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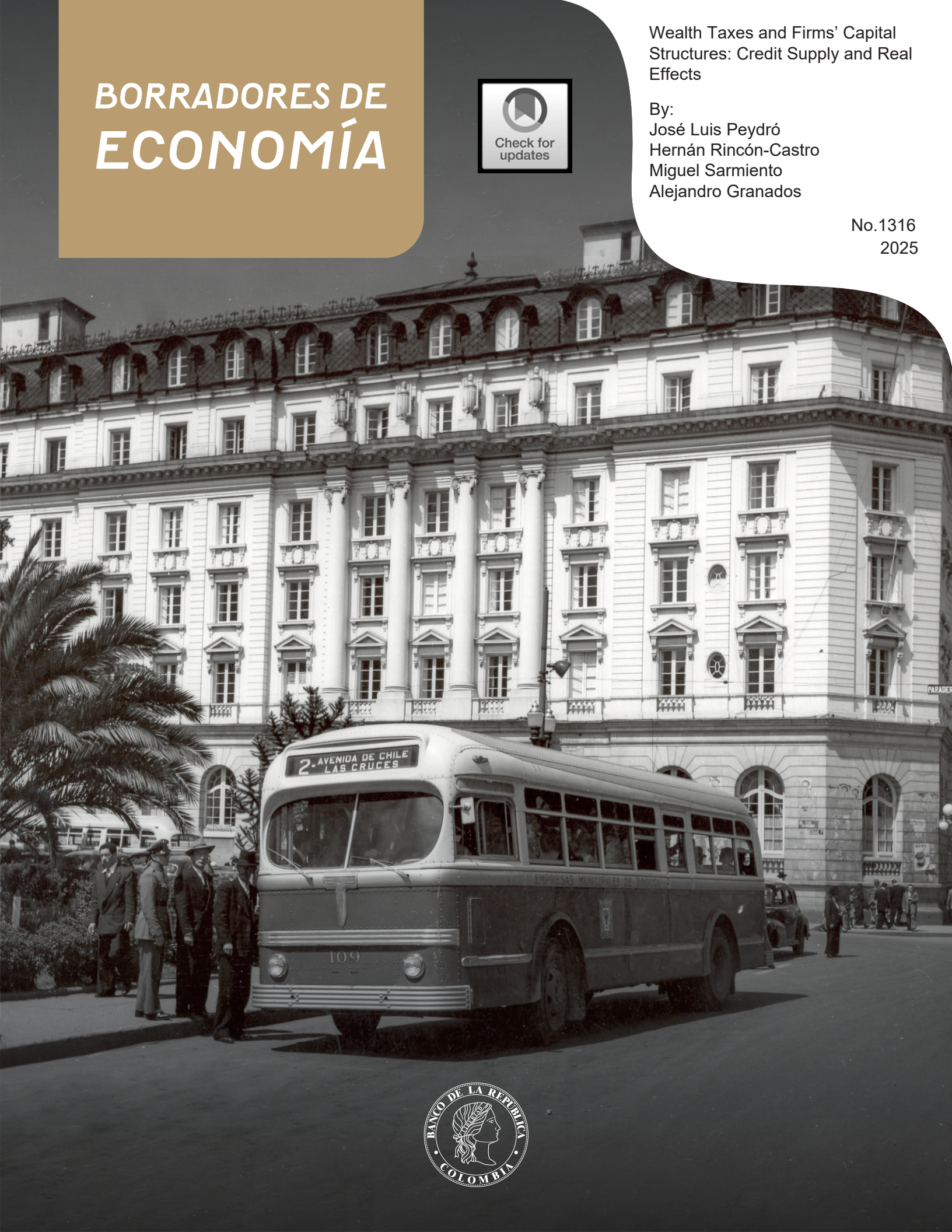

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Wealth Taxes and Firms' Capital Structures: Credit Supply and Real Effects*

José Luis Peydró[a] Hernán Rincón-Castro[b] Miguel Sarmiento[c] Alejandro Granados[d]

Abstract

We study the financial and real effects of a wealth tax reform in Colombia that included a large share of small and medium-sized enterprises (SMEs) as new taxpayers. The tax was introduced in response to a severe weather shock that affected several regions of the country. We use a unique administrative dataset consisting of business loans from the credit registry, matched with balance sheet data and tax reports from both banks and non-financial firms. We identify a concentration of firms around the new tax threshold confirming anticipation of the tax by some affected firms. The new taxpayer firms exhibit tighter credit conditions compared to non-taxpayers firms. Those firms that anticipated the tax and those with ex-ante higher leverage show even tighter credit conditions. The reallocation of credit is higher among banks with high tax contributions. The tax reform also affected the allocation of trade credit among new taxpayers. Affected firms exhibit substantial negative real effects on investment, productivity, and employment. Our results indicate that taxing the wealth of SMEs affects their capital structure and real activity.

