP)	65.64	39.10	41.49	17.75	74.08	53.17	36.46	31.77
Total natural resources rents (% of GDP)	3.13	5.69	6.10	2.10	4.11	7.91	3.07	3.85
Barro-Lee: Average years of primary schooling, age 25+, total	3.39	2.71	3.11	2.59	4.10	4.83	4.64	3.69
Government Effectiveness: Estimate	0.11	0.21	-0.11	-0.11	0.57	1.22	-0.60	-0.35
Voice and Accountability: Estimate	-0.10	0.21	-0.50	0.29	0.14	0.74	-1.43	-0.43
Public stability index	-0.12	-0.38	-0.34	-0.24	0.37	0.80	-1.20	-1.20
Inflation, GDP deflator (annual %)	28.85	22.02	26.53	20.04	23.99	22.75	22.51	20.51
Labor force participation rate, total (%of total population ages 15+)	67.76	59.70	64.93	62.93	59.44	56.01	57.35	67.49
Palma Ratio prior to the treatment year	3.35	3.32	4.36	4.37	5.50	5.53	4.81	5.41

Appendix D: Example of Placebo test

The idea of the placebo test (also known as falsification test) is similar to the classic framework of permutation inference and consists of systematically check that the estimated impact of the treatment is not driven by other factors, or by chance, on the control sample. In other words, this means applying the SCM to every potential control. This means putting the treated country in the donor pool, and another country is taken to run the SCM in this process. This process is done systematically until information about pre-and post- RMSPE for each country is collected. In this Appendix, I took Bangladesh as an example to illustrate how the treatment is assigned at random in the case of Colombia that implemented an Expenditure Rule (ER) in 2000.

Colombia is the treated unit, and there are 23 countries in the donor pool (control countries). To carry on the placebo test, I take back Colombia into the donor pool, and now the treatment is assigned to the first country in the donor pool, which is Bangladesh. Now it is assumed that Bangladesh is the treated country and implemented an ER in 2000. The SCM is carried on, and now there is information about the countries used to construct Synthetic Bangladesh (Table 16) and the pre-and post-intervention RMSPE. The estimation statistics are shown in Table 17. With the right panel of Figure 17, the SCM presents a good fit in the pre-treatment period but not a significant divergence in the post-treatment period. Indeed, what is observed in the left panel of Figure 17, is that both in the pre-and post-treatment period, the placebo gap is close to zero.

By running the placebo tests, it is possible to collect information about each country in the donor pool and thus answer the question of *"how often would we obtain a gap as large as the one of the exposed state if we had chosen a country at random?"*. A causal impact comes from obtaining a post-intervention gap that stands out from the respective placebo counterparts. This is not the case for Bangladesh, and neither for Colombia. Even though the answer to the question above is the same for both countries, Colombia's probability is almost five times smaller.

Table 16: Country weights in Synthetic Bangladesh

Country	Weight	Country	Weight
Barbados	-	Mauritania	-
China	0.274	Moldova	-
Colombia	-	Morocco	-
DominicanRepublic	-	Philippines	-
Egypt	-	SierraLeone	-
Ghana	-	SouthAfrica	-
Guatemala	-	Sudan	0.293
Honduras	0.263	Thailand	-
Jordan	-	Tunisia	-
Kazakhstan	-	Turkey	-
Korea	0.263	Ukraine	0.171
Malawi	-		

Table 17: Synthetic Control Method Estimates of the impact of Fiscal Rules, Bangladesh

	Bangladesh
Pre-intervention RMSPE[1]	0.094
RMSPE median (donor pool)	0.191
Pre-intervention RMSPE rank	4
post/pre intervention RMSPE rank[2]	11
Donor probability[3]	58.33

[1] RMSPE refers to root mean square prediction error

[2] post/pre RMSPE ratio rank is the position where the country is located with respect to the donnor countries (the higher the better)

[3] Donor probability is the probability of obtaining a post-pre RSPE ratio as large as the threated if one were to assign the intervention at random in the data

Figure 17: Synthetic Control Estimates of the Fiscal Rule in Bangladesh