# Behavioral Responses to Inheritance Taxes: Evidence from Brazil

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**Abstract**

In this paper, I analyze behavioral responses to inheritance and gift taxes in Brazil using inheritance tax microdata from 2014 to 2020. Employing bunching and differences-in-differences (DD) techniques, I observe that individuals strongly react to tax hikes and adjust their wealth transfers to avoid taxes. This results in a large short-run elasticity ($e = 20$). I also find that retiming responses are sensitive to changes in top rates for gift transfers and tax system variations (flat rates versus progressive brackets). Finally, evasion increased in the medium-run, and approximately 60% of the projected tax revenue increase was lost due to retiming responses.

***Keywords:*** Behavioral Responses, Inheritance Tax, Gifts, Brazil

***JEL***: D31, H31, H71, H26, H24, D91

# 1 Introduction

Taxes on intergenerational transfers are commonly prescribed as a way to raise tax revenues and reduce wealth inequality (OECD, 2021; Piketty, 2014). Yet, if taxpayers anticipate a tax reform and/or change their behavior, tax revenues may remain unchanged or even decrease, and hinder redistribution (Nordblom et al., 2006). Hence, the efficiency of inheritance and gift taxes depends significantly of individuals' tax responsiveness. However, assessing behavioral responses to inheritance taxes is an empirical challenge. Exogenous variation in tax rates is rare and wealth transfer data are hard to find (Glogowsky, 2021). Moreover, the existing evidence is restricted to rich countries, and much less is known about behavioral responses to inheritance and gift taxes in developing countries.

This paper aims to fill this gap by estimating behavioral responses to inheritance and gift taxation in Brazil. I use administrative tax microdata that cover the *universe* of inheritance and gift receipts in nine states (60% of total tax collection) between 2014 to 2020 and leverage cross-sectional and time variation in inheritances and gifts tax rates. In Brazil, the inheritance and gift tax is levied at the state level.[1] After 2015, 13 states passed tax reforms that created sizeable variation in the tax rate schedule and tax design (e.g., flat rates versus progressive brackets). For instance, the top tax rate increased by up to 6 percentage points in some states, a large tax policy experiment. Moreover, I exploit an unique feature of the Brazilian tax code: tax hikes are only in force after a period of 90 days counting from the law approval's date. This feature created a transition window, and an opportunity to retime wealth transfers from 2016 onward (new tax schedule) toward 2015 (old tax schedule).

The short-term responses to an increase in inheritance and gift taxes in a developing country like Brazil are ex-ante ambiguous. The literature on behavioral responses to taxation posits that whenever a tax reform creates tax-avoidance opportunities, behavioral responses are largest along the tax-avoidance margin (Saez, 2017). The 2015 reform in Brazil created strong incentives to retime inter-vivos gifts to just before the tax hike. On the one hand, the weak tax enforcement environment in a developing country could lead to more legal avoidance or illegal evasion. On the other hand, differently than in the US, Brazil has low exemption thresholds, which means that many ordinary people are paying the tax. In

[1] The Brazilian Federal Constitution caps the top marginal rate at 8%, but states have autonomy to set exemption thresholds, brackets and other forms of relief.

addition to owning less wealth, these individuals are expected to hold less liquid assets (e.g., real estate), which limits their ability to retime wealth transfers in the short term. Lastly, large short-term responses could be explained by high levels of wealth inequality and a strong tax responsiveness by the very wealthy.

Using administrative data, I proceed in two steps to investigate responses to the tax changes. First, I analyze short-term behavioral responses. The tax change was not effectively in place until January 1st 2016. However, since the tax reform was approved in late September 2015, individuals had three months (last quarter of 2015) to accelerate transfers and avoid the 2016 tax-rate increase. Using a bunching approach, I find large adjustments at both the intensive (value of transfers) and extensive (number of transfers) margins during the transition period in comparison to the counterfactual distribution. This implies a very large short-run elasticity for gift transfers with respect to the net-of-tax rate ($e = 20$). These short-term responses are consistent with estimates found elsewhere in the literature on retiming responses for realized capital gains in 1986 and 2013 for the US, and for gifts in 2004 for Sweden (Auerbach et al., 1988; Saez, 2017; Escobar et al., 2019). To address potential concerns that bunching may not capture the full extent of the responses to wealth transfer taxes, I employ a differences-in-differences (DD) design using states that did not enact a reform as counterfactual. In my setting, both approaches yield very similar results.

I also leverage variation from six different inheritance tax reforms and identify two tax design features that impact individual responses. First, I find that larger tax hikes yield stronger retiming responses. Since individuals may under-react to a tax increase in the short-run because of adjustment costs (e.g., compliance costs), these strong responses indicate agents overcoming optimization frictions (Chetty et al., 2011). Second, the effects are stronger when a large increase in top tax rates is combined with a change from a flat rate regime to a progressive brackets system. For instance, for the same variation in tax rates, a regime change leads to 1.5 times more sizable retiming responses. This is in line with previous studies that document that changing to a progressive tax system increases the perception of complexity of tax laws by taxpayers, and triggers tax avoidance behavior (Schneider, 2005; Agell et al., 2000).

Second, I use a DD approach to analyze medium-term responses. I find that evasion increased in the post-reform period, mostly through the rise in non-reported estates. The

number of reported bequests dropped by roughly 20% in treated states in 2016 (one year after the reform), and declined even further in subsequent years. Over the four-year horizon, I find no evidence of a systematic difference in mortality rates across treated and non-treated states, which means that the decline is due to a reduction in the number of tax returns as a proportion of total deaths above age 20. My results indicate that the reform increased evasion by 9 percentage points in the post-reform period. Evasion in the post-reform period is not exclusive to states with low baseline tax compliance, and is mostly driven by missing bequests at the middle and lower portions of the inheritances distribution. Importantly, I find that neither the number nor the size of gifts were affected in the post-reform, meaning that the responses for gifts were restricted to the short-run.

Third, I consider the revenue consequences of the behavioral responses I have identified. Following the framework laid out in Saez et al. (2012), I find that roughly 60% of the projected revenue increases of the tax reform are lost due to retiming responses. In addition, I find that tax collection of inheritance and gifts taxes did not increase in the post-reform period in states that enacted a tax reform. The surge in gifts during the transition period caused a small increase in tax revenues during the year after the reform — in comparison to states in the control group —, but the higher evasion in the post-reform period canceled out the revenue effects from the higher tax rates. Since inheritances take time to materialize, and pay tax, my results suggest that inheritance and gift tax revenues may decrease even further if tax enforcement is not strengthened in reform states.

Overall, the evidence presented in this paper is consistent with the literature showing large short-term behavioral elasticities due to tax avoidance (retiming of wealth transfers) (Escobar et al., 2019; Saez, 2017). For the US, Joulfaian (2004) documents that gift tax receipts increased by 300% in 1976, just before the hike in gift tax rates in 1977. Similarly, Ohlsson (2011) reports that gift tax revenues increased by twenty times just before the implementation of a new estate tax in Sweden in 1948. Gift tax receipts in New York dropped by nearly 40% in 1999, just before the gift tax repeal in 2000 (Joulfaian, 2005). I make three contributions to this literature. First, my setting is a developing country, whereas previous studies focus only on rich countries. Second, my results inform elasticities for a broader set of taxpayers ("ordinary citizens"), instead of focusing on the extreme right tail of the wealth distribution. Third, my results highlight the importance of a potentially

widespread response margin in a low-enforcement environment: evasion.

This paper is organized as follows. The related literature is in Section 2. Section 3 describes the inheritance tax and the reform in Brazil. Section 4 reports the data. Section 5 presents the empirical approach, results and robustness checks. Section 6 concludes.

## 2 Related Literature

This study contributes to the literature on behavioral responses to taxation, and the growing empirical public finance literature on inheritance and gift taxation. Previous research has found that taxes on wealth transfers affect both the timing of these transfers and how people allocate wealth transmissions between bequests and gifts. For example, altruistic parents may tailor inter-vivos gifts just below the exemption thresholds to reduce the tax liability on what will be later bequeath to their children (Nordblom et al., 2006).

Joulfaian (2005) finds that lower tax rates on bequests increase the relative price of gifts and that a one percent increase in the relative price decreases the probability of making gifts by 0.43 percentage points. Using a broader sample for the US, Page (2003) documents that a one percentage point increase in the marginal estate tax rate is associated with additional U$4,000 in gifts. This is effect is particularly salient among older households. Bernheim et al. (2004) find that the 1997 estate and gift tax changes in the US, which reduced the tax advantage of gift-giving, decreased the probability of making gift transfers by 10–14 percentage points in 1997 and 2000. Joulfaian et al. (2004), Poterba (2001) and Goupille-Lebret et al. (2018), however, provide empirical evidence that life-time gifts are not fully explored as a tax minimization device.

Glogowsky (2021) finds that kinks in German inheritance and gift tax trigger small behavioral responses which are mostly confined to short-term estate planning. Escobar et al. (2019) exploit an event that is similar to the Brazilian case: Swedish heirs could reduce the tax burden or avoid taxation all together by making a one-time tax-favored gift to each of their children. They find large elasticities for both middle class and wealthy households and precise bunching at the exemption threshold. A master thesis by Bhering (2021) also examines responses to the Brazilian inheritance tax using a DD design and data for the Pernambuco state. The overlapping part of the papers find similar elasticities for gifts

transfers on the vicinity of the reform. However, unlike my analysis, this study is restricted to a unique state and uses brackets that were not affected by the reform as control group. Crucially, I extend the control group to other states not affected by the reform. I also measure the short-term timing responses using a bunching approach and use the DD design to provide medium-run effects. Lastly, I use information on the number of heirs/recipients to assign transfers to their true tax bracket and study how marginal rates affected the timing of transfers. My results also relate to the small literature on bequest motives (Kopczuk, 2013). In particular, the strong behavioral responses to inheritance and gift taxes corroborate the idea that, at least some part, of bequests are intentional (Page, 2003).

# 3 Institutional Background

## 3.1 The inheritance and gift tax in Brazil

Brazil is divided into 27 states and some 5,550 municipalities. The Brazilian inheritance and gift tax (Imposto de Transmissão de Causa Mortis e Doação ITCMD) is levied on the inheritance share of each heir/recipient, and tax collection is carried by the state-level tax authority. There is no federal taxation of inheritances and gifts and the sub-federal governments have almost complete autonomy over taxation and public spending of these taxes. In addition, inheritance and gifts are not liable to income taxes.

The top marginal rate is capped at 8%, but states are free to set exemption thresholds, brackets and special forms of relief. Cumulative lifetime gifts which exceed the exemption threshold per recipient per year are subject to the gift tax. Importantly, the transfer of ownership is only granted after the tax is collected.

The ITCMD is enforceable to surviving family members or other donees residing in Brazil and is levied on transfers of all assets on inventories or donations (e.g., real estate, vehicles, bonds, etc.). According to each state law, the executor of an inventory must file a tax return within six months of the death of a Brazilian citizen or resident, regardless of the estate's total value. After this period, fines and interest may apply. The tax also encompasses inter-vivos gifts tranfers that exceed an annual exemption threshold which is set by each state and is indexed by inflation. Each individual can make an unlimited number of tax-free gifts as long as their sum is equal or inferior to annual exemption threshold. Differently than in the

US, the exemption thresholds are relatively low, which means that there are many "ordinary people" paying the tax.[2]

In Brazil, there are two ways to carry out an inventory: judicial or extrajudicial. A judicial inventory is done if the deceased left a will, if any of the heirs are minor or if there is a disagreement in the division between the heirs. The extrajudicial procedure is the most common. It is done in a notary's office and it usually takes one or two months. The estate is valued as of the date of the start of the inventory. The tax rates are not a function of the kinship degree and there are no exemptions for beneficiaries. Hence, all transmissions to spouses and/or other relatives are taxed. Depending on the matrimonial regime, however, tax liability can be reduced. In a regime of sharing of goods (the most common), the spouse's share (often 50%) will not be part of the deceased's estate and therefore, no tax is levied in his/her share of the inventory. Funeral expenses and other administrative or legal fees are not deducted from the estate tax. Once the inventory is drawn up, the share of assets are assigned to each executor according to succession rules or a will.

In contrast with rich countries, where inheritance and estate tax revenues have been on a general downward trend in recent years, tax revenue from inheritance and gifts tax increased substantially in Brazil over the past two decades: from 0.04% of GDP in 2001 to 0.13% of GDP in 2019 (OECD, 2021).

## 3.2 The Inheritance Tax Reform

Hit by a deep financial crisis since the beginning of the recession in 2015 (Brazil's Gross Domestic Product (GDP) decreased by 7% during the 2015-2016 biennium), the recently reelected government announced in March 2015 that it would take initiatives to increase taxation on the "richest" (FSP, 2015). The Federal government considered a tax on profits and dividends, including remittances abroad, and a federal tax on inheritances and large fortunes — on top of the existing state-level ITCMD. The new federal tax on inheritances and gifts would have progressive brackets, and its maximum rate would coincide with the top income tax rate (27.5%). Importantly, all tax collected by this potential federal tax would flow directly to the Federal Government without sharing it with sub-national governments. In July 2015, the Government proposed a Constitutional amendment for the federal inheritance

[2]The average annual exemption threshold for inter-vivos gifts was R$50,000 (U$10,000) in 2019.

tax, but the matter was never voted due to lack of political support.

The mere rumors of the creation of a new tax on inheritances generated responses from tax payers. For example, inheritance tax revenues increased by 55% in São Paulo, Brazil's richest state, during the first semester of 2015 in comparison with first semester of 2014 — before any reform happened (FSP, 2015). In early September 2015, the National Council of Finance Policy (CONFAZ), chaired by the Minister of Finance and composed of the state secretaries of finance, sent a public letter to the President of the Senate with the suggestion to increase the ITCMD's top rate to 20%.[3] The CONFAZ argued that an increase in inheritance tax rates should "*consider the current situation of financial difficulties of sub-national governments, and a fairer taxation which is already common in developed countries.*"(CONSEFAZ, 2015) The Senate rejected the proposal.

States increased inheritances and gifts tax rates as a part of a fiscal package to alleviate state's financial crisis. By the end of September 2015, 10 states had passed an inheritance tax reform — and therefore could charge the new tax starting in January 1st 2016. Two states took longer to pass the reform: Mato Grosso do Sul passed it on November 16th and Rio de Janeiro on December 29th. The probability of passing the law, especially at a fast pace, was a function of states' governors' political power. Interestingly, only one governor failed to approve legislation lifting tax rates: the governor of the state of Paraná. In fact, a reform was voted but only to approve an increase in the exemption threshold. I discuss this case with more details in Section 4.

The state of Rio de Janeiro passed a reform on December 2015 but parts of the legislation became the object of a judicial case. Items related to private pension plans were declared unconstitutional. Then, the state passed another law in November 2017 which included higher taxation on top brackets. Reliable individual data from Rio de Janeiro is only available from 2016 to 2019. For this reason, I exclude Rio de Janeiro's data from my core results and provide additional estimates using the 2017's reform as a robustness check.

## 3.3 The 90-day Rule

The fast pace which the laws passed in the state chambers reflected the hurry of local governments to implement the new tax code. According to the Brazilian legislation, tax

[3]According to the Constitution, the top marginal rate is set by a Federal Senate Resolution.

increases are only in effect after a period of 90 days after the law approval and publication. This "anteriority principle" appears in the Constitution as a way to guarantee predictability to taxpayers by preventing sudden tax increases. **Figure A1** in the Appendix shows the tax schedule once the legislation is passed. This feature creates a 90-day transition window until the *de facto* application of the reform on January 1st of 2016. In states that implemented the reform, top rates were increased by 2 to 6 percentage points and progressive tax brackets were implemented.[4] In the other 14 states the tax code remained unchanged. I use this arguably exogenous variation in the timing of the inheritance tax law to evaluate the behavioral responses to an increase in inheritances tax in Brazil.