Keywords: Wealth taxes, firms' capital structure, bank credit, trade credit, real effects

JEL Codes: G21, G28, F34, E32

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Impuesto al patrimonio y estructura de capital de las empresas: oferta de crédito y efectos reales*

José Luis Peydró, Hernán Rincón-Castro, Miguel Sarmiento, Alejandro Granados

Resumen

Estudiamos los efectos financieros y reales de una reforma del impuesto al patrimonio en Colombia que incluyó a una gran proporción de pequeñas y medianas empresas (PYME) como nuevos contribuyentes. El impuesto se introdujo en respuesta a un grave fenómeno climático que afectó a varias regiones del país. Utilizamos un conjunto único de datos administrativos que consiste en préstamos, emparejados con información de sus estados financieros y tributaria, tanto de los bancos como de las empresas. Identificamos una concentración de empresas en torno al nuevo umbral impositivo, lo que confirma la anticipación del impuesto por parte de algunas de las empresas afectadas por el impuesto. Las nuevas empresas contribuyentes presentan condiciones crediticias más restrictivas en comparación con las empresas no contribuyentes. Las empresas que anticiparon el impuesto y aquellas con un mayor apalancamiento ex ante muestran condiciones crediticias aún más restrictivas. La reasignación del crédito es mayor entre los bancos con altas contribuciones fiscales. La reforma tributaria también afectó la asignación del crédito comercial entre las nuevas empresas contribuyentes. Las empresas afectadas por el nuevo impuesto revelan efectos reales negativos sustanciales sobre la inversión, la productividad y el empleo. Nuestros resultados indican que gravar el patrimonio de las PYME afecta su estructura de capital y su actividad real.

Códigos JEL: *G21, G28, F34, E32*

Palabras claves: *impuesto al patrimonio, estructura de capital de las empresas, crédito bancario, crédito comercial, efectos reales*

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1 Introduction

Taxing wealth has been used by governments in both advanced and emerging economies to increase revenues, substitute other taxes, encourage the use of productive capital, and reduce wealth inequality (Gordon and Rudnick, 1996; Piketty, 2014; Saez and Zucman, 2019; Adam and Miller, 2021; Scheuer and Slemrod, 2021; Guvenen et al., 2023).[1] However, this policy may not be free of costs and can have larger negative effects than other taxes on efficiency, saving, investment, capital accumulation, and economic growth; besides of increasing tax avoidance, evasion, and risks of capital flight (Auerbach and Kotlikoff, 1987; Hansson, 2010; Atkinson and Stiglitz, 2015; Scheuer and Slemrod, 2021).[2] This paper examines the credit channel of wealth taxes, a previously unexplored angle that explains how wealth taxes affect firms' capital structures, including bank and trade credit, as well as their associated real effects.

From optimal taxation, and assuming equal rate of returns on assets, a tax rate on capital income can be equivalent to a wealth tax rate (Kaplow, 1994; Saez and Zucman, 2019). Based on this equivalence, literature on taxation and its impacts on firms and individuals focuses on the capital income tax, rather than on the wealth tax; even though, this equivalence does not hold when returns are heterogeneous (Guvenen et al., 2023; Guvenen et al., 2024). Moreover, when the tax is levied on the firm's wealth, it increases leverage or encourages the liquidation of dividends, as long as the dividend tax rate is lower than the wealth tax rate (Chetty and Saez, 2005). Evidence shows that corporate income taxes tend to increase debt financing, as interest payments are tax-deductible. Thus, higher income taxes are associated with high leverage, debt shifting, and lower investment (Gertler and Hubbard, 1990; Rajan and Zingales, 1995; Huizinga et al., 2008; Faccio and Xu, 2015; Heider and Ljungqvist, 2015).

[1] Table A.1 shows the evolution of wealth tax collection as a percentage of GDP and as a share of total tax revenue, respectively, of the OECD countries that have imposed it since 2000.

[2] Hebous et al. (2024) discuss conceptual, design, and administrative issues of three approaches to tax wealth: capital income tax (tax on returns), wealth tax, and inheritance tax. The authors' objective is to guide policymakers who consider reforms to wealth taxation. According to them, "taxing actual returns is generally less distortive and more equitable than a wealth tax."

Similarly, banks' corporate income taxes result in higher leverage and lower credit for the corporate sector, which affects debt financing and investment decisions (Sobiech et al., 2021). When taxes affect bank credit, firms reduce short-term loans for liquidity management and increase their use of cash and trade credit (Restrepo et al., 2019). However, the literature has yet to explore the effects of wealth taxes on the firms' capital structure, the provision of bank credit, and the real activity.

This paper studies the financial and real effects of the 2010 wealth tax reform (i.e., reform to the *Impuesto al Patrimonio*) in Colombia. The wealth tax reform took place during a "serious public calamity" due to climate change affectations that demanded more public revenues, according to according to the writing of the tax statute. It was introduced under the declaration of the "state of economic, social, and ecological emergency" by a presidential decree in December 29, 2010, and put in place since January 1, 2011. The government established a "one-time" wealth tax on financial, non-financial firms and individuals, which contrasted with the wealth tax of most advanced economies where it was imposed only on individual' wealth. The reform consisted in the extension of the tax base by including new taxpayers defined as firms with reported wealth between COP 1 billion and COP 3 billion (i.e., around USD 285,000 and USD 860,000, respectively). The number of wealth taxpayer firms increased from 3,441 firms in 2010 to 11,118 firms in 2011 (i.e., 7,677 new taxpayers, 2.23 times the number of taxpayers of the previous year). Government tax revenues from the wealth tax increased by 90 percent (from 0.4% of GDP to 0.7% of GDP between 2010 and 2011), while their participation in the total tax revenues of the Central government raised from 3% to 5%. Remarkably, 94% of the wealth tax revenues come from firms (Figure 1).

The wealth tax reform was effective in increasing the number of taxpayers firms and the government's tax revenues, consistent with recent evidence on changes in corporate taxes on developing economies (Bachas and Soto, 2021). However, from the taxpayers' perspective,

this was a fiscal shock with undesirable financial and real effects, which are the focus of this study. Therefore, we answer the following questions: i) Can changes in wealth tax affect the supply of bank credit and the reliance on trade credit in SMEs? and, ii) What are the associated real effects of the wealth tax reform on SMEs?

To answer these questions, we employ difference-in-difference (D-in-D) methods to compare the effects of the wealth tax reform among similar SMEs that only differs in their liquid capital that condition their tax treatment. Under this setting, our treatment group corresponds to firms that were included as new taxpayers of the wealth tax, while the control group includes similar firms that continue as non-taxpayers before and after the wealth tax reform. Using information from wealth tax reports at the firm level, we observe the actual taxpayers and non-taxpayers during the evaluated period (2009-2012). Thus, we correctly identify treatment and control groups avoiding potential selection bias (Bertrand et al., 2004; Abbring and Van Den Berg, 2007). We employ a unique administrative dataset composed by the universe of corporate credits among banks and non-financial firms (bank-firm-loan level data from the Colombian credit registry) matched with firms' and banks' balance-sheet data (regulatory information at the firm and bank level) and with tax reports at the firm and bank levels from the Colombian Tax Authority (*Dirección de Impuestos y Aduanas de Colombia, DIAN*).[3]

We first examine the distribution of firms around the tax notches introduced by the 2010 wealth tax reform to check if some of them anticipate the tax. The motivation for doing so is that if some firms might have anticipated the tax by evading or avoiding it or paid it but at a lower value than due, the treatment group is compromised. We use bunching methods for the identification of firms that might have anticipated the wealth tax following

[3]Since 2015, Colombia applies the international accounting standards established by the International Financial Reporting Standards (IFRS) and, therefore, the firms' assets and liabilities are valued at market prices. Thus, all valuations in one way or another are recorded in the equity accounts of the firms, except for shares and participations, which are valued at the initial placement value. During previous years, which include our sample period, they were valued at book prices, while revaluations/devaluations were reported in separated accounts.

Saez (2010), Chetty et al. (2011), Kleven and Waseem (2013) and Kleven (2016). According to this literature, the amount of bunching or clustering of individuals below or above a tax policy threshold is proportional to the size of the behavioral response. As long as the dividend tax rate is lower than the wealth tax rate, the firms' response can be either an increase in leverage or liquidation of dividends (Chetty and Saez, 2005).

Then, following the approach of Khwaja and Mian (2008) we identify the changes in the supply of credit to firms affected by the wealth tax relative to similar firms below the tax threshold and distinguish the effects among firms that anticipated the tax using the results of the bunching exercise in the first stage. Under this approach, the inclusion of bank-time fixed effects allows to control for bank liquidity shocks that could affect their supply of credit. Additionally, the use of region-industry-time fixed effects allows to control for potential demand of credit at the regional and industry level (Amiti and Weinstein, 2018; Beck et al., 2018; Jiménez et al., 2022). Importantly, the new taxpayers firms are mostly small and medium-sized enterprises (SMEs), which tend to be bank dependent and have been subject to higher loan loss provisions by banks since 2007 (Morais et al., 2020).

As financially constrained firms tend to substitute bank credit for trade credit (Amberg et al., 2021), we perform a third exercise using the amount of trade credit (i.e., non-financial firm credit or supplier credit) to identify changes in firms' reliance on it due to the wealth tax. We also test for changes in the provision of trade credit by affected to their counterparts around the wealth tax reform.

Finally, we assess the associated real effects of the wealth tax reform on firm outcomes, including total debt, income, investment, capital accumulation, employment, and productivity. In the financial and real effects exercises, we analyze the behavior of firms that not only anticipated the tax, but also over those with ex-ante high leverage. We examine the effects on firms with high leverage, that are usually riskier in credit markets (Sufi, 2007), but that can be new firms in need of high external financing, mostly bank credit (Robb and Robinson,

2014).

We find five main results. First, we find that 722 out of 5,572 firms (12.9%) with wealth between COP 500 million and COP 1,500 million anticipated the tax as of December 31, 2010. Of these companies, 443 (61.3%) were below the threshold of COP 1.0 billion and 279 (38.7%) were above it. This finding suggests that a small fraction of firms were able to effectively anticipate the wealth tax, confirming the fiscal shock for most of the new taxpayers. We find that dividend liquidation in 2011 was significantly higher than in previous years, which is a common strategy for reducing the wealth tax burden.

Second, we find that the wealth tax is associated with tighter credit conditions for new taxpayer firms. Albeit the new taxpayer firms received 2.3 percentage points (pp) pp more credit than the non-taxpayer firms, those firms paid significantly higher loan rates. Among new taxpayer firms, those that anticipated the wealth tax received about 3.9 percentage points (pp) less credit and paid significantly higher loan rates (about 61 basis points more) compared to taxpayer firms that did not anticipate the tax. The estimated effects are larger for firms with high ex-ante leverage. Similar effects are observed in a sample that only includes new loans. These results suggest that changes in borrowers' liquid capital affect their credit conditions.

Third, we examine the effects of the wealth tax reform among banks with high and low tax burden. Although banks have been paying the wealth tax since 2003, the 2010 tax reform increased the tax rate for the previous tax thresholds and imposed a surcharge of 25%. We find that banks with higher wealth tax contributions (4.8%) reduced the provision of credit in 6.44 pp and charged 336 bps more on loan rates compared to banks with lower tax contributions (i.e., banks with low liquid capital). The effects are higher over the new taxpayer firms and on those that anticipated the tax, confirming the distortional effects of the wealth tax on the supply of credit. The fact that banks with relatively higher liquid capital lend less after the reform can lead to a shift in the credit supply to riskier banks,

which could have implications for financial stability (Giannetti and Jang, 2025).