# 4 Data

The data come from the Secretaries of the Treasury of nine states in Brazil. Each observation corresponds to an individual inheritance or gift tax receipt at the state level. The data include information on the market value, date, and number of beneficiaries for the *universe* of estates and gifts transfers made from 2014 to 2020. Together, reform states in my sample encompass 90% of total inheritance tax revenues among the 13 states that passed the tax reform. States Minas Gerais and Santa Catarina did not enact a reform, which I refer to as control states.

I treat Paraná as a reform state because it approved a reform by the end of September 2015. However, differently than other states, Paraná's reform did not increase taxes. Instead, it increased the exemption threshold for inheritances and gifts transfers from R$25k to R$50k. Still, it looked like the tax hike was going to pass until the last minute. The governor personally supported the tax reform, a fact that was highly publicized by local media (Gazeta, 2015), and because of this there could have been effects. I also show estimates in which I consider Paraná as control state. It does not alter my core findings.

The proportion of deaths that result in a tax filing varies considerably. Coverage ranges from 10% to 43% of total decedents above age 20. The overall coverage is 40% of adult deaths in these states and 26% of total decedents in the country.[5] All inheritances/gifts must file

[4] See Figure A2 in the Appendix.

[5] Although incomplete, such coverage is fairly high compared to evidence from rich countries: in the UK, this number is roughly 50%, in Italy it is 55%, while in France is just above 10% and in the U.S. it is lower

a tax return in order for ownership to be transferred to the heirs/donees, even if the asset is exempt of taxes. If the decedent did not own any property, she should not appear in tax records. The high proportion of real estate in inheritances and gifts declarations (nearly 70% and 45%, respectively) explains the good tax coverage. For the inheritance tax declarations, family members or other donees must fill out the tax declaration with the asset's market value. The values of assets are verified and adjusted (if needed) by the Registry Office and/or the tax agency in each State of Brazil yielding estimates that are updated and reliable.

**Table 1** provides summary statistics for the state-panel dataset. Nominal values for transfers at the time of receipt are updated to 2019 values using the change in the consumer price index. Despite the fact that control group only contains 2 states, the sample is overall balanced in terms of observations because of the state of Minas Gerais is Brazil's second largest and richest state comprises nearly half of observations in the dataset. Panel A reports the average number of recipients and descriptive statistics for estates whereas Panel B focuses on gifts. The average estate value is smaller in the control group, but the median estate is very similar across groups. The differences come from top percentiles as the distribution is more skewed to the right in treated states. Also, the average number of heirs is somewhat larger in the control group. For gifts, one sees the jump in 2015 as a result of the reform and a very large standard error. Although for a DD setting what matters is whether the pre-trends are similar, control and reform states are very similar in both number and size of transfers.

# 5 Empirical Approach

In the following section, I estimate the impact of changes in inheritance and gift taxation on the timing of transfers in Brazil. The reform introduced a "time notch" since individuals could avoid the increase in taxation by retiming transfers to just before the end of the transition period. This response should generate excess bunching located around the notch — the 90th day after the law approval.

I use two different approaches to measure timing responses. First, I estimate timing responses using a bunching estimator (Chetty et al., 2011; Kleven, 2016). In this framework,

than 0.5% (Berman et al., 2021).

the responses correspond to the differences between the observed distribution and an estimate of a smooth counterfactual that would be expected in the absence of the tax change. The estimated counterfactual density is computed using only treated states.

One potential concern with this approach is that the reform may introduce other responses for observations near the cutoff (e.g., asset shifting, avoidance, etc.). The introduction of other behavioral responses could bias the estimation of the "true" counterfactual and invalidate my estimates (Kleven et al., 2013). To overcome this potential source of bias, I employ a differences-in-differences (DD) approach using states that did not enact a reform as a counterfactual. The underlying assumption is that, in the absence of the reform, the changes in outcomes would be similar across the states that enacted the reform and those who did not. Another advantage of the DD approach is that it allows me to estimate longer term responses, up to 4 years after the reform took place.

## 5.1 Bunching Approach

The use of a bunching approach in an inter-temporal setting is slightly different from traditional estimations found in the bunching literature (Goupille-Lebret et al., 2018). Since the tax rate depends on the time transfers were made, the variable of interest here is the amount and size of transfers made instead of the number of individuals bunching at the notch. I estimate counterfactual densities using the standard estimation approach suggested by Chetty et al. (2011). The data on gifts transfers are collapsed into 7 days width bins. The bunching approach depends on a plausible definition of the excluded range in order to estimate the counterfactual density (Kleven et al., 2013). Since the interest is to assess behavioral responses after the reform's legislation but before its implementation, the excluded range is the transition period. Therefore, to estimate the counterfactual distribution, I fit a 7th degree polynomial to the observed distribution, while excluding the transition region around the notch. Finally, the end of the transition period is is normalized to be zero. Specifically I estimate the following model:

$$C_b = \sum_{j=0}^{J} \beta_j \cdot Time_b^j + \sum_{k=bl}^{bi} \beta_k \cdot \mathbb{1}[time_b = k] + \epsilon_{st} \tag{1}$$

where the dependent variable $C_b$ is the log of both the count and market value of transfers

made by individuals at the 7 day bin $b$, $(Time_b)^j$ are flexible polynomial fits for age, $\mathbb{1}[time_b = k]$ is a dummy variable that takes the value of 1 if bin $b$ is part of the transition period [bl,bi] around the notch, and $\epsilon_{st}$ is the residual. The counterfactual density is estimated as follows:

$$\hat{C}_b = \sum_{j=0}^{J} \hat{\beta}_j \cdot Time_b^j \tag{2}$$

The estimated excess mass at the kink is $\sum_{k=bl}^{bi}(C_b - \hat{C}_b)$ where $C_b$ is the empirical distribution of the log number or value of transfers in bin $b$ and $\hat{C}_b$ is the estimated counterfactual density in bin $b$. Standard errors are calculated using a bootstrap procedure on the binned data (Chetty et al., 2011).

## 5.2 Short-term responses

**Figure 1** reports the observed and the counterfactual densities of (the log of) the number and value of transfers on 7 days binned data. Panel (a) displays the log of the number of transfers whereas panel (b) shows the distribution of the log value of transfers. Both panels show the excess mass estimate in log points divided by the value at the notch, with its standard error are shown in parentheses. One first main finding is that bunching for the log count of gifts is concentrated on the last seven days of the transition period and is precisely estimated. Panel (a) reports significant bunching corresponding to 0.67 times (in log) the height of the counterfactual contribution during the transition period. This corresponds to an increase of 95% on the number of transfers during the transition period. Another interesting result is that, although the notch is associated with missing mass just above the cutoff, the following trend does not seem to be altered by the surge near the notch. There is no visible missing mass on the other side of the threshold.

Panel (b) documents a much larger bunching for the value of transfers of 1.09 (200%) times the height of the counterfactual contributions during the same time period. In comparison with panel (a) the upward trend starts much earlier, somewhat before the transition period, and there is more missing mass after the cutoff. The value flow of gifts also peaks near the cutoff. Combining both results, I find very large behavioral responses to the increase in inheritances and gift taxation. In the following section, I examine the robustness of these

results using states that did not apply a reform as counterfactual.

## 5.3 Tax systems

I now leverage the reform-induced variation in the intensity of tax hikes and the design of the inheritance and gift taxes (flat rates versus progressive taxation) by comparing responses across six different tax reforms. I display results using the market value and the number of transfers as the outcome variable instead of their log transformed values. This is because of the small number of transfers (sometimes zero) in week bins for some states.

The results, displayed in Figure 2, can be summarized as follows. First, there is considerable heterogeneity in anticipatory behavior across tax regimes. Second, starting with a flat rate system and changing to a progressive brackets system leads to stronger behavioral responses. Consistent with increased complexity and avoidance behavior, for the same tax variation I observer 1.5 times greater responses when there is a change from flat rates to a progressive brackets system (Schneider, 2005; Pántya et al., 2016). Third, increases in inheritances and gift taxes causes substantial bunching at the extensive margin. Panel (a) of **Figure 2** shows that the behavioral response is sizable for all states that changed inheritances and gift tax rates, and is precisely estimated. Fourth, larger tax increases trigger more sizeable responses. This likely reflects optimization frictions, like compliance costs, which reduce the bunching response for small tax changes. Interestingly, the top left figure, for the state of Piauí, the tax reform triggered sizeable responses even though only inheritance tax rates change while gift taxes remained unaltered ($\Delta\tau = 0$).

Turning to the intensive margin responses (e.g., the size of the transfer) in Panel (b), I find the same anticipatory responses but in a larger magnitude. Again, big tax hikes, like in the bottom right figure ($\Delta\tau$=0.6) trigger the strongest responses from taxpayers. This result is consistent with taxpayers overcoming adjustment costs and frictions affecting less the extensive margin elasticities (Londono-Vélez et al., 2022; Chetty, 2012). In addition, in the Brazilian setting, individuals had incentives to make large transfers instead of a small number of gifts, which explains the higher adjustments in the intensive margins.

## 5.4 Short term responses Differences-in-Differences (DD)

To isolate the short term effects of the reform, I combine two sources of variation, the transition period (90 days after the approval of the law) and whether the state enacted or not the reform. Using data from 2014 to 2016, I estimate the average effect of the tax reform on wealth transfers with DD specifications of the following form:

$$Y_{st} = \alpha + \beta_1 Treat_s \times Transition_t + \beta_2 Treat_s \times Post_t + X'_{st} + \delta_s + \gamma_t + \epsilon_{st} \tag{3}$$

where $Y_{st}$ denotes the log of estate's value or number in state $s$ at time $t$. $Treat_s$ is a treatment dummy variable for whether the state enacted the reform. This indicator is designed to capture any unobserved, time-invariant characteristics of the states that did the reform. The $Transition_t$ dummy takes the value of 1 for the transition period which comprises the 90 days following the reform's approval. The $Post_t$ dummy takes the value of 1 for the period after the end of the transition period. These variable captures systematic time trends specific to this period of the year. $X'_{st}$ is a vector of state controls, $\delta_s$ are state fixed effects, and $\gamma_t$ year fixed effects.

The coefficients of interest are those of the interactions between $Treat_s$ and both $Transition_t$ and $Post_t$. Here, $\beta_1$ captures the effect of the reform on the number and size of estates and gifts transferred during the transition period while $\beta_2$ measures the difference in average number and size of estates and gifts between treated and control states after the reform. These represent the causal effect of the reform under the assumption that trends in control states correspond to the counterfactual evolution in treated states, had they not implemented the tax reform. **Figure 3** displays trends in the value of estates and gifts, and **4** reports the trends for the log count of transfers.

In states that did not enact a reform, individuals had no incentives to increase neither the number nor the size of transfers. In contrast, in states that passed the reform legislation, individuals had a small window of opportunity to avoid the coming higher tax rates. State controls are time dependent: the logarithm of states' GDP and population. It is necessary to own wealth in order to transfer it. Therefore, I include the number of millionaires by state by year to control for a measure of wealth. Since the treatment varies at the state level, I follow Bertrand et al. (2004) and cluster standard errors by state and year.

While regressions with time and state fixed effects in the form of equation (3) have been for many years the workhorse method in applied econometrics, a recent literature documents possible pitfalls of the two-way fixed effects specifications (Callaway et al., 2021; De Chaisemartin et al., 2020). In particular, De Chaisemartin et al. (2020) show that when treatment effects vary over time or across states, negative weights may result in a negative point estimate even if all the average treatment effects are positive. Reassuringly, using De Chaisemartin et al. (2020)'s `twowayfeweights` estimator, I find that less than 20% of the weights are negative, and their sum is only 0.05.

**Figures 3** and **4** show the trends for control and treatment group along the extensive and intensive margins for gifts and bequests in the data. They show that both groups follow parallel trends before the tax reform, which lends support to the main assumption of the DD method.

#### 5.4.1 Short term responses (DD)

**Table 2** displays the results for estimations of the responses to the tax increase during the transition period. Panel A reports the DD estimates of the impact of the reform on the log of the value of estates and gifts, and Panel B reports the results to models in which the dependent variable is the log of the number/count of transfers. Columns (1) and (4) report results of regressions without any controls, while other estimates include state and fixed effects, and log of GDP and population by state.

The results are very similar to the estimates found using the bunching estimator. The models precisely estimate the impact of the reform on the stream of gifts and results are not sensitive to the inclusion of controls. The estimations show a large responsiveness of taxpayers to the forthcoming higher tax rates. On the other hand, I find no significant impact on the flow of estates or on the number of reported deaths (log count) during the transition period. Finally, the the number of declared deaths was reduced by 12%, although the coefficient is only significant at the 10% level in our most demanding specification. The value of bequests left on the subsequent year of the reform also decreased by roughly 22%. This means that individuals reacted to changes in taxation by, at least to some extent, substituting gifts for bequests. This substitution between gifts and bequests corroborate the hypothesis that tax minimization seems more important than retaining control of wealth as

a factor that influences the timing of transfers (Kopczuk, 2013; Goupille-Lebret et al., 2018).

These results indicate similar responses to estimates found elsewhere in the literature. For example, for the US in 1976, Joulfaian (2004) documents that gift transfers increased by 4-fold in response to the impending higher gift tax rates in 1977. Ohlsson (2011) reports a similar episode in Sweden. Revenue from the gift tax increased twenty-fold in 1947, before the introduction of a new estate and wealth tax in the following year. The similar short-term responses come despite the fact that top marginal rates were substantially higher in the US and Sweden than in Brazil.

For example, in Sweden in the 1940s, the top marginal rate was 20%, and 57.75% in the US in 1976. In Brazil, the top marginal rate is limited to 8% and the largest increase was of 6 percentage points. Moreover, the top bracket was much higher in 1976 for the US (U$5 million) than the average for Brazil in 2010s (R$500,000 or U$100,000). Finally, while in the US the tax hike affected only the very wealthy, in Brazil the reform impacted a broader set of taxpayers. Therefore, my results suggest that the strong anticipatory responses to inheritance and gift tax hikes are not restricted to the ultra rich in developed countries.

#### 5.4.2 Medium run responses (DD)

Results reported using the bunching approach and the DD in **Table 2** indicate that short-term responses in gifts during the transition period affected bequests on the year following the reform. In this section, I use the DD method to examine taxpayers responses after 4 years since the reform. Using data from 2014 to the first semester of 2020, I start by plotting estimates of $\beta$'s from the following leads-and-lags regression:

$$Y_{st} = \alpha + \beta_1 Treat_s + \sum_{k=-1}^{6} \beta_k \mathbb{1}[t = k] \times Treat_s + \delta_s + \gamma_t + \epsilon_{st} \tag{4}$$

where $Treat_s$ is a dummy equal to 1 if the state $s$ enacted the reform. $t$ is measured in years and ranges between $-1$ and $+5$. The $\beta_k$'s measure the difference in participation between treated and control states before and after the reform, conditional on controls. All coefficients are normalized relative to the year before the reform approval's date ($t = -1$). The results, displayed in **Figures 5** and **6**, show a sharp decrease in both the number and value of estates left during the subsequent years after the reform, while gifts were not

affected. The effect becomes larger over time, meaning that more people died without reporting property to the tax authority in treated states. To examine taxpayers behavior over time, I modify Eq. (3) to include an interaction between the treatment indicator and a year dummy ($Treat_s \times Year_t$). I run the following regression:

$$Y_{st} = \alpha + \beta_1 Treat_s \times Transition_t + Treat_s \times Year_t + X_{st}^{'} + \delta_s + \gamma_t + \epsilon_{st} \tag{5}$$

**Table 3** reports the results. Panel A presents the estimates by year which show that the under-reporting of estates grows over time. The inclusion of state varying controls (e.g., log of GDP, log of population, number of millionaires) slightly inflates the coefficients. The increasing evasion might be explained by the weak enforcement environment and low sanction risk. In addition, the macroeconomic conditions in Brazil since the reform are also likely to have played a role. Unemployment and inflation were on the rise and GDP fell by nearly 7% during the 2015-2016 biennium. Real estate represents over two thirds of inheritances and "ordinary people" usually sell the inherited real estate in order to pay the ITCMD. Under worse economic conditions, the selling of real estate may take more time than usual and the tax payment may be delayed. However, despite the economic recovery in 2017, the number of declared estates continued to plunge. Panel B shows a decline in the overall value of estates which is a consequence of increased evasion after the reform. Interestingly, gift-giving behavior, in both extensive and intensive margins, is not altered 5 years after the reform.