We rationalize these findings with the expected effects of a decline in liquid capital for both firms and banks. From the macroeconomic point of view, "a wealth tax would be equivalent to confiscation of a fraction of [the initial capital stock] unexpectedly" (D'Erasmo et al., 2016, p. 38). The tax on the banks' liquid capital reduces their capacity to lend, similar to a capital requirement. Banks reduce their lending to firms, especially to SMEs, which are the firms that were also affected by the tax. This implies that the wealth tax generates a misallocation of credit because it taxes banks‘ capital (supply) and firms' capital (demand). As has been demonstrated by the literature, if the wealth tax induces a liquidity constraint for the firm, the emerging financial friction generates a misallocation of capital within sectors across firms (Buera et al., 2011; Midrigan and Xu, 2014; Bau and Matray, 2023).

Fourth, we find compelling evidence suggesting that affected firms increased the reliance on trade credit (i.e., credit from their suppliers), but reduced the provision of trade credit to their counterparts. The point estimate suggests an increase of about 9.5 pp in the use of trade credit by new taxpayers compared to non-taxpayers. However, among taxpayers, those that anticipated the tax and those with ex-ante high leverage reduced the use of trade credit by around 3.3 pp and 3.8 pp, respectively. We also identify that affected firms reduced the provision of trade credit to their partners in 7.3 pp, and that the contraction was higher among firms that anticipated the tax and those with high leverage. These findings confirm that the wealth tax affected the allocation of trade credit among firms.

Fifth, we identify that after the wealth tax reform taxpayers' firms exhibited lower debt on around 7.5 pp compared to non-taxpayers' firms, and that those with high ex-ante leverage ratio exhibited an additional 3.5 pp decline in their total debt, compared with taxpayers with low leverage ratio. Firms that anticipated the wealth tax also exhibit lower indebtedness in around 1.7 pp more than the affected firms. Also, the results show that firms affected by the tax reform reduced their total income and total investment by 6.2 pp and 9.3 pp respectively,

compared to firms below the tax threshold. In addition, these firms had lower capital accumulation by about 4.2 pp compared to non-taxed firms. Affected firms that anticipated the wealth tax and those with a high leverage ratio reduced their capital accumulation by an additional 3.0 pp and 2.5 pp respectively. We find that, after the tax reform, affected firms that anticipated the wealth tax have lower productivity in approximately 0.2%. The effects are more pronounced for firms with high leverage, including a relative decline of 4.5% in employment. This finding confirms that the wealth tax reform discouraged capital accumulation, with negative effects on firm productivity and employment.

Overall, the results suggest that the new taxpayers experienced significant financial and real effects, especially those with high ex-ante leverage. Affected firms that anticipated the wealth tax were also affected, but to a lesser extent than firms that could not anticipate the tax. This evidence highlights that taxing the wealth of SMEs leads to a reallocation of bank credit with financial and real distortions among the new taxpayers.

Our results contribute to several strands in the finance literature. First, we extend the growing evidence on the financial effects of corporate taxes to the financial effects of wealth taxes. Corporate taxes affect banks' funding cost, leverage, and capital structure (Horváth, 2020; Bremus et al., 2020; Gambacorta et al., 2021). Moreover, corporate income tax affects the firms' capital structures by increasing leverage (Heider and Ljungqvist, 2015). On the other hand, banks' corporate income taxes lead to higher bank leverage and lower credit to the corporate sector, affecting their debt financing and investment decisions (Sobiech et al., 2021). We show that wealth taxes are associated with tighter credit conditions for new taxpayer firms. Among new taxpayer firms, those that anticipated the tax (and those with ex-ante high leverage) received less credit and paid significantly higher loan rates. The large contraction in loan maturities for firms with high leverage further indicates that these firms faced a higher rollover risk during the wealth tax reform, suggesting that these firms were particularly vulnerable to economic shocks. These results are consistent with a reallocation

of credit in the segment of firms affected by the reform. Moreover, we find that banks with higher tax contributions lend significantly less and increase loan rates more compared to banks with lower tax contributions. The results therefore confirm the distorting effects of the wealth tax on the supply of credit.

Second, we contribute to the literature on the role of trade credit for SMES. As small firms heavily rely on bank credit (Berg, 2018; Delis et al., 2021; Chodorow-Reich et al., 2022), trade credit is used by firms to cover liquidity shocks (Amberg et al., 2021), even in times of increased uncertainty. As shown by Garcia-Appendini and Montoriol-Garriga (2013), during the great financial crisis of 2008-09 suppliers with high liquidity increased the provision of trade credit. Moreover, there is evidence that a tax on financial operations among banks and firms in Colombia (it is called *Gravamen a los Movimientos Financieros*, GMF) reduced bank credit and increased trade credit (Restrepo et al., 2019). We identify that new firms subject to the wealth tax increase their reliance on trade credit, thereby partially substituting bank credit for trade credit (Hardy et al., 2022), but reduce the provision of trade credit to their counterparts. The effects are larger on firms that anticipated the tax and in those with ex-ante high leverage. These findings confirm that wealth taxes on SMEs affect the provision of trade credit, which is an important source of firm financing among SMEs.

Third, we provide micro evidence for the macro literature that studies the real effects of a wealth tax. This literature finds that if a one-off wealth tax is unexpected and credible, it can have positive short-run effects on GDP and consumption, assuming Ricardian equivalence; however, if the tax is permanently non-credible, it leads to significant efficiency costs and reduces the expected return on capital investment and other assets, reduces saving, investment and capital accumulation, which worsens the capital stock, overall productivity and output, and encourages capital flight (Eichengreen, 1989; Diamond and Saez, 2011; Kempkes and Stähler, 2016; D'Erasmo et al., 2016). That is, "the effects of imposing a wealth tax whose one-off nature is not credible are very similar to those of a permanent increase in a capital

gains tax" (Kempkes and Stähler, 2016, p. 836). As the experience of taxation in most countries shows, nothing is more permanent than a "one-time" tax, and firms and households know this [4]. We show that after the wealth tax reform, taxpaying firms experienced significant reductions in debt, income, investment, capital accumulation, and productivity relative to non-taxpaying firms. Moreover, firms that anticipated the tax and firms with high ex-ante leverage experienced additional contractions.

Lastly, our findings complement evidence on the behavioral economics of wealth taxes, found mostly from advanced economies (Seim, 2017; Jakobsen et al., 2020; Advani and Hannah, 2021;Brülhart et al., 2022; Jakurti and Süssmuth, 2023). Under that approach, Londoño-Vélez and Ávila Mahecha (2021, 2024) evaluate the behavioral responses to personal wealth taxes in Colombia during 1993-2016 linked to the Panama Papers (i.e., the offshoring to Colombia's most relevant tax havens). Londoño-Vélez and Ávila Mahecha (2021, 2024) show that wealth tax hikes cause taxpayers to lower their reported wealth instantly. Besides, taxpayers inflate (interpersonal) debt, underreport non-third-party-reported business assets, and hide assets in hard-to-track entities in tax havens. According to these authors, two-fifths of the wealthiest 0.01 percent evade taxes and hide one-third of their wealth offshore. That is, individuals both evaded and eluded the wealth tax. From the same approach, Gómez (2019) studies the behavioral response of firms to the wealth tax in Colombia and finds that in years 2006 and 2010 there were between 23.8% and 35.7% more firms at the wealth cutoffs where the tax rate changes. This implies elasticities of corporate wealth with respect to the statutory tax rate of 0.250 and 0.447 for firms with wealth around COP 3,000 million. We extend this evidence by showing the financial and real effects of the wealth tax reform on corporations, specially over SMEs that became taxpayers of the wealth tax in 2010.

To our knowledge, this is the first paper that evaluates the effects of a change in wealth

[4]In the case of Colombia, the wealth tax has been permanent since 2002, although the authorities have stated in each tax reform that it is a one-time tax. The wealth tax for firms was in force until 2017 according to the 2014 tax reform (Law 1739), and it was eliminated for firms with the 2018 tax reform (Law 1943), and it remains only for individuals.

taxes on firms' capital structures and real effects, including the potential distortions on both bank credit and trade credit.

The remaining of the paper has three sections besides this introduction. Section 2 provides de background of the wealth tax reform. Section 3 describes the data. Section 4 presents and explains the methodology and results. Lastly, section 5 concludes.

2 Background of the tax reform

The wealth tax was introduced in the Colombian tax system in 1935 and eliminated in 1992 (Rico, 2004). Then it was reintroduced in 2002 for the universe of filers of the 2001 income tax. The wealth tax rate was set at a flat rate of 1.2% of all net wealth (assets minus liabilities) reported by individuals and firms in their 2001 income tax returns and whose gross wealth (assets without subtracting liabilities) on August 31, 2002, was equal to or above COP 169.5 million (Table A.2).[5] According to the government, the aim of the tax was to finance the war against drug trafficking, guerrillas, and paramilitary groups. Then, in 2003, the tax was reintroduced on the declarants of the income tax with a reported wealth equal to or above COP 3 billion and the rate was set on 0.3% on the net wealth owned as of January 1, 2004, and for the fiscal years 2004, 2005 and 2006.[6] In 2006, the tax was extended to years 2007, 2008, 2009 and 2010 on the taxpayers with a reported wealth equal or above COP 3 billion.[7] The tax rate was set on 1.2% of the net wealth held as of January 1st of each year from 2007 to 2010.

[5]Presidency decree 1837 ("Declaration of the state of internal commotion") and 1838 of August 11, 2002. The deductions allowed were debts, the net worth of assets in national firms, and the mandatory contributions to pension funds.

[6]Law 863 of December 29, 2003. The tax is caused annually by the possession of wealth on January 1st of each taxable year whose value exceeds COP 3 billion.

[7]Law 1111 of January 1, 2006. As said before, the tax liability was set on the taxpayers that met the wealth cutoff reported on January 1, 2007. Hence, firms that had wealth greater than COP 3 billion at that time had to pay the tax from 2008 to 2010, even if during these years they reported a lower wealth than the cutoff. In contrast, firms that had wealth below COP 3 billion by January 1, 2007, but wealth above it in any other year paid no wealth tax.

Then, the tax reform of 2009 reintroduces the wealth tax on the declarants of the income tax, but for the year 2011.[8] The tax was generated by the reported wealth as of January 1, 2011, whose value is equal to or greater than COP 3 billion. The tax rates are 2.4% for a reported wealth equal to or greater than COP 3 billion without exceeding COP 5 billion and 4.8% for a reported wealth equal to or greater than COP 5 billion. The tax had to be paid in eight equal installments during the years 2011, 2012, 2013, and 2014.

By the end of 2010, due to a "serious public calamity," because the climate change affectations that demanded more public revenues, the government declares "the state of economic, social and ecological emergency (Decree 4580 of December 7, 2010). Based on this exceptional decision, a wealth tax reform was imposed by a presidency decree on December 29, 2010 (Decree 4825 of December 29, 2010). Table A.3 compiles the timeline of announcements ("news") about the wealth tax for the period from 2008 to 2010.