To summarize the results of the DD analysis, I find that changes in taxation affected the flow and number of estate transfers during the post-reform period. While tax payers accelerated transfers during the transition period, the number of declared estates declined substantially after the reform was implemented. Next, I investigate the possible heterogeneity in evasion responses by taxpayers.

### 5.4.3 Missing Estates

Having shown that evasion increases after the reform, I now examine if responses change by wealth groups. To answer this question, I gather estates data into R$5,000 bins and compute the 2-year average number of declared estates before and after the reform in treated

and non-treated states. This means I compare the growth in the average number of estates by bin between 2014-2015 vs 2016-2017. Panel A of **Figure 7** plots the results. Observations near the red horizontal line indicate that the number of estates was the same in the two periods (pre-reform versus post-reform).

Despite the reduction in very small estates (below R$100k) in both treatment groups, which should reflect the poor economic conditions of the post-reform period, in the treated states the decline in the number of estates was twice as large as the decline in the control group (-17% versus -8%). Looking at the middle portion of the estates distribution, estates between R$100k and R$500k, one sees that the differences are driven by positive growth in the number of declared estates in the control group (18% versus -2%). When looking at the top estates categories (above R$500k), I find that reported estates increased treated states but in a smaller magnitude than in the non-treated states (21% versus 63%).

Finally, I restrict the treatment group to states with at least 18% of tax coverage to examine how the baseline tax compliance could drive my results.[6] Panel B in **Figure 7** plots the results. Estimates are roughly the same, meaning that evasion increased in states with relative good coverage of the inheritance tax in Brazil during the post-reform period.

## 5.5 Elasticities using Individual-level Data

Having established that the behavior of tax payers is altered by the change in the inheritance and gift tax rates, I now proceed to estimate an average elasticity using the wealth brackets. Since each state had specific legislation with changes in marginal rates for different brackets, I use all changes in state-level tax rates as identifying variation. The tax base is the share of inheritance/donation of each recipient.

Calculation of the marginal tax rate is somewhat difficult because the tax rate depends on the exact share that the heir/donee received, whereas the data only carry the number of beneficiaries. In the absence of this detailed knowledge, I rely on mild assumptions to distribute wealth to recipients. For intervivos gifts, this is straightforward and I assume they are equally divided among the beneficiaries. For estates, as there is no information on the marital status of the deceased, I assume that all deceased were married under a regime of property division — the most common in Brazil — and left a surviving spouse. That

[6] See **Table A1 in Appendix.**

means that the half of the estate goes to the living spouse while the remaining is equally divided between the other recipients. If a estate has one single beneficiary, I assume that this recipient is the surviving spousal. These assumptions, however, can be relaxed without substantially changing the main results. Next, I modify Equation (3) to include an intensity for treatment for each inheritance bracket. Where $\Delta\tau_{ist}$ is the change in the top marginal rate for inheritance bracket $i$ in state $s$ at time $t$. More formally I estimate the following regression:

$$Y_{ist} = \alpha + \beta_1 \log(1+\Delta\tau_{ist}) \times Transition_t + \beta_2 \log(1+\Delta\tau_{ist}) \times Post_t + X'_{st} + \delta_s + \gamma_t + \epsilon_{st} \quad (6)$$

For inheritances and donations brackets that the reform did not alter, the tax rate the intensity is zero, meaning that the estimation is the same as in Equation (3). For the inheritances that were altered by the reform, the intensity is just a scaling factor, up or down, based on the change of the rate for that particular bracket. While some brackets generate incentives to accelerate transfers, others generate incentives to wait until the effective implementation of the reform. For example, in Parana the only reform was to lift the exemption threshold for inheritances from R$25,000 to R$50,000. Therefore, the treatment for an inheritance smaller than R$50,000 in Paraná would be log(0.96). On the other hand, a donation of R$450,000 in Pernambuco would take a treatment of log(1.06) since the reform increased the tax rate for this bracket from 2% to 8%.[7] I report $\beta_1$ as the effect on aggregate wealth transfers during the transition period of a one percentage point increase in the inheritance and gift tax rate.

**Table 3** reports the results for estimated elasticities. As expected, there were no behavioral adjustments for the size of inheritances during the transition period. I find very large estimated elasticities for gifts during the transition period which reflect the timing responses reported in previous estimates. Using data from Pernambuco, which represents 2% of the data used in this paper, Bhering (2021) finds very similar elasticities (19.75). This evidence is consistent with the hypothesis that individuals accelerated inter-vivos gifts during the transition period to pre-pay the inheritance tax under a more favorable tax schedule. I find very noisy estimates for elasticities in the post-reform period. The positive coefficients found for inheritances after the reform should reflect the progressive brackets and new exemption

[7] See Table B in the Appendix section for the tax schedule before and after the inheritance reform.

thresholds which reduced marginal tax rates for small inheritances.

## 5.6 Robustness Checks

In this section, I present robustness checks.

**Including specific linear trends.** I provide estimates that include specific linear trends to control for non-parallel linear trends prior to reform for different states. Point estimates in Panel A of **Table 6** are very similar to the results presented in **Table 2**. Moreover, since some registration systems may register a transfer with unknown reported dates as belonging to the 31st of December, Panel B in **Table 6** reports results removing the last day of the year. Coefficients are virtually the same, which confirms that the core results are not led by any type of manipulation in register systems.

**Small cluster size.** First, I address potential concerns related to small cluster size by bootstrapping standard errors with 500 reiterations instead of clustering them by state (Cameron et al., 2008). Panel C in **Table 6** reports the results. As expected, standard errors are smaller than when using the conservative clusters as suggested by Bertrand et al. (2004).

**Include Rio de Janeiro.** I also provide results using the DD including data from Rio de Janeiro, which is only available from 2016 to 2019. Panel D in **Table 6** reports the results. The sample size increases by roughly 10%. Since Rio de Janeiro enacted the reform on November 2017, I limit the sample to have equal periods for all states, which means restricting estimations to year 2017 for the other states. Reassuringly, the main results still hold to the inclusion of Rio de Janeiro but standard errors are somewhat larger than estimates shown in **Table 2**. In summary, these results confirm that the flow of gifts went up during the transition period as taxpayers accelerated transfers.

**Using gifts brackets not affected by the reform as counterfactual.** Finally, I show results using inter-vivos gifts brackets not affected by the reform as a counterfactual in treated states. The tax reforms modified the location of the bracket cutoffs and gifts tax rates, but some of the brackets were not affected by the change. One potential source of endogeneity in this strategy is the fact that the reform affected the value of transfers across brackets cutoffs. **Table A3** in the appendix reports my results. Overall, this strategy lead to quantitatively equivalent results to the ones found using the bunching estimator and

non-treated states as counterfactual.

**Real estate transfers.** Real estate consists of roughly 75% of what is left at a bequest in Brazil. As aforementioned, one way individuals could evade the inheritance tax is by forging a real estate purchase contract between, say, a relative and her child. By doing so, the person would pay a municipal tax and be able to transfer the property. I use publicly available data from registries offices in two states, Santa Catarina and Rio de Janeiro, to provide evidence that individuals did not engaged into this type of evasion. The data covers the *universe* of real estate transactions receipts in the two capital cities from years 2012 until 2022. Remember that Rio de Janeiro enacted a reform by the end of 2017, whereas Santa Catarina is in the control group. **Figure A3** in the appendix shows that there is no evidence that this type of evasion was driving the decline in the reported bequests, as shown in **Table 3**.

**Mortality and tax compliance.** Estimates in **Tables 3** and **4** indicate that the inheritances and gifts tax reform triggered substantial evasion as reported estates declined substantially in the post-reform period. A potential mechanism driving this result would be if reform and control states differ systematically in terms of mortality rates trends for individuals over age 20. Panel (a) of **Figure A4** in the appendix plots the differences in all-cause mortality rates for ages above 20, whereas panel (b) displays the proportion of deceased older than age 20 who left a declared estate. One sees that while there is no significant difference in mortality rates, the coverage of the inheritance tax decreases by 9 percentage points in states that enacted the reform. This finding lends support to the idea that the reform caused evasion through the under-reporting of estates.

## 5.7 Tax revenues

From a tax policy perspective, one important question is whether the large short and medium-run behavioral responses presented in previous sections interfere with tax revenue collection.

**Revenue Loss.** In this section, I follow the framework from Saez et al. (2012) to derive the revenue consequences of the behavioral responses I have uncovered. Very simply put, the fraction of the projected mechanical revenue lost through behavioral responses is $ea\frac{d\tau}{(1-\tau)}$. With $e = 20$, $a = 1.5$, $d\tau = .02$ $\tau = .056$, the revenue loss due to short-term responses

corresponds to almost 63% of projected revenues in 2016. The high elasticity implies that the revenue-maximizing tax rate would be $\tau^* = 1/(1+ae) = 1/(1+1.5*20) = 3.2\%$. This implies that the 2015 tax increase was an inefficient way to raise revenue.

**Tax collection in the medium-run.** I use publicly available data on states' tax collection from 2013 to 2020 to verify how the reform impacted the inheritance tax revenues for up to 5 years after the reform. **Figure A5** in the Appendix shows trends over the past decade in terms of population, GDP, and tax collection. Regarding the ITCMD collection, it has increased in states that implemented a reform during these two years as a consequence of the tax increase and behavioral responses documented earlier. **Figure A6** in the Appendix shows that there are no systematic differences in the collection of the inheritance and gift tax between treatment and control group after 5 years since the reform, and **Figure A7** plots the differences in total tax revenues between treated and non-treated states.

# 6 Conclusion

In this paper, I leverage rich intra-national variation in tax rates and exploit an unique feature in the Brazilian legislation to provide evidence that changes in inheritance and gift taxes affect short and medium-run behavior of taxpayers (Joulfaian, 2004; Escobar et al., 2019). While previous studies focus on the very wealthy in rich countries, this paper informs short-term elasticities from ordinary citizens in a developing country setting.

In line with the literature on behavioral responses to taxation (Saez et al., 2012), I provide compelling evidence that taxpayers react forcefully when offered with tax avoidance opportunities – here the retiming of wealth transfers. This implies a large short-run elasticity of gift transfers with respect to the net-of-tax rate. I also uncover two tax design features that shape individual responses. First, anticipatory responses increase with the underlying variation of gift tax rates. Second, starting with a flat tax system and then changing to a progressive tax system yields stronger responses.

My findings have policy implications for the design of inheritances and gift taxes. First, eliminating the opportunities for legal tax avoidance, such as the transition window. Second, in a low baseline tax compliance environment, like the Brazilian setting, increasing tax rates must come with a crack down on evasion, which runs mostly through non-reported estates.

This is particularly true for large tax increases and when changing the tax system from flat to progressive rates. Efforts to increase tax compliance can be done by systematically cross-validating information with hospitals, registry offices and the National Health System Data Base for tax enforcement purposes.

Because states adopted higher inheritance and gift tax rates only 7 years ago, my results should be interpreted with caution: I find mostly short-run timing responses from taxpayers. In addition, my results indicate higher medium-run evasion and that tax collection is not affected 5 years after the reform. Since inheritances take time to materialize, and pay tax, I cannot rule out that other effects will arise in coming years. Future research could address some of the limitations of this work. The lack of comprehensive longitudinal data on individuals makes it impossible to firmly associate the substitution between gifts and bequests, or disentangle it from bad economic conditions.

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# 7 Figures

**Figure 1 (a):** Bunching Extensive Margin Gifts

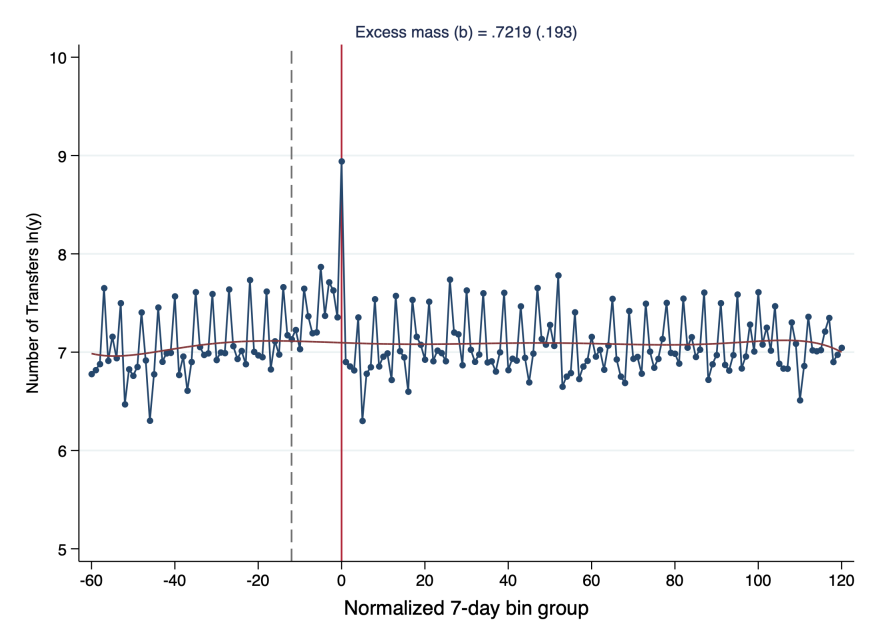
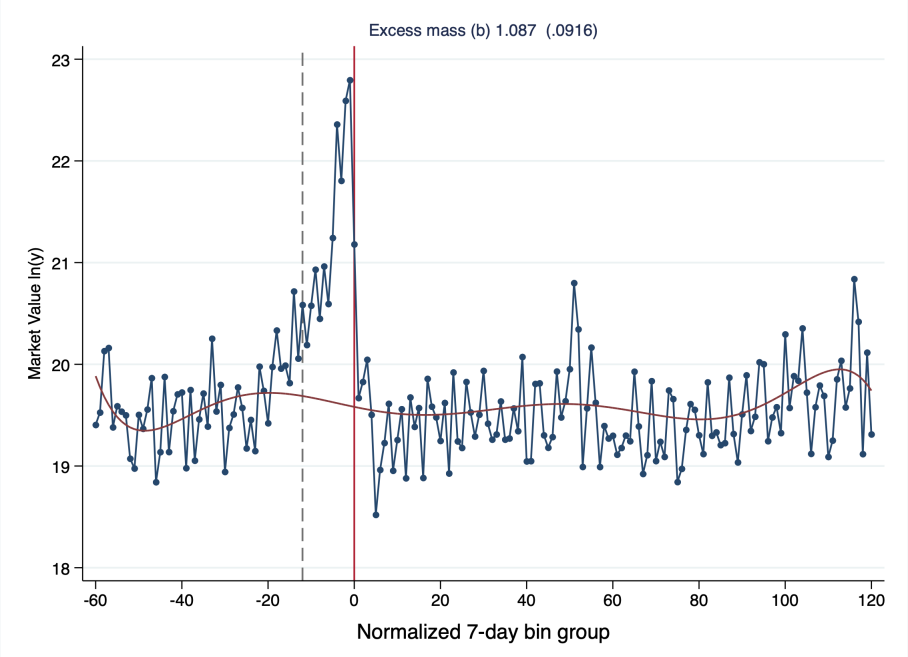
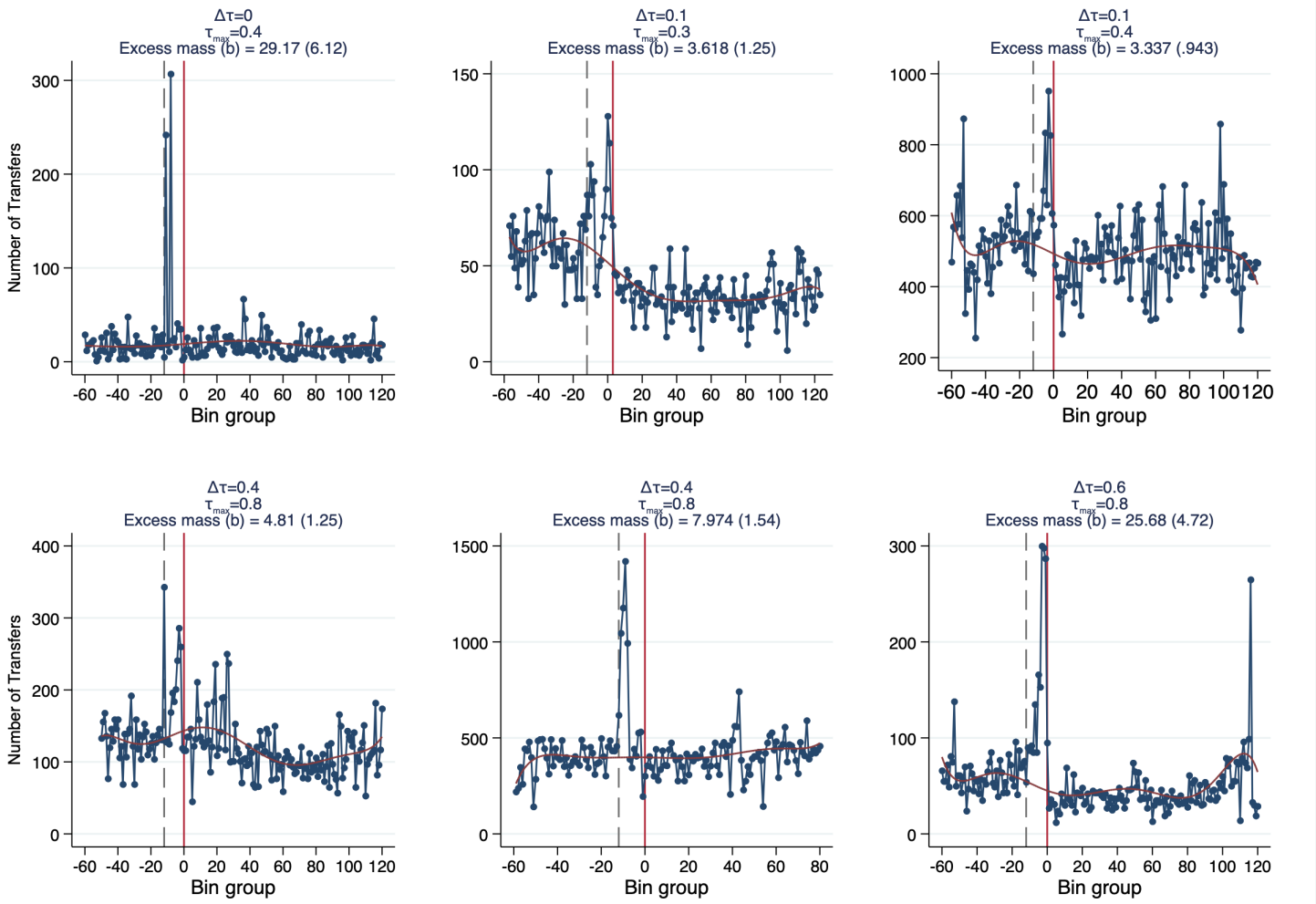



**Figure 1 (b):** Bunching Intensive Margin Gifts



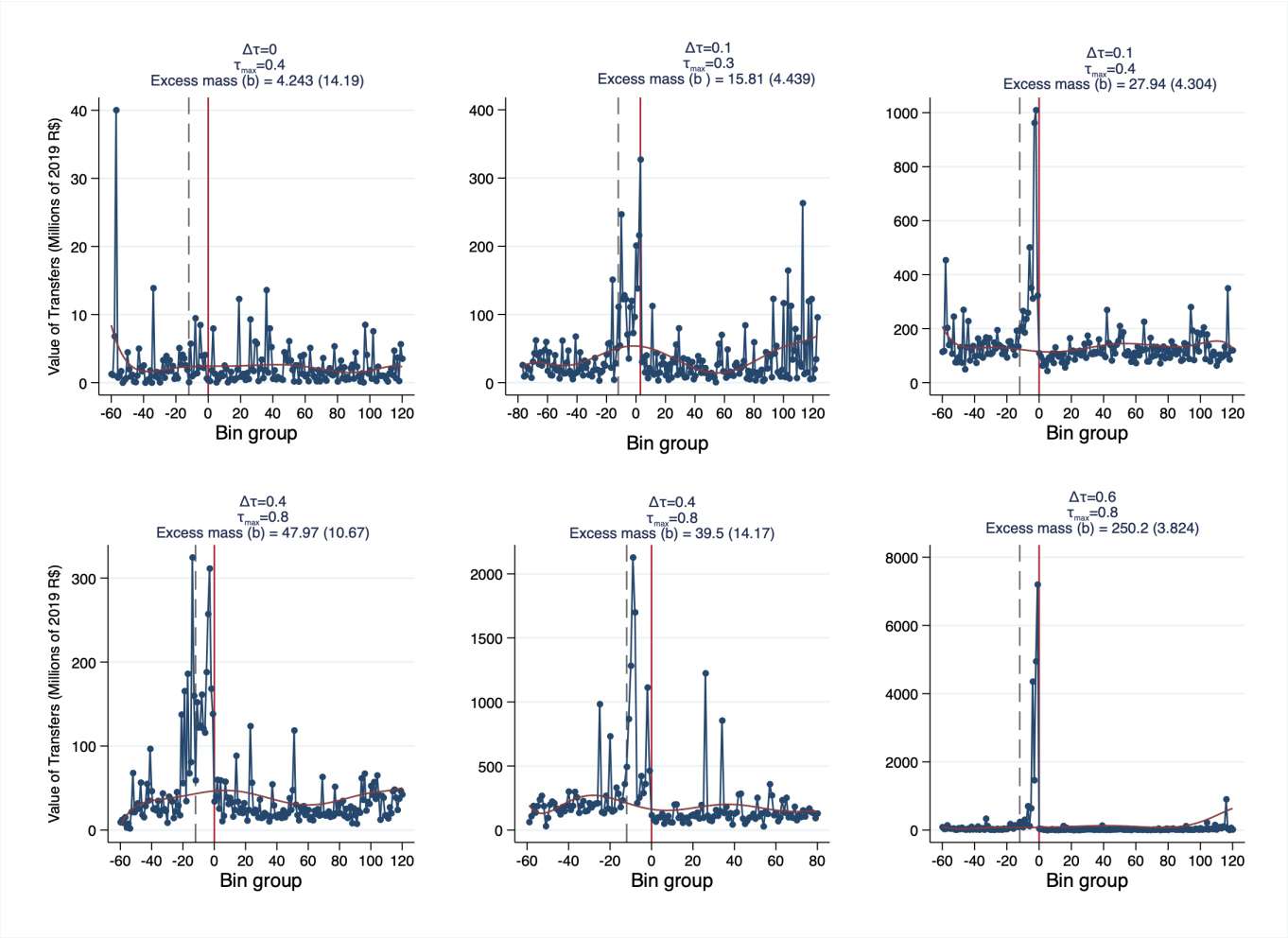

Note: In this figure, panel (a) presents the log count and panel (b) the log value of transfers made around the notch in Brazil. Data is binned by week and the dashed and solid lines represent the beginning and the end of the transition period of 12 weeks, respectively. The excess mass is estimated following Chetty et al. (2011) and standard errors are calculated using a bootstrap procedure.

**Figure 2 (a):** Extensive Margin by Tax Regime




Note: In this figure, panel (a) presents the number of transfers made around the notch in Brazil. The data is binned by weeks. The dashed and solid lines represent the beginning and the end of the transition period of 12 weeks, respectively. The excess mass is estimated following Chetty et al. (2011) and standard errors are calculated using a bootstrap procedure. $\Delta\tau$ is the variation in top rates for gift tax and $\tau_{max}$ is the new top tax rate after the reform. $\Delta\tau$ equal to zero, for the state of Piaui, means that the tax reform only affected the inheritance tax rates, while gift tax rates remained unaltered. Data from Rio de Janeiro cover the period from 2016 to 2019.

**Figure 2 (b):** Intensive Margin by Tax Regime




Note: In this figure, panel (b) the value of transfers (Millions of 2019 R$) made around the notch in Brazil. The data is binned by weeks. The dashed and solid lines represent the beginning and the end of the transition period of 12 weeks, respectively. The excess mass is estimated following Chetty et al. (2011) and standard errors are calculated using a bootstrap procedure. $\Delta\tau$ is the variation in top rates for gift tax and $\tau_{max}$ is the new top tax rate after the reform. $\Delta\tau$ equal to zero, for the state of Piaui, means that the tax reform only affected the inheritance tax rates, while gift tax rates remained unaltered.

**Figure 3 (a):** Trends Ln(value) of Estates

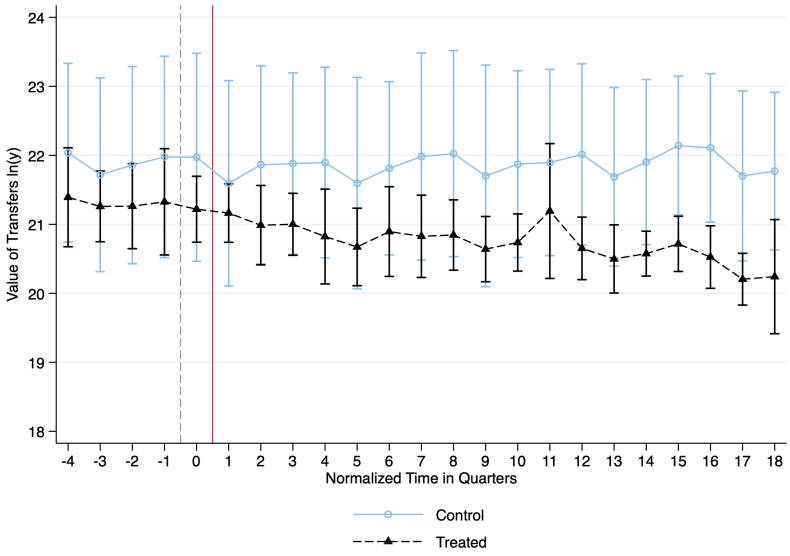
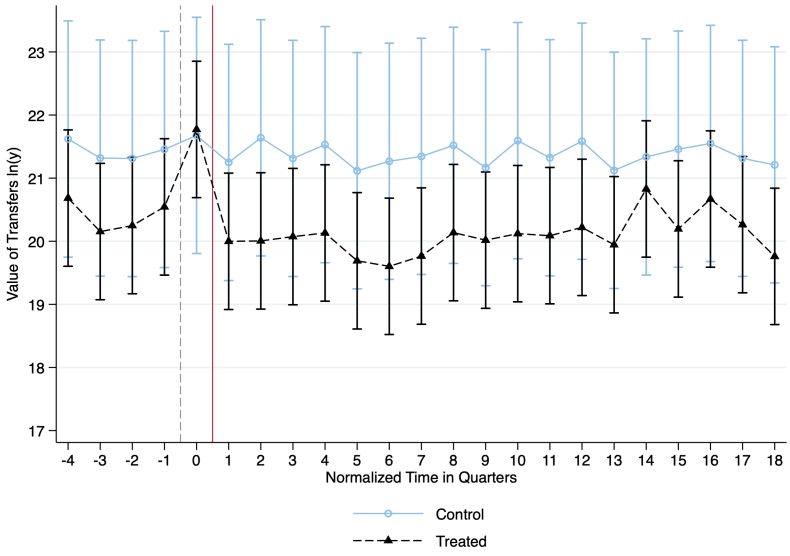



**Figure 3 (b):** Trends Ln(value) of Gifts




Note: The figure presents the average ln(value) in treated and control groups. The dashed vertical lines represent the transition period. Time is in quarters normalized to zero, the transition period. Regressions do not include any additional controls.

**Figure 4 (a):** Trends Ln(count) of Estates

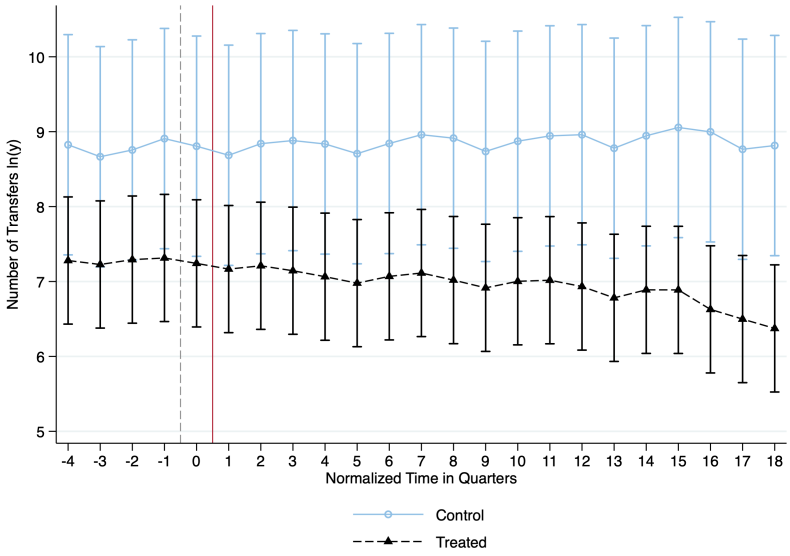
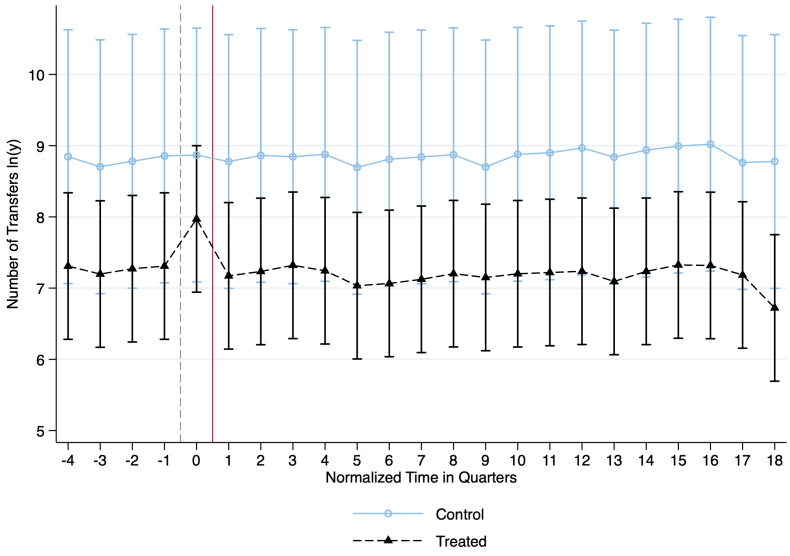



**Figure 4 (b):** Trends Ln(count) of Gifts




Note: The figure presents the average ln(number) in treated and control groups. The dashed vertical lines represent the transition period. Time is in quarters normalized to zero, the transition period. Regressions do not include any additional controls.