The reform established that the wealth tax is caused only once (one-off tax) and on financial and non-financial firms' and individuals' filers that, on January 1, 2011, had a reported wealth equal to or above COP 1 billion (i.e., around USD 285,000). The tax base was defined as assets minus liabilities (including debt) and the value of shareholdings on national corporations. The tax had to be paid in 8 equal installments during 2011 to 2014. Thus, unlike previous reforms of the wealth tax, the 2010 reform included as *new taxpayers* firms with a reported wealth equal to or greater than COP 1 billion and below or equal to COP 3 billion.[9] It is worth mentioning that not alike those reforms since 2003 which had to pass through Congress before they were approved. The firms in the new bracket cutoffs are SMEs with relatively low capital and with a high dependence on bank and trade credit. The reform to the wealth tax created a progressive tax system in which each tax bracket

[8]Law 1370 of December 30, 2009.

[9]The DIAN will establish priority control programs on those taxpayers who declare assets less than the tax assets declared or possessed on January 1 of the immediately preceding year, in order to verify the accuracy of the declaration and establish the occurrence of generating economic events. of the tax that were not taken into account for its settlement.

cutoff has a different statutory tax rate: i) 1.0% if COP 1 billion $\leq$ reported wealth $<$ COP 2 billion; ii) 1.4% if COP 2 billion $\leq$ reported wealth $<$ COP 3 billion. The presidency decree on December 29, 2010, also introduced a 25% surcharge on firms with reported wealth above COP 3 billion (i.e., around USD 860,000). This was complemented with another one, this time through Congress, that restated the wealth tax brackets cutoffs and rates introduced by the 2009 tax reform. Thus, the tax rate is 2.4% to reported wealth in the COP 3 billion $\leq$ reported wealth $<$ COP 5 billion range, and 4.8% to reported wealth $\geq$ COP 5 billion.[10]

Therefore, the affected firms are mainly those with reported wealth between COP 1 billion and COP 3 billion (i.e., new wealth taxpayers) and those firms with reported wealth greater than COP 3 billion (i.e., old taxpayers that now pay a surcharge of 25%). Table A.2 depicts the evolution of the wealth tax in Colombia, where we observe that since 2004 firms with reported wealth above COP 3 billion were the target taxpayers and the tax reform of 2010 introduced firms with reported wealth above COP 1 billion as new taxpayers. As mentioned in the introduction, the government tax revenues from the 2010 tax reform increased by 90 percent (from 0.4% of GDP to 0.7% of GDP between 2010 and 2011), while their participation in the total Central government tax revenues raised from 3% to 5% (Figure 1). Remarkably, 94% of taxpayers were corporations. The number of firms included as taxpayers also increased dramatically from 3,441 in 2010 to 11,118 in 2011 (i.e., 7,677 new taxpayers, 2.23 times the number of taxpayers of the previous year). These figures show that, from the government´s view, the tax reform was successful in increasing the number of tax payers, the tax base and the revenues.

2.1 Wealth tax and anticipation

In this section, we discuss some of the potential behavioral effects of wealth tax reform on SMEs. Small firms (usually) do not have reserves to cover new taxes. These firms only have

[10]Law 1430 of December 29, 2010.

reserves for existing taxes (e.g., the corporate income tax rate at the time of the wealth tax reform was 33%). The wealth tax is levied on the liquid capital of firms (capital = assets - liabilities). Thus, firms with higher capital or retained earnings (i.e., high accumulated capital) will have a higher tax burden. For example, to reduce the tax burden, firms may distribute retained earnings to shareholders in advance of the tax, if they can anticipate the tax and there is no tax on dividends (or if the dividend tax rate is lower than the wealth tax rate). If neither the tax is anticipated nor there is a dividend distribution, retained earnings are invested (i.e., in working capital, inventories, cash, etc.), and firms must reduce cash holdings or increase debt to pay shareholders, and thus they will exhibit higher leverage (i.e., a higher debt-to-asset ratio), as it seems to happened around the COP 1 billion cutoff Figure 2). The opposite is observed when firms increase their retained earnings and do not pay dividends, when they are taxed.

Figure 3 depicts the total amount of dividends effectively paid from 2009 to 2012 among the new taxpayer firms and the non-taxpayer firms. We observe that the new taxpayer firms increased by 201% the distribution of retained earnings to shareholders in 2011 compared to 2010, while non-taxpayer firms paid for the first time dividends in 2011. In 2012 both types of firms reduced the distribution of dividends to shareholders. The higher liquidation of dividends by the new taxpayer firms in 2011 may indicate a strategy to reduce their liquid assets (wealth) to reduce the tax burden associated with the wealth tax.

To explore the anticipation hypothesis, we follow the bunching procedure of Kleven and Waseem (2013) and Kleven (2016), which is applied to Londoño-Vélez and Ávila Mahecha (2021), Londoño-Vélez and Ávila Mahecha (2024) and Gómez (2019) to study the behavioral response of individuals and firms before the wealth tax, respectively, for the case of Colombia. The procedure compares the observed distribution of wealth near the COP 1 billion cutoff with the counterfactual distribution without the cutoffs. Concretely, we proceed as follows: First, select the threshold that is close to the cutoff of the wealth brackets ordered by the tax

reform. That is, firms with wealth between COP 0.5 billion and COP 1.5 billion. Second, select the "bins," or range of firms' wealth around the wealth bracket cutoffs, so that the bands coincide with the ranges of wealth selected in the first step. Third, the firms that anticipate each wealth cutoff are identified. These firms are then added or interacted with the treatment group and the estimations are carried out again.

Figure 4 shows the density distribution or clustering of firms according to their wealth in COP million. These visualizations allow the identification of patterns in the distribution of firms a long their wealth. The range includes firms with wealth between COP 0.5 billion and COP 1.5 billion, highlighting the bracket cutoff at COP 1.0 billion. The histogram organizes the data in intervals (bins) of COP 10 million. The x-axis represents the wealth levels, while the y-axis shows the frequency of firms grouped in each interval. The vertical line indicates the COP 1 billion cut-off point, which allows us to observe how the concentration of firms varies with the cut-off point.