**Figure 5 (a):** Leads and lags - Ln(value) of Estates

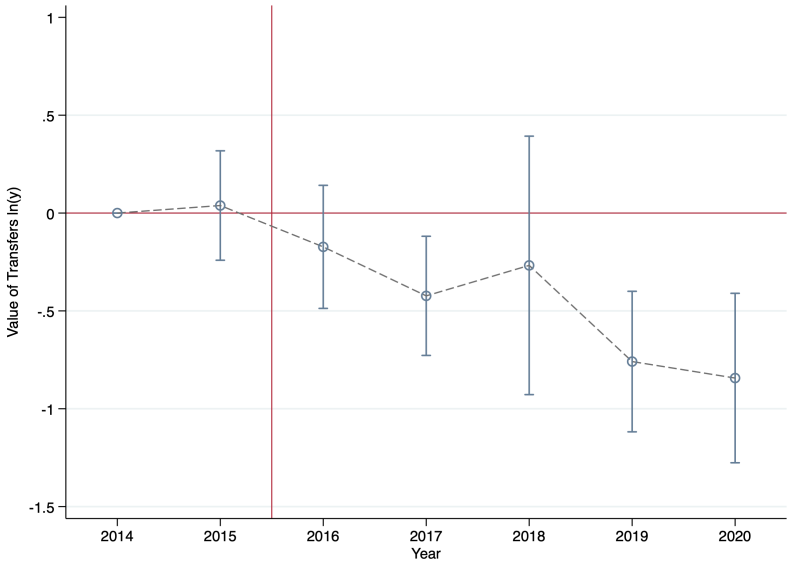
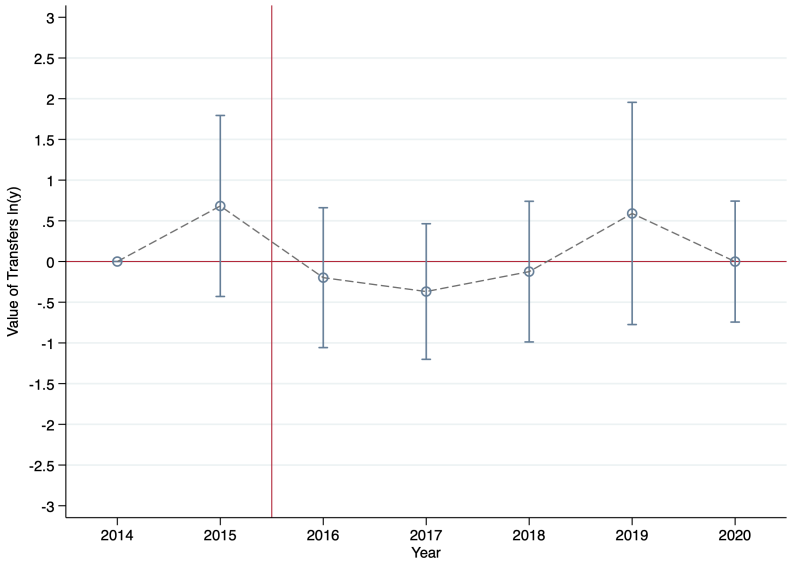



**Figure 5 (b):** Leads and lags - Ln(value) of Gifts




Note: The figure presents estimates of the parameters in Equation 4. The omitted category is the difference between treated and control groups on the quarter before the transition period. The regressions control for state and year fixed effects.

**Figure 6 (a):** Leads and lags - Ln(count) of Estates

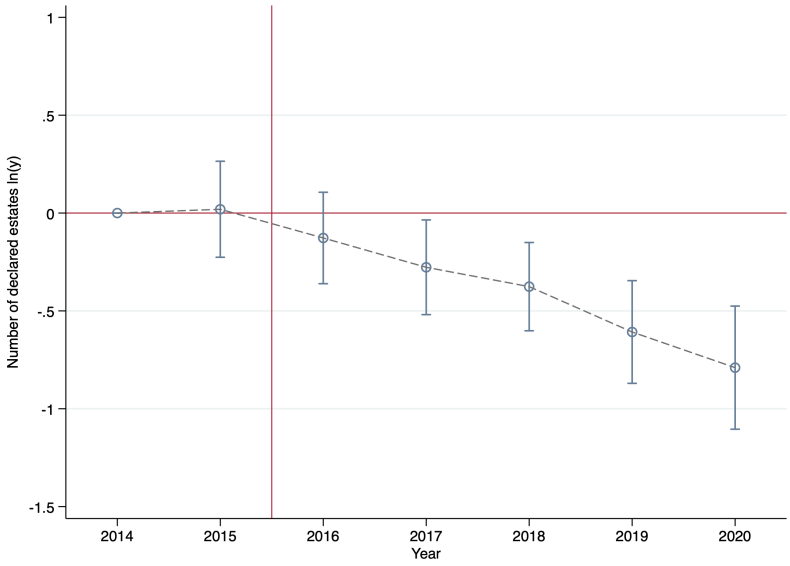
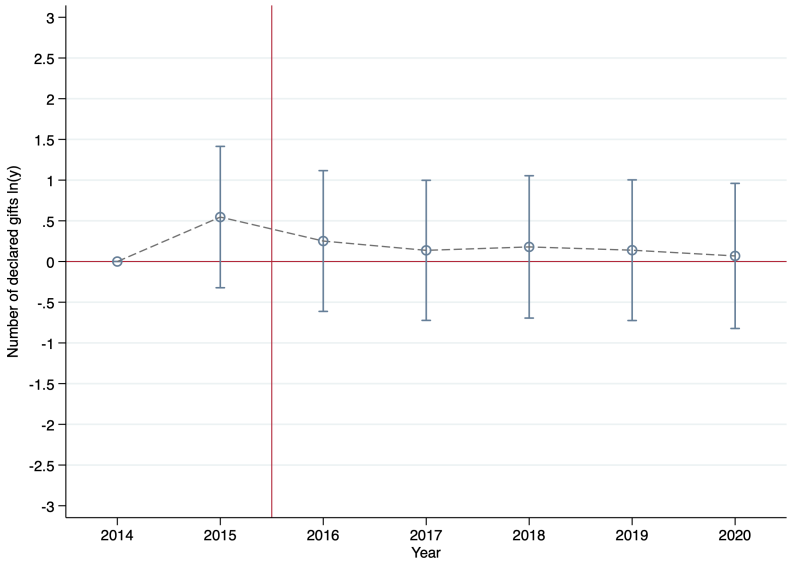



**Figure 6 (b):** Leads and lags - Ln(count) of Gifts




Note: The figure presents estimates of the parameters in Equation 4. The omitted category is the difference between treated and control groups on the quarter before the transition period. The regressions control for state and year fixed effects.

**Figure 7 (a):** Declared Estates by Wealth Bracket

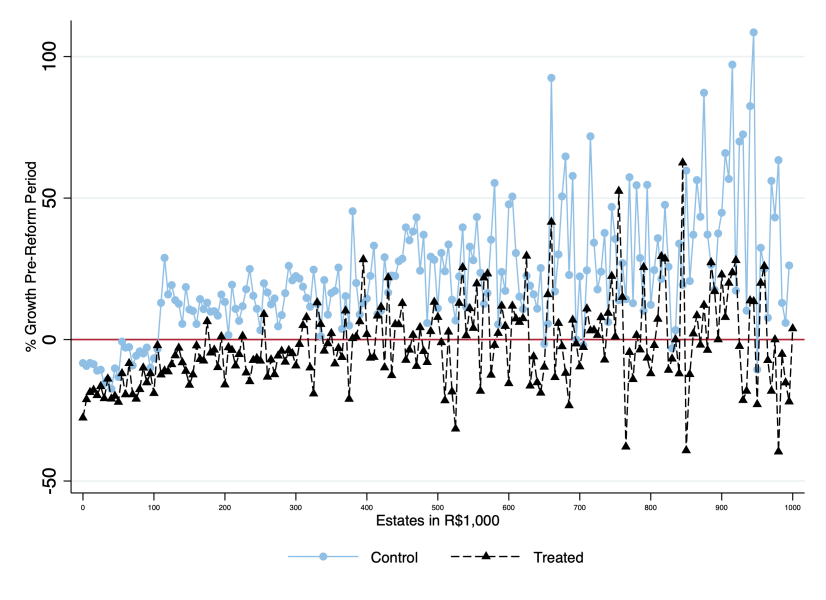
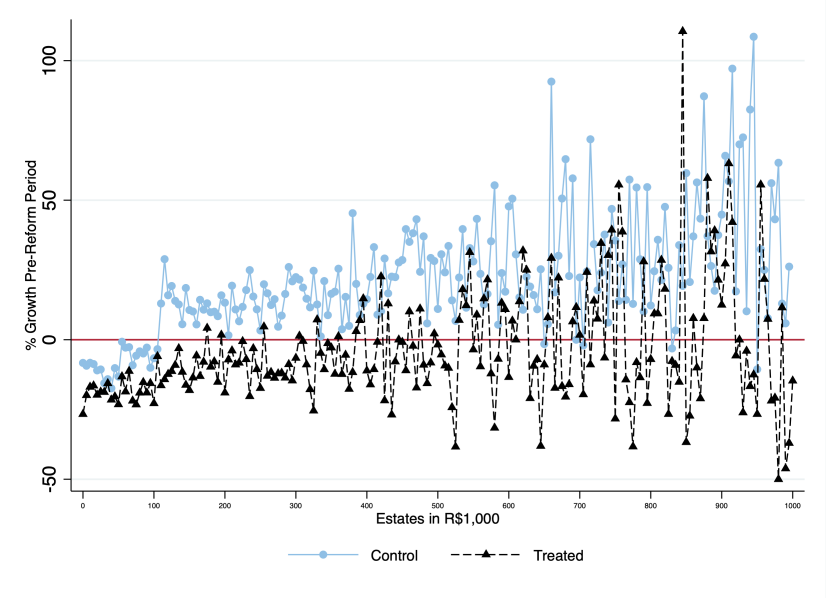



**Figure 7 (b):** Declared Estates by Wealth Bracket using High Baseline Tax Compliance States




Note: The figure presents the growth (%) in the number of declared estates between the pre (2014-2015) and post-reform (2016-2017) period by wealth bracket across treated and non-treated states. In Panel B, the sample is restricted to states with tax coverage of at least 18% (e.g., proportion of deceased age 20 or more leaving a bequest).

# 8 Tables

**Table 1:** Descriptive Statistics

| Type of Transfer | Year | Av. Recipients | SD | N | Mean | SD | p25 | p50 | p95 |
|---|---|---|---|---|---|---|---|---|---|
| **Panel A**- Estates | | | | | | | | | |
| Control | | | | | | | | | |
| Estates | 2014 | 4.60 | 3.38 | 62,750 | 431,841 | 2,358,025 | 53,478 | 133,696 | 1,439,696 |
| Estates | 2015 | 4.56 | 3.39 | 63,601 | 459,476 | 2,316,630 | 54,678 | 135,694 | 1,539,736 |
| Estates | 2016 | 4.49 | 3.35 | 64,009 | 459,689 | 2,334,362 | 56,295 | 136,235 | 1,577,435 |
| Estates | 2017 | 4.47 | 3.33 | 68,205 | 478,383 | 2,333,441 | 56,824 | 142,005 | 1,615,454 |
| Estates | 2018 | 4.40 | 3.31 | 68,116 | 494,546 | 2,563,942 | 56,988 | 141,235 | 1,630,043 |
| Estates | 2019 | 4.35 | 3.30 | 71,623 | 464,322 | 2,084,950 | 56,000 | 142,000 | 1,541,813 |
| Treated | | | | | | | | | |
| Estates | 2014 | 3.56 | 3.38 | 52,317 | 646,695 | 3,776,288 | 43,197 | 129,685 | 2,036,768 |
| Estates | 2015 | 3.61 | 3.40 | 52,830 | 684,796 | 4,671,487 | 44,790 | 133,458 | 2,198,745 |
| Estates | 2016 | 3.56 | 3.28 | 48,992 | 636,867 | 4,289,024 | 44,022 | 130,558 | 2,011,988 |
| Estates | 2017 | 3.56 | 3.28 | 43,964 | 635,404 | 3,851,782 | 44,494 | 130,310 | 2,122,757 |
| Estates | 2018 | 3.51 | 3.21 | 39,794 | 629,604 | 3,927,276 | 45,041 | 132,593 | 2,112,816 |
| Estates | 2019 | 3.52 | 3.31 | 32,490 | 674,006 | 3,807,277 | 50,000 | 142,910 | 2,268,356 |
| **Panel B**- Gifts | | | | | | | | | |
| Control | | | | | | | | | |
| Gifts | 2014 | 1.73 | 1.53 | 52,898 | 250,781 | 1,472,047 | 26,739 | 74,335 | 761,202 |
| Gifts | 2015 | 1.75 | 1.55 | 53,352 | 262,442 | 1,917,110 | 28,181 | 78,108 | 804,904 |
| Gifts | 2016 | 1.76 | 1.56 | 55,316 | 260,673 | 2,569,225 | 28,382 | 77,736 | 761,706 |
| Gifts | 2017 | 1.82 | 1.62 | 53,453 | 273,526 | 1,602,483 | 32,043 | 85,449 | 833,880 |
| Gifts | 2018 | 1.75 | 1.52 | 56,721 | 297,240 | 2,754,289 | 31,125 | 83,000 | 824,925 |
| Gifts | 2019 | 1.73 | 1.51 | 61,816 | 245,907 | 1,108,474 | 30,000 | 85,715 | 800,000 |
| Treated | | | | | | | | | |
| Gifts | 2014 | 1.28 | 1.07 | 65,146 | 351,576 | 3,245,958 | 30,750 | 80,218 | 930,526 |
| Gifts | 2015 | 1.33 | 1.17 | 72,875 | 598,048 | 5,632,153 | 32,108 | 94,232 | 1,382,068 |
| Gifts | 2016 | 1.35 | 1.20 | 63,008 | 297,549 | 1,896,330 | 24,358 | 75,686 | 849,765 |
| Gifts | 2017 | 1.32 | 1.12 | 60,727 | 273,197 | 1,849,453 | 27,344 | 77,246 | 802,319 |
| Gifts | 2018 | 1.34 | 1.14 | 63,333 | 342,640 | 2,575,403 | 27,566 | 83,000 | 979,265 |
| Gifts | 2019 | 1.31 | 1.12 | 66,511 | 354,033 | 3,463,222 | 27,750 | 80,000 | 931,711 |

Note: This table reports descriptive statistics of the inheritance tax receipts by year in Brazil. The mean value, standard deviation, first quartile, median and the top 95 quantile of estates and inter-vivos gifts. The last two columns display the mean and the standard deviation of the number of recipients of both types of transfers.

**Table 2:** Short term Impact of the Tax Reform on Transfers

| | **Estates** | | | **Gifts** | | |
|---|---|---|---|---|---|---|
| **Panel A**- Log Count of Transfers | (1) | (2) | (3) | (4) | (5) | (6) |
| $Treat \times Transition$ | -0.072 | -0.015 | -0.005 | 0.567 | 0.649** | 0.690** |
| | (0.506) | (0.044) | (0.045) | (0.446) | (0.222) | (0.238) |
| $Treat \times Post$ | -0.127 | -0.149** | -0.118* | 0.214 | 0.200 | 0.292 |
| | (0.763) | (0.057) | (0.060) | (0.654) | (0.245) | (0.333) |
| Mean outcome | 6.18 | 5.55 | 5.02 | 6.20 | 6.02 | 5.03 |
| Year FE's | | ✓ | ✓ | | ✓ | ✓ |
| State FE's | | ✓ | ✓ | | ✓ | ✓ |
| State Controls | | | ✓ | | | ✓ |
| $N$ | 1,247 | 1,247 | 1,247 | 1,247 | 1,247 | 1,247 |
| **Panel B**- Log Value of Transfers | | | | | | |
| $Treat \times Transition$ | -0.199 | -0.140* | -0.130 | 1.206* | 1.237** | 1.327*** |
| | (0.581) | (0.074) | (0.077) | (0.644) | (0.342) | (0.348) |
| $Treat \times Post$ | -0.186 | -0.206*** | -0.205** | -0.033 | -0.035 | 0.275 |
| | (0.846) | (0.042) | (0.055) | (0.779) | (0.265) | (0.313) |
| Mean outcome | 18.99 | 18.12 | 18.40 | 18.53 | 18.10 | 17.65 |
| Year FE's | | ✓ | ✓ | | ✓ | ✓ |
| State FE's | | ✓ | ✓ | | ✓ | ✓ |
| State Controls | | | ✓ | | | ✓ |
| $N$ | 1,247 | 1,247 | 1,247 | 1,247 | 1,247 | 1,247 |

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$

Note: Estimates in Panel A report models described in Equation (3) in which the dependent variable is the log count of transfers. In Panel B, the outcome variable is the log value of transfers. In columns 1-3, coefficients are the DD estimates for estates. Estimates in columns 4-6 display the models for gifts as a dependent variable. In all regressions the standard errors are with clustered at the state-year level.

**Table 3:** Medium-term Impact of the Reform on Transfers

| | **Estates** | | **Gifts** | |
|---|---|---|---|---|
| **Panel A**- Log Count of Transfers | (1) | (2) | (3) | (4) |
| 1 year before reform | 0 | 0 | 0 | 0 |
| reform year | 0.023 | 0.014 | 0.489 | 0.545 |
| | (0.096) | (0.087) | (0.359) | (0.353) |
| 1 year after reform | -0.132 | -0.148* | 0.397 | 0.552 |
| | (0.092) | (0.088) | (0.355) | (0.362) |
| 2 years after reform | -0.274** | -0.293** | 0.320 | 0.538 |
| | (0.096) | (0.102) | (0.352) | (0.381) |
| 3 years after reform | -0.366*** | -0.388*** | 0.368 | 0.618 |
| | (0.093) | (0.099) | (0.358) | (0.401) |
| 4 years after reform | -0.611*** | -0.633*** | 0.331 | 0.610 |
| | (0.112) | (0.099) | (0.353) | (0.421) |
| 5 years after reform | -0.806*** | -0.834*** | 0.228 | 0.503 |
| | (0.119) | (0.115) | (0.365) | (0.414) |
| Mean value | 5.56 | 4.89 | 6.18 | 4.93 |
| **Panel B**- Log Value of Transfers | | | | |
| 1 year before reform | 0 | 0 | 0 | 0 |
| reform year | 0.024 | 0.016 | 0.417 | 0.469 |
| | (0.089) | (0.089) | (0.392) | (0.394) |
| 1 year after reform | -0.190** | -0.227** | 0.135 | 0.226 |
| | (0.085) | (0.096) | (0.376) | (0.411) |
| 2 years after reform | -0.382*** | -0.430*** | 0.004 | 0.137 |
| | (0.088) | (0.108) | (0.374) | (0.440) |
| 3 years after reform | -0.531*** | -0.572*** | 0.201 | 0.383 |
| | (0.091) | (0.113) | (0.381) | (0.470) |
| 4 years after reform | -0.765*** | -0.798*** | 0.303 | 0.536 |
| | (0.133) | (0.120) | (0.390) | (0.452) |
| 5 years after reform | -1.025*** | -1.037*** | 0.111 | 0.347 |
| | (0.112) | (0.114) | (0.378) | (0.456) |
| Mean value | 18.12 | 18.29 | 18.25 | 17.55 |
| Year FE's | ✓ | ✓ | ✓ | ✓ |
| State FE's | ✓ | ✓ | ✓ | ✓ |
| State Controls | | ✓ | | ✓ |
| $N$ | 2701 | 2701 | 2699 | 2699 |

Clustered standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$

Note: Estimates report models described in Equation (5). In panel A, the dependent variable is the log count of transfers and in panel B log value of transfers. In columns 1-3, coefficients are the DD estimates for estates and estimates in columns 4-6 display the models for gifts as a dependent variable. In all regressions the standard errors are with clustered at the state-year level.

**Table 4:** Declared Estates by Wealth Bracket

| | Estates (pre-reform) | | Δ% | |
|---|---|---|---|---|
| Wealth Bracket | Treated | Control | Treated | Control |
| Less than 100k | 53,631 | 63,903 | -17.35 | -8.4 |
| 100k to 500k | 35,871 | 46,580 | -2.24 | 17.06 |
| 500k to 1M | 7,177 | 8,422 | 4.1 | 31.78 |
| More than 1M | 8,365 | 7,425 | 25.08 | 66.45 |
| Total | 105,044 | 126,330 | | |

Note: This table reports estimates of the number of declared estates during the pre-reform period (2014-2015) by wealth brackets in control and treatment group. Δ% represents the growth in percentage between the pre-reform and the post-reform (2016-2017) periods. Interpretation: in treated states, 43,411 estates were declared in the bracket of less than R$100k during the post-reform period, a reduction of 17% in comparison to the pre-reform period.

**Table 5:** Elasticities

| | **Estates** | | | **Gifts** | | |
|---|---|---|---|---|---|---|
| **Panel A**- Log Value of Transfers | (1) | (2) | (3) | (4) | (5) | (6) |
| $\log(1+\Delta\tau_{ist}) \times Transition$ | 2.439 | 2.749 | 3.051 | 20.421** | 20.581** | 20.625** |
| | (3.340) | (3.510) | (3.428) | (5.366) | (4.826) | (4.801) |
| $\log(1+\Delta\tau_{ist}) \times Post$ | 4.840 | 4.197 | 4.511 | -5.690** | -4.001 | -3.704 |
| | (3.694) | (4.311) | (3.984) | (2.114) | (2.517) | (2.133) |
| Year FE's | | ✓ | ✓ | | ✓ | ✓ |
| State FE's | | ✓ | ✓ | | ✓ | ✓ |
| State Controls | | | ✓ | | | ✓ |
| $N$ | 2,773,620 | 2,773,620 | 2,773,620 | 1,104,033 | 1,104,033 | 1,104,033 |

Clustered standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$

Note: Estimates in Panel A report models described in Equation (5). In columns 1-3, the outcome variable is the log size of inheritances. Estimates in columns 4-6 display the models using the log value of individual gifts as a dependent variable. Standard errors are clustered at the state level.

**Table 6:** Robustness Checks

| | **Inheritances** | | **Gifts** | |
|---|---|---|---|---|
| **Panel A**- State Linear trends | (1) | (2) | (3) | (4) |
| $Treat \times Transition$ | -0.083 | -0.081 | 1.116*** | 1.115*** |
| | (0.079) | (0.079) | (0.268) | (0.269) |
| $Treat \times Post$ | -0.147 | -0.181 | -0.298 | -0.302 |
| | (0.105) | (0.107) | (0.272) | (0.294) |
| State & Year FE's | ✓ | ✓ | ✓ | ✓ |
| State Controls | | ✓ | | ✓ |
| $N$ | 2,495 | 2,495 | 2,495 | 2,495 |
| **Panel B**- Without 31st December | | | | |
| $Treat \times Transition$ | -0.113 | -0.110 | 1.118** | 1.154*** |
| | (0.074) | (0.074) | (0.312) | (0.316) |
| $Treat \times Post$ | -0.254*** | -0.236** | -0.191 | 0.073 |
| | (0.053) | (0.074) | (0.170) | (0.263) |
| State & Year FE's | ✓ | ✓ | ✓ | ✓ |
| State Controls | | ✓ | | ✓ |
| $N$ | 2,495 | 2,495 | 2,495 | 2,495 |
| **Panel C**- Bootstrap SE's | | | | |
| $Treat \times Transition$ | -0.105 | -0.102 | 1.136*** | 1.170*** |
| | (0.103) | (0.105) | (0.168) | (0.170) |
| $Treat \times Post$ | -0.253*** | -0.238** | -0.201** | 0.043 |
| | (0.055) | (0.078) | (0.073) | (0.127) |
| State & Year FE's | ✓ | ✓ | ✓ | ✓ |
| State Controls | | ✓ | | ✓ |
| $N$ | 2,495 | 2,495 | 2,495 | 2,495 |
| **Panel D**- Including Rio de Janeiro | | | | |
| $Treat \times Transition$ | -0.015 | -0.011 | 1.045** | 1.072** |
| | (0.107) | (0.105) | (0.281) | (0.284) |
| $Treat \times Post$ | -0.236*** | -0.171* | -0.213 | -0.028 |
| | (0.038) | (0.092) | (0.188) | (0.122) |
| State & Year FE's | ✓ | ✓ | ✓ | ✓ |
| State Controls | | ✓ | | ✓ |
| $N$ | 1,610 | 1,610 | 1,610 | 1,610 |

Clustered standard errors in parentheses

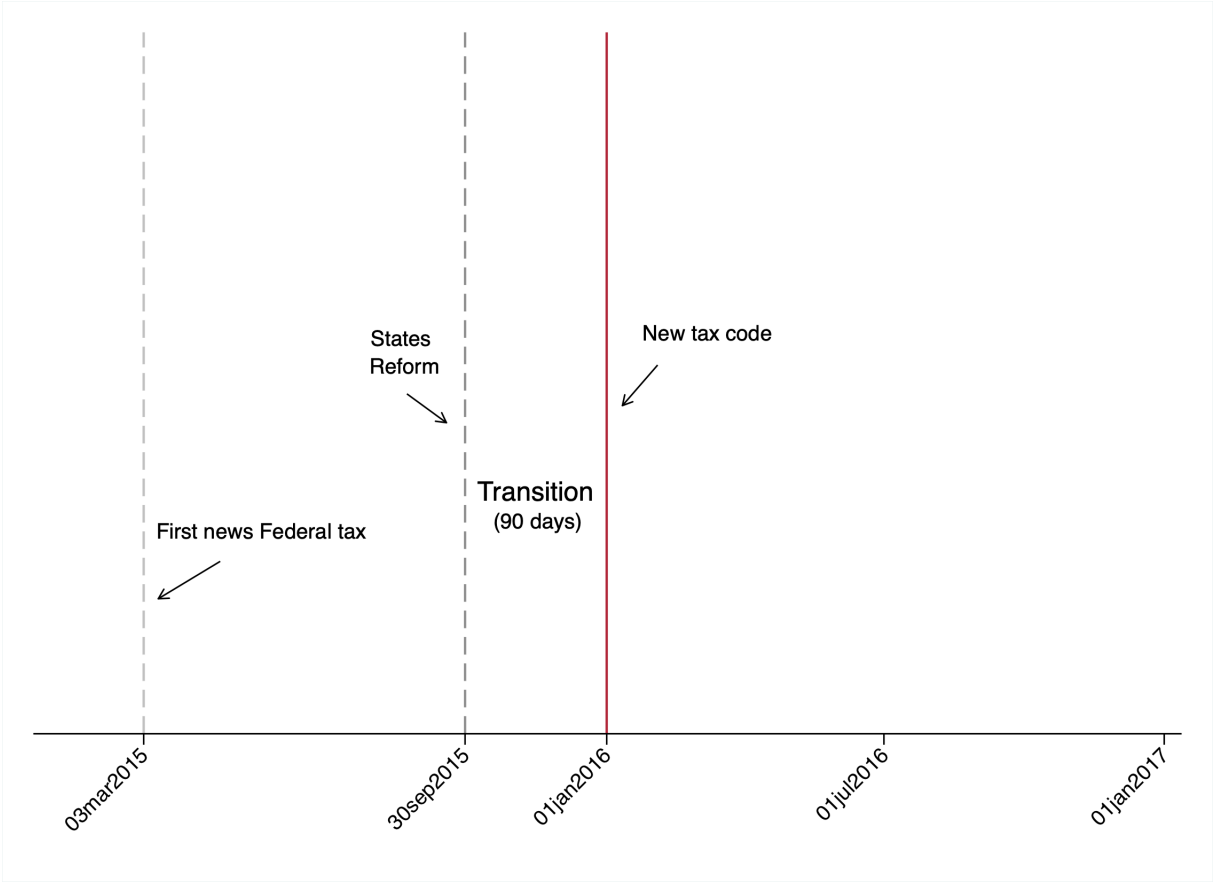
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$

Note: Estimates in this table report models described in Equation (3). Estimates in Panel A include linear state time trends. Panel B report models excluding transfers made on December 31. Estimates in Panel C show results using the same specification as in **Table 2** but with bootstraped standard errors (500 reps). Panel D presents estimates including the state of Rio de Janeiro. The sample in Panel D is restricted to have equal periods for all treated and untreated units. Standard errors are clustered at the state level in all regressions except for estimates in Panel C.

# 9 Appendix

## 9.1 Figures

**Figure A1:** Tax Schedule Brazilian Reform 2015




Note: This figure shows the tax schedule of the 2015 tax reform in Brazil. States passed legislation by the end of September 2015 but according to the Brazilian legislation the new tax code was only applied from January 1st 2016.