Figure 5 shows the observed trend (gray line) of the clustering of firms and its counterfactual trend (blue line). This is estimated using a polynomial fitted outside the ranges affected by the tax. The dashed gray lines (W_r^l), below the bracket cutoff at COP 1 billion, and W_r^u, above the bracket cutoff at COP 1 billion, represent the points at which firms begin to adjust their wealth to avoid hitting or exceeding the cutoff (dashed red line) and at which concentration decreases. The concentration thresholds W_r^l and W_r^u, with COP 945 million and COP 1,065 million, show a clear strategy by firms to under-report wealth to stay below the cutoff, or to reduce it to decrease the tax base above the cutoff. Notice that there is a significant jump in the density of firms near the cutoff, reflecting the presence of bunching behavior in response to the wealth tax.

Figure 6 shows the parameter estimates to identify the firms that anticipated the wealth tax at the COP 1 billion cutoff, where τ is the statutory tax rate at this cutoff. The estimated excess of mass parameter b indicates an increase in the concentration of firms just

below the cutoff, reflecting firms' wealth adjustments to conceal a part to the tax authority. The estimated lack of mass parameter m shows a smaller number of firms above the cutoff, suggesting that firms prefer to adjust downwards. The estimate of the change in the wealth reported ΔW^*, which indicates the average adjustment in the wealth of firms below the cutoff, confirms the under-reporting strategy of firms.[11] The estimated elasticity of firms' wealth to the tax e points out that a 1% change in the net-of-tax rate results in a 1.12% adjustment in firms' reported wealth. This might reflect that those changes are mainly accounting or declarative, rather than real changes in wealth. It is worth noting that, despite the low elasticity e, the estimate of the excess of mass reveals that there is a significant distortion in the distribution of wealth and that, although firms do not substantially modify their wealth, there is a strategic behavior that leads to a concentration of firms below the cutoff. The estimate of the proportion of firms in the dominated range a^* says that 46% of the firms did not adjust their wealth, possibly because of limitations on the liquidity of their assets, high leverage or the risk of audits.

We repeat the bunching analysis for the different wealth tax cutoffs to see whether larger firms also anticipated the wealth tax. Figure 7 shows the distribution of firms below and above the cutoff in each comparison group. We observe that the anticipation was remarkably higher in the group of firms with liquid capital between COP 500 million and COP 1,500 million (i.e. the new taxpayers with the lowest liquid capital). Specifically, 722 out of 5,572 companies (12.9%) with assets between COP 500 million and COP 1,500 million anticipated the tax as of 31 December 2010. Of these companies, 443 (61.3%) were below the asset threshold of COP 1.0 billion and 279 (38.7%) were above it. Firms close to the COP 2.0 billion threshold with a tax rate of 1.4% show lower anticipation. Similar effects are observed for larger firms with a tax rate of 2.4% (cut-off COP 3.0 billion) and for firms with a tax rate of 4.8% (cut-off COP 5.0 billion). This suggests that the new taxpayers in the first cutoff (i.e.

[11] Choosing a level of wealth to report to the tax authority that is lower than the true level of wealth causes the firm to incur concealment costs (Slemrod, 1992, 2001).

the smaller firms) were more responsive to the wealth tax. Therefore, our baseline analysis focuses on the financial and real effects of the wealth tax on this first group of firms.

3 Data

We employ four data bases. First, administrative information from the Colombian credit registry (*Superintendencia Financiera de Colombia*, SFC) that includes the universe of corporate loans at the bank-firm loan level. In Colombia, banks must report all their loans to the SFC on a quarterly basis. Banks and firms are identified using the tax identification number. Reports are mandatory, are updated electronically and include detailed characteristics of all new and ongoing loans made to firms by every bank. All loans must be reported regardless of their size. For each loan, the data set includes the issuing bank, the borrower, the outstanding amount, the (annualized) interest rate, the maturity of the loan, the collateral-covered fraction, the loan provisions, the borrower's credit score and some information about the borrower (size, location, and industry). We keep only private commercial banks in the sample to avoid any noise coming from credits from public banks that may be directed or subsidized by policy decisions. We exclude loans granted to individuals pursuing entrepreneurial activity as we do not have information on their balance sheet outcomes. The sample for the main analysis includes 71,406 bank-firm quarter loans spanned during the period 2009q1-2012q4 among 28 banks with 5,320 firms (SMEs). Table 2 (Panel B) reports the summary of statistics of the credit registry data. The mean loan volume is 275 million COP (78,500 USD), mean loan rate is 17.56%, and average loan maturity is 3.28 years. Importantly, these firms neither issue bonds or stocks nor have access to international credit markets; thereby their financing needs depend on local bank credit and trade credit. See the variable definitions in Table 3.

Second, quarterly bank balance sheet data from the SFC. The number of bank-level observations is 252 and includes measures of capitalization, liquidity, deposits to assets, loans to assets, nonperforming loans ratio (npl), and loan provisions to total loans, following

regulatory requirements (Morales et al., 2022; Morais et al., 2020). Banks in the sample have a median of 13.7% in capital equity (regulatory level is 9%), the ratio of deposits to assets is 71%, the ratio of liquid assets to total assets is around 12%, and npl is around 5% (Table 2 (Panel A).