**Figure A2 (a):** Inheritances Marginal Tax Rates by Wealth Bracket

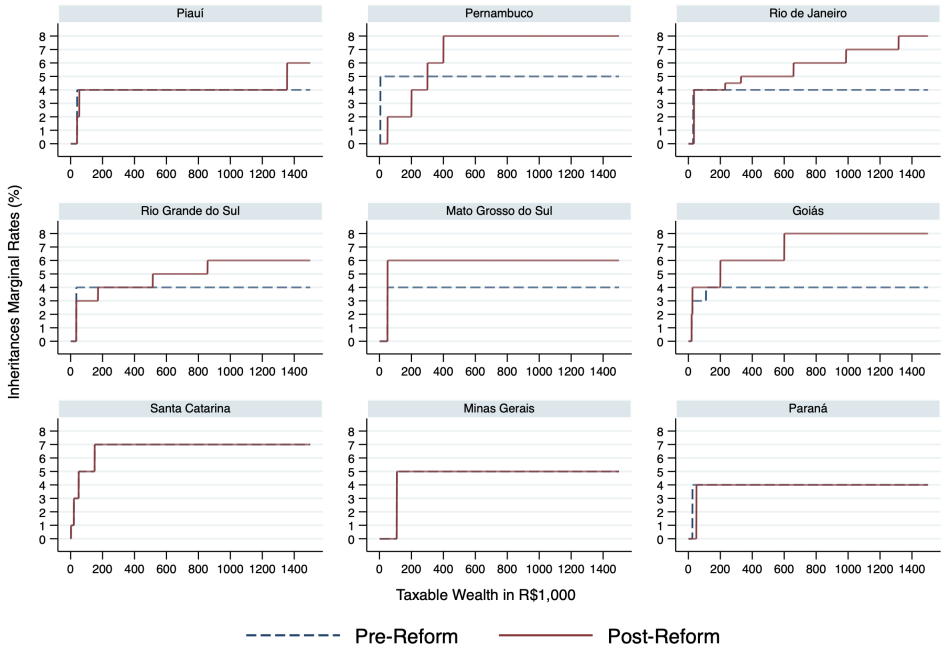
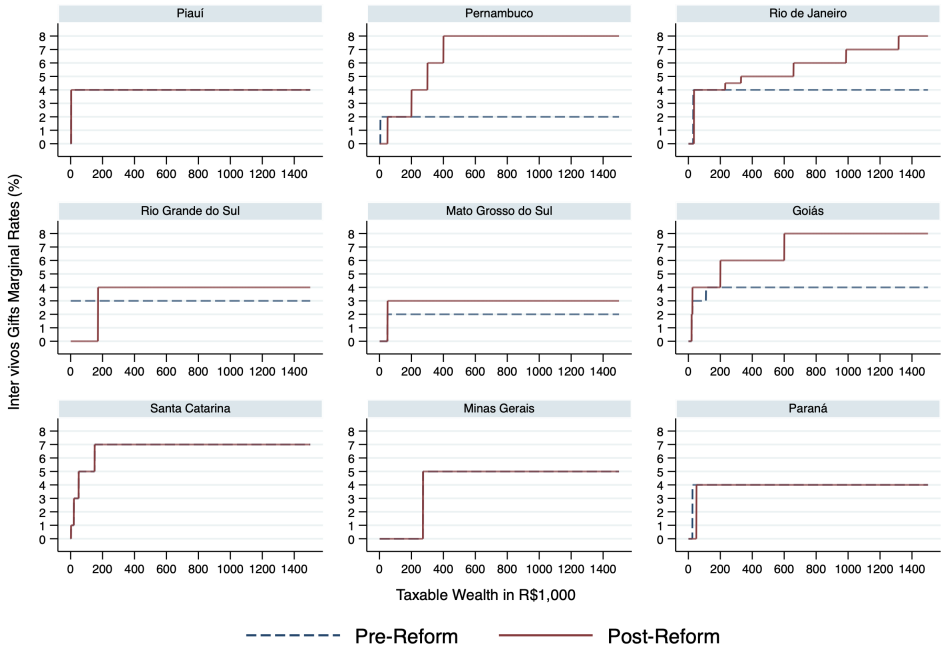
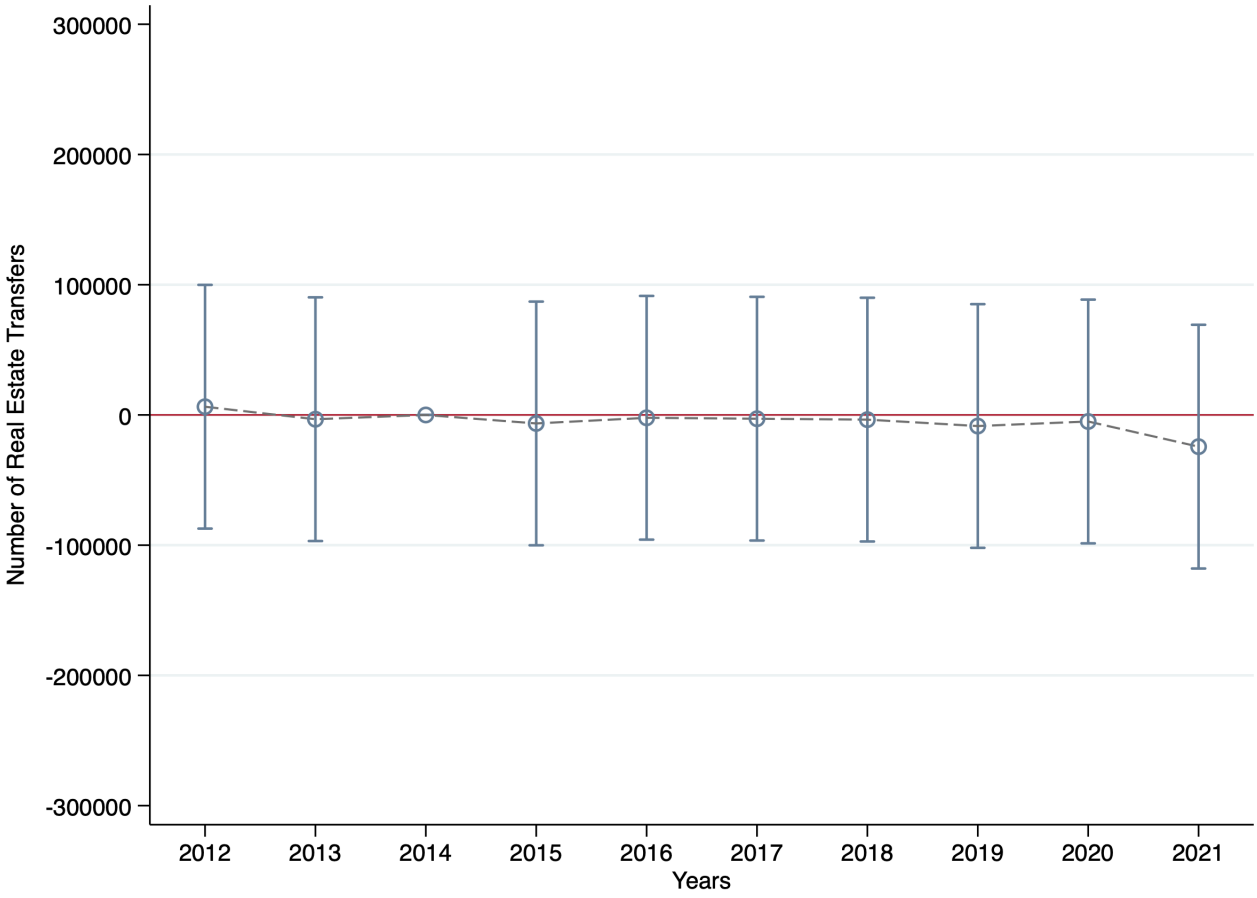



**Figure A2 (b):** Gifts Marginal Tax Rates by Wealth Bracket




Note: This figure shows marginal rates by wealth brackets in Brazilian states before and after the 2015 reform. Panel (a) presents the inheritance tax code at the state-level and panel (b) the gifts tax rates by wealth brackets. The top six estates passed legislation that modified the tax rates schedule.

**Figure A3:** Real estate transfers in Rio de Janeiro and Santa Catarina




Note: In this figure, panel (a) presents the number and panel (b) the market value (in R$ millions) of transfers made around the time notch in Brazil from 2014 to 2019. The dashed and solid lines represent the beginning and the end of the transition period of 12 weeks, respectively. The excess mass is estimated following Chetty et al. (2011) and standard errors are calculated using a bootstrap procedure.

**Figure A4 (a):** All-cause mortality deaths age above 20

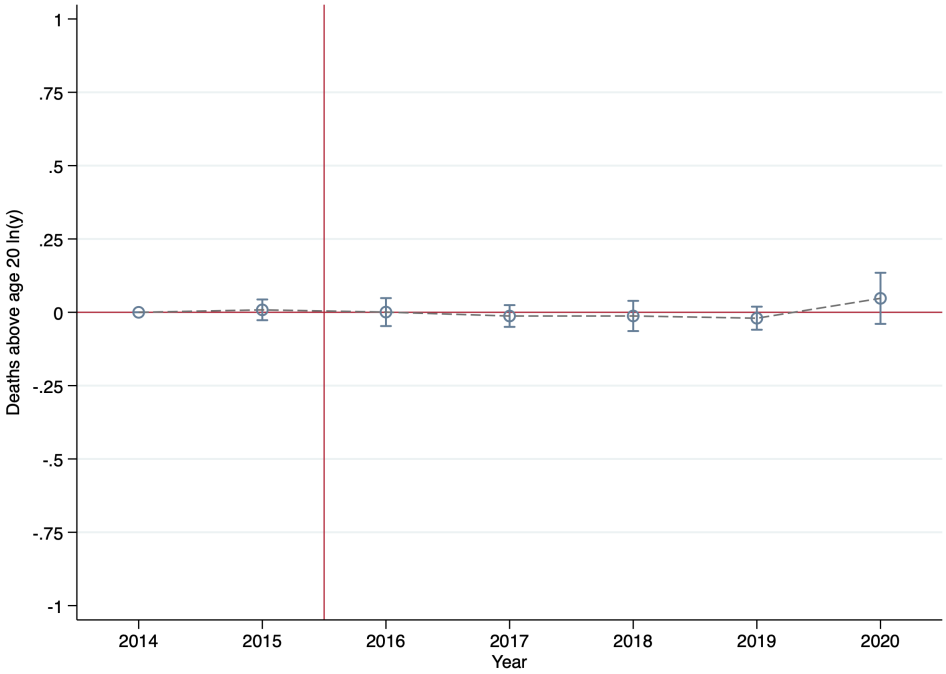
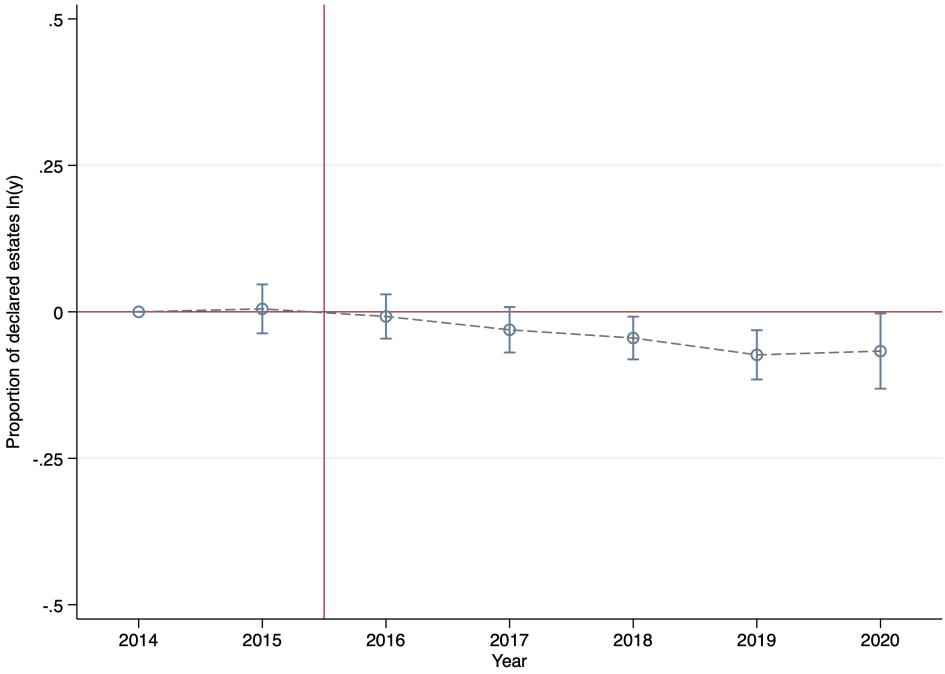
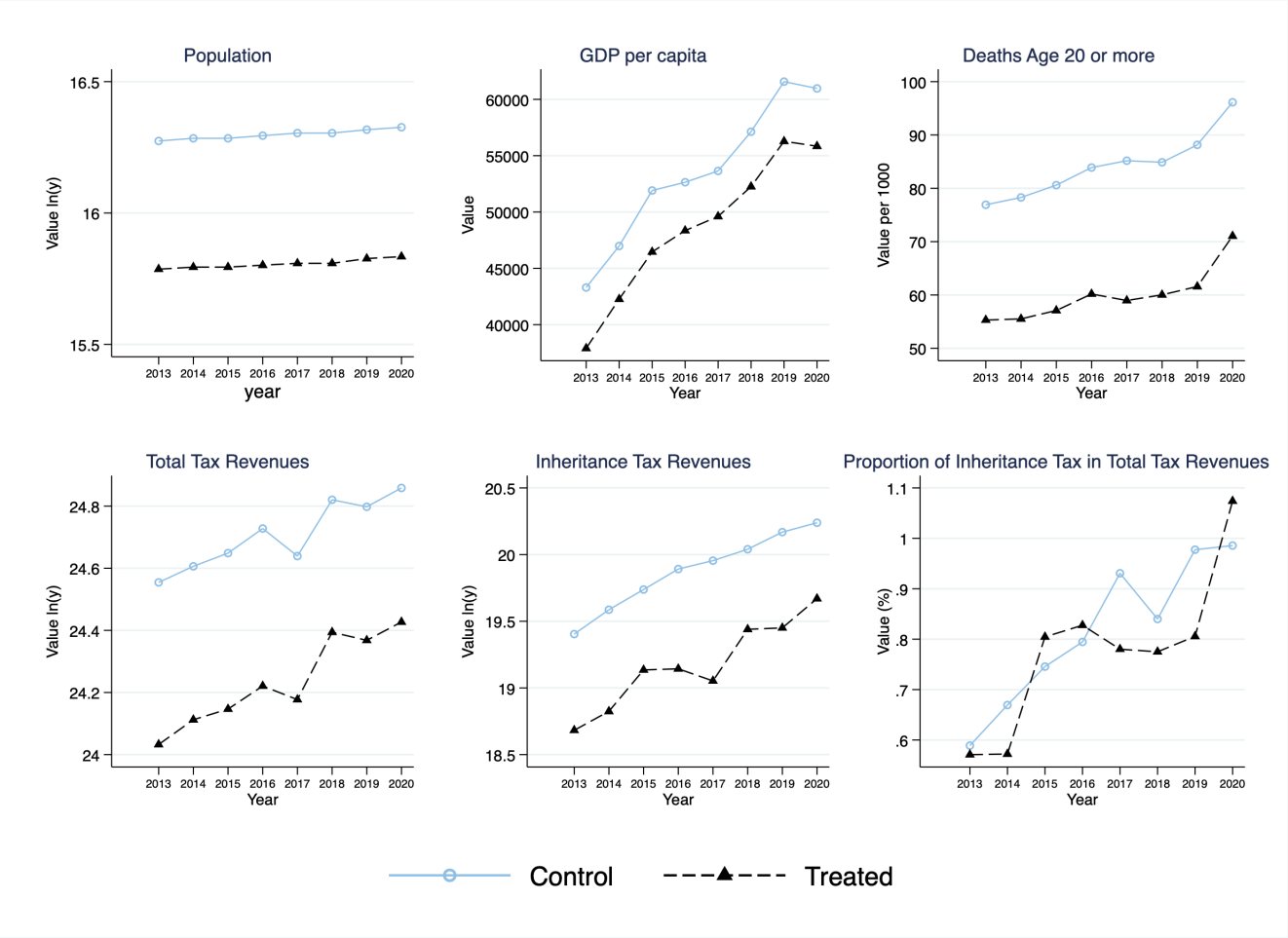



**Figure A4 (b):** Proportion of deceased (age above 20) declaring an estate



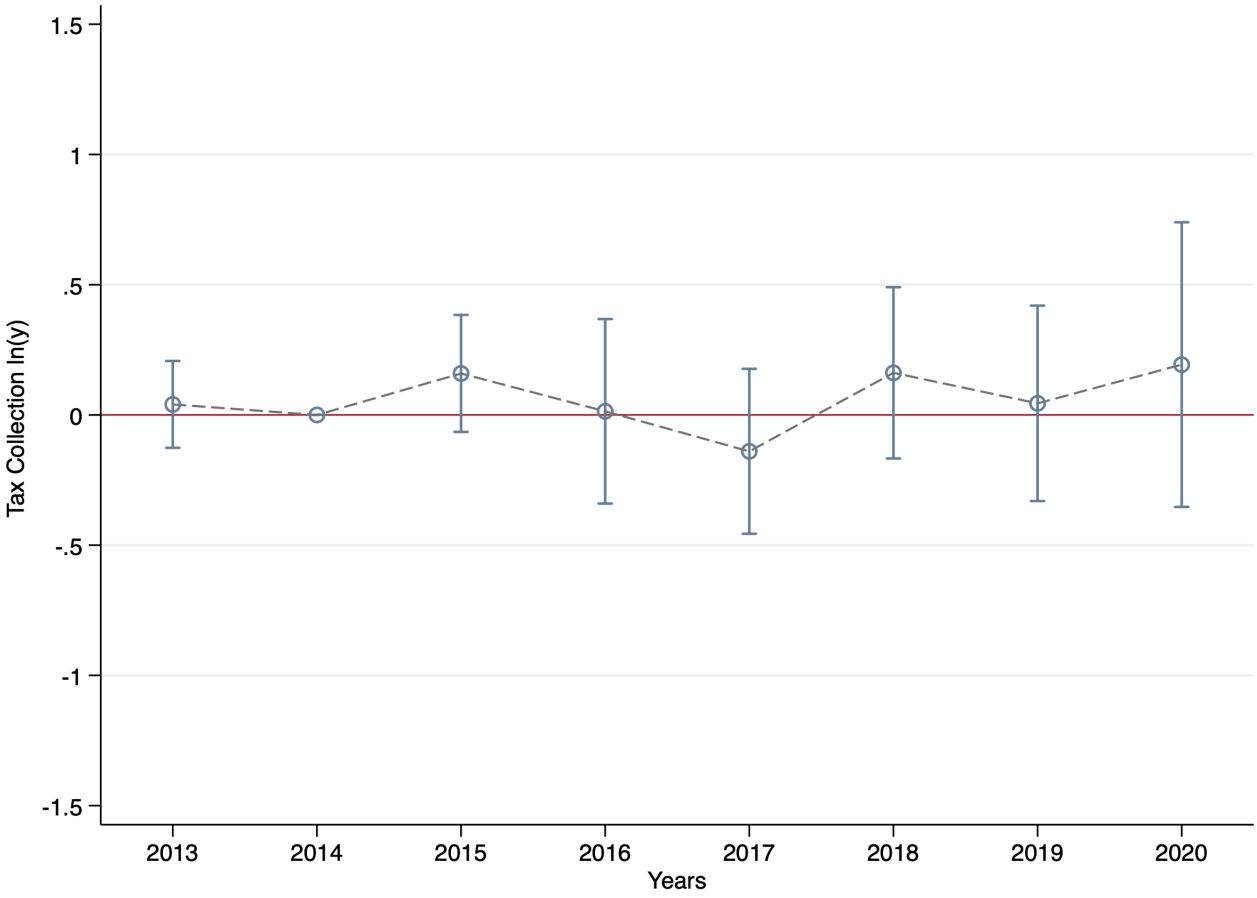

Note: In this figure, panel (a) presents the number and panel (b) the market value (in R$ millions) of transfers made around the time notch in Brazil from 2014 to 2019. The dashed and solid lines represent the beginning and the end of the transition period of 12 weeks, respectively. The excess mass is estimated following Chetty et al. (2011) and standard errors are calculated using a bootstrap procedure.

**Figure A5:** Population, GDP, Tax Revenues, and ITCMD



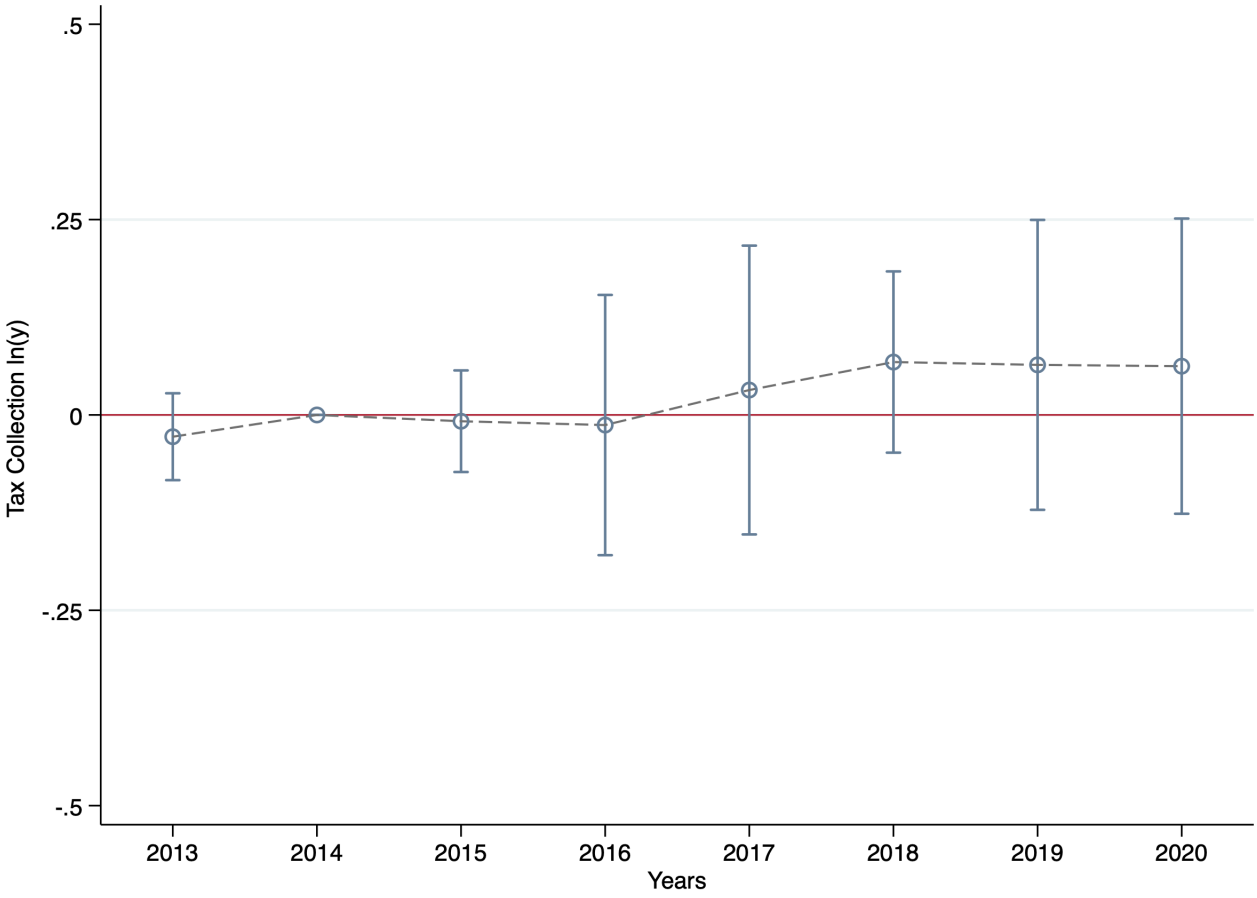

Note: The figure presents the average logarithm of population, GDP, total tax revenues, and the ITCMD tax collection in treated and control groups from 2013 to 2020. Regressions do not include any additional controls. Publicly available data on States' tax collection comes from the Sistema de Informações Contábeis e Fiscais do Setor Público Brasileiro (Siconfi) and population and GDP estimates from the Instituto Brasileiro de Geografia e Estatística (IBGE) and the SIM (Sistema Integrado de Mortalidade).

**Figure A6:** Inheritances and Gifts Tax Collection - Leads and Lags




Note: This figure presents estimates of the parameters in Equation (4). The omitted category is the difference between treated and control groups in 2014. The regression is run at the state level and does not include any additional controls. Standard errors are clustered at the state level.

**Figure A7:** Total Tax Revenues - Leads and Lags




Note: This figure presents estimates of the parameters in Equation (4). The omitted category is the difference between treated and control groups in 2014. The regression is run at the state level and does not include any additional controls. Standard errors are clustered at the state level.

## 9.2 Tables

**Table A1:** Schedule of the Tax Reform in Brazil

| | Law Number | Date of Approval | Date of Effectiveness | Population (2015) | GDP (R$ millions) | Coverage (2015) |
|---|---|---|---|---|---|---|
| **Treated** | | | | | | |
| Rio Grande do Sul | 14.741 | 24/08/2015 | 01/01/2016 | 11,175,777 | 665,169 | 19.85% |
| Pernambuco | 15.601 | 30/09/2015 | 01/01/2016 | 9,317,317 | 237,658 | 4.76% |
| Goias | 3.066 | 30/09/2015 | 01/01/2016 | 6,625,528 | 295,337 | 21.05% |
| Paraná | 18.573 | 30/09/2015 | 01/01/2016 | 11,089,062 | 654,116 | 20.78% |
| Mato Grosso do Sul | 4.759 | 16/11/2015 | 14/02/2016 | 2,653,928 | 139,058 | 8.64% |
| Piaui | 6.744 | 23/12/2015 | 22/03/2016 | 3,238,459 | 54,403 | 9.36% |
| Rio de Janeiro | 7.786 | 16/11/2017 | 14/02/2018 | 16,841,138 | 1,083,215 | 19.66% |
| **Control** | | | | | | |
| Santa Catarina | 13.136 | 25/11/2004 | 23/02/2005 | 6,802,306 | 405,808 | 39.07% |
| Minas Gerais | 14.941 | 29/12/2003 | 28/03/2004 | 20,648,978 | 901,795 | 40.43% |

Note: This table displays the tax schedule for our control and treatment groups. A feature of the tax code in Brazil imposes that governments should respect a waiting period of 90 days between the approval of the tax reform and the collection of the new tax. Coverage represents a ratio between the number of reported estates and the total number of deaths above age 20 by state in 2015.

**Table A2:** Impact of the Tax Reform on Transfer (Parana in the control group)

| | **Estates** | | | **Gifts** | | |
|---|---|---|---|---|---|---|
| **Panel A**- Log Value of Transfers | (1) | (2) | (3) | (4) | (5) | (6) |
| $Treat \times Transition$ | -0.032 | 0.110 | 0.120 | 0.780 | 0.835** | 0.865** |
| | (0.345) | (0.116) | (0.119) | (0.493) | (0.371) | (0.371) |
| $Treat \times Post$ | -0.154 | -0.194** | -0.138* | -0.314 | -0.289 | -0.176 |
| | (0.572) | (0.056) | (0.073) | (0.703) | (0.191) | (0.256) |
| Mean outcome | 18.87 | 18.21 | 18.50 | 18.38 | 18.16 | 17.72 |
| Year FE's | | ✓ | ✓ | | ✓ | ✓ |
| State FE's | | ✓ | ✓ | | ✓ | ✓ |
| State Controls | | | ✓ | | | ✓ |
| $N$ | 2,495 | 2,495 | 2,495 | 2,495 | 2,495 | 2,495 |
| **Panel B**- Log Number of Transfers | | | | | | |
| $Treat \times Transition$ | -0.021 | 0.117* | 0.134** | 0.304 | 0.445** | 0.469** |
| | (0.291) | (0.064) | (0.065) | (0.302) | (0.202) | (0.204) |
| $Treat \times Post$ | -0.091 | -0.129** | -0.014 | -0.052 | -0.035 | 0.045 |
| | (0.572) | (0.052) | (0.059) | (0.557) | (0.185) | (0.254) |
| Mean outcome | 6.08 | 5.62 | 5.12 | 6.08 | 6.02 | 5.09 |
| Year FE's | | ✓ | ✓ | | ✓ | ✓ |
| State FE's | | ✓ | ✓ | | ✓ | ✓ |
| State Controls | | | ✓ | | | ✓ |
| $N$ | 2,495 | 2,495 | 2,495 | 2,495 | 2,495 | 2,495 |

Clustered standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$

Note: Estimates in Panel A report models described in Equation (3) in which the dependent variable is the log value of transfers. In Panel B, the outcome variable is the log count of transfers. In columns 1-3, coefficients are the DD estimates for estates. Estimates in columns 4-6 display the models for gifts as a dependent variable. Standard errors are clustered at the state level in all regressions.

**Table A3:** Gifts brackets not affected by the reform as control group

| | **Gifts** | | |
|---|---|---|---|
| **Panel A**- Log Count of Transfers | (1) | (2) | (3) |
| $Treat \times Transition$ | 0.718* | 0.627** | 0.624** |
| | (0.382) | (0.307) | (0.279) |
| $Treat \times Post$ | 0.160 | -0.064 | -0.084 |
| | (0.449) | (0.248) | (0.200) |
| **Panel B**- Log Value of Transfers | | | |
| $Treat \times Transition$ | 1.151* | 1.156** | 1.145** |
| | (0.574) | (0.473) | (0.461) |
| $Treat \times Post$ | 0.167 | -0.218 | -0.272 |
| | (0.584) | (0.317) | (0.276) |
| Year FE's | | ✓ | ✓ |
| State FE's | | ✓ | ✓ |
| State Controls | | | ✓ |
| $N$ | 3,112 | 3,112 | 3,112 |

Clustered standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$

Note: Estimates in Panel A report models described in Equation (3) in which the dependent variable is the log value of transfers. In Panel B, the outcome variable is the log count of transfers. In columns 1-3, coefficients are the DD estimates for estates. Estimates in columns 4-6 display the models for gifts as a dependent variable. Standard errors are clustered at the state level in all regressions.

**Table A4:** Leads and Lags

| | **Estates** | | **Gifts** | |
|---|---|---|---|---|
| **Panel A**- Log Count of Transfers | (1) | (2) | (3) | (4) |
| 1 year before reform | 0 | 0 | 0 | 0 |
| reform year | 0.019 | 0.005 | 0.546 | 0.605 |
| | (0.122) | (0.110) | (0.433) | (0.431) |
| 1 year after reform | -0.127 | -0.158 | 0.252 | 0.415 |
| | (0.117) | (0.114) | (0.431) | (0.457) |
| 2 years after reform | -0.277** | -0.317** | 0.137 | 0.368 |
| | (0.121) | (0.132) | (0.429) | (0.481) |
| 3 years after reform | -0.376** | -0.421** | 0.180 | 0.445 |
| | (0.113) | (0.124) | (0.436) | (0.505) |
| 4 years after reform | -0.608*** | -0.655*** | 0.139 | 0.436 |
| | (0.131) | (0.126) | (0.431) | (0.536) |
| 5 years after reform | -0.790*** | -0.843*** | 0.069 | 0.366 |
| | (0.157) | (0.145) | (0.445) | (0.522) |
| **Panel B**- Log Value of Transfers | | | | |
| 1 year before reform | 0 | 0 | 0 | 0 |
| reform year | 0.038 | -0.021 | 0.682 | 0.652 |
| | (0.140) | (0.121) | (0.555) | (0.673) |
| 1 year after reform | -0.173 | -0.319* | -0.198 | -0.353 |
| | (0.157) | (0.185) | (0.429) | (0.598) |
| 2 years after reform | -0.423** | -0.619** | -0.369 | -0.575 |
| | (0.152) | (0.217) | (0.416) | (0.656) |
| 3 years after reform | -0.267 | -0.489* | -0.124 | -0.315 |
| | (0.329) | (0.271) | (0.431) | (0.704) |
| 4 years after reform | -0.759*** | -0.997*** | 0.590 | 0.412 |
| | (0.179) | (0.233) | (0.681) | (0.652) |
| 5 years after reform | -0.843*** | -1.095*** | -0.001 | -0.169 |
| | (0.216) | (0.230) | (0.371) | (0.704) |
| Year FE's | ✓ | ✓ | ✓ | ✓ |
| State FE's | ✓ | ✓ | ✓ | ✓ |
| State Controls | | ✓ | | ✓ |
| $N$ | 56 | 56 | 56 | 56 |

Clustered standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$

Note: Estimates report models described in Equation (5). In panel A, the dependent variable is the log count of transfers and in panel B log value of transfers. In columns 1-3, coefficients are the DD estimates for estates and estimates in columns 4-6 display the models for gifts as a dependent variable. In all regressions the standard errors are with clustered at the state-year level.