Third, regulatory data on firms' balance sheets, including financial statements, from *Superintendencia de Sociedades*, SS (i.e., the Colombian agency that oversees corporations). The SS database includes a unique identification number, company name, place of incorporation, sector, balance sheet information on assets, sales, liabilities, capital, debt, investment in fixed assets (i.e., property, plant and equipment), revenues, trade credit (debt and provision), and income statements. We remove observations with negative assets, negative liabilities, or negative revenues. In addition, we exclude firms undergoing liquidation at the start of the sample period. Productivity estimation is based on several firm-level variables, including sales, number of employees, physical capital, investments, and intermediate inputs. We compute measurements of firms' leverage (i.e., Debt-to-Cash and Debt-to-Assets) and identify the use of trade credit (i.e., payable accounts). The sample includes 22,312 observations at the firm-year level during 2009 and 2012. We match the datasets using the firms' identification numbers (Table 2 (Panel C). Fourth, data on tax reports at the firm level of the Colombian tax authority (*Dirección de Impuestos y Aduanas Nacionales*, DIAN). The data include the company identification number, the year of payment of wealth tax and the decile of liquid capital for each company. Thus, we identify the firms affected (taxpayers) and non-affected (non-taxpayers) by the wealth tax reform during the full period (2009-2012), which is a key advantage for our identification strategy.

The treatment and control groups are defined using both the firm's liquid capital (assets minus liabilities) as a threshold and the tax reports. More concretely, our treatment group is composed of firms with liquid capital between COP 1 billion and COP 1.5 billion (i.e., above the first tax bracket cut-off) in 2010 and that were subject to the wealth tax in 2011 and had

to pay it up to 2014. The control group is composed by firms with liquid capital between COP 500 million and COP 999 million (i.e., below the first tax bracket cutoff) in 2010 and that were not subject to the wealth tax. Table 1 describes the sample and reports their basic statistics including financial ratios, bank credit and trade credit, between the treatment and control groups. Firms in the control group are relatively smaller than those in treatment group, and have lower assets, liabilities, capital, and leverage ratios. These firms also have less bank credit and trade credit. Productivity levels are relatively similar. Firms in both groups have between 10 and 100 employees, and those in the treatment group have relatively higher average of employees.

4 Methodology and Results

In this section, we describe and implement the empirical approach used to evaluate the firms' financial and real effects of the wealth tax reform. We employ differences-in differences (D-in-D) methods to evaluate the effects of the change in the tax policy on the supply of bank credit, the reliance on trade credit (i.e., credit from suppliers), and the associated real effects.

4.1 Bank Credit

In this section, we analyze whether firms affected by the wealth tax exhibited changes on the supply of bank credit. As mentioned in the previous section, the new taxpayers' firms of the wealth tax are SMEs that heavily rely on bank credit, and that, compared with the control group (i.e., non-taxpayers' firms), exhibit higher leverage. Evidence shows that low capitalized firms tend to obtain less bank credit, and that the decision to lend strongly depends on the risk-taking behavior of banks (Jiménez et al., 2014 ; Jiménez et al., 2022, Morais et al., 2020; Fraisse et al., 2020). We use a D-in-D model to identify the effects of the wealth tax on the supply of credit among taxpayers' firms and non-taxpayers' firms.

More concretely, we compare the amount of credit, loan rates, and maturity of loans granted to firms subject to the wealth tax (treated) and those that were not subject to the wealth tax but have similar characteristics (control). We include in the analysis the effects of the observed anticipation discussed in Section 2. The sample includes 79,673 bank-firm-quarter loans spanned during the period 2009q1-2012q4 among 28 banks with 5,320 firms. The sample is restricted to firms with multiple banking relationships to allow credit substitution across banks (Khwaja and Mian, 2008).

The model is represented by equation (1):

$$\begin{aligned} Credit_{f,b,q} = \alpha + \beta_1 Post + \beta_2 Treated_f * Post + \beta_3 Treated_f * Post * Firm_{f,q-1} + \\ \beta_4 Firm_{f,q-1} + \beta_5 Bank_b + \gamma_b + \gamma_{b,q} + \gamma_{s,r,q} + e_{f,b,s,r,q} \end{aligned} \tag{1}$$

where $Credit_{f,b,q}$ are different loan margins (i.e., loan volume, loan rates, and loan maturity) at the bank-firm-quarter level). $Volume_{f,b,q}$ is the logarithm of the amount of credit (COP million) grated by bank b to firm f at time q and $Rate_{f,b,q}$ is the loan rate (in percentage points) charged by bank b to firm f in quarter q. $Maturity_{f,b,q}$ is the log of maturity of the loan (in years). $Post$ is 1 if the observation is between 2011q1 and 2012q4 (i.e., after the wealth tax reform) and is 0 between 2009q1 and 2010q4. $Treated_f$ is a dummy equal to 1 if the firm's liquid capital is between COP 1.0 billion and COP 1.5 billion (and the firm was subject to the wealth tax since 2011) and 0 if the firm's liquid capital is between COP 500 million and COP 999 million (and not subject to the wealth tax). $Firm_{f,q-1}$ captures the firm's leverage and other characteristics of the firm (i.e., leverage, assets, income, liabilities, revenue, etc.) included with one period lag. We employ alternative measures of leverage. $High\text{-}Leverage_{f,q-1}$ is an indicator variable equal to 1 for those firms with a Debt-to-Cash ratio above the percentile 75^{th} of the distribution between firms, and 0 otherwise. For robustness, we also measure leverage as the Debt-to-Assets ratio. Using

the results of the bunching exercise in section 2, we identify the firms that anticipated the wealth tax and use this characteristic to compare their credit outcomes during the wealth tax reform. In particular, we define $Anticipation_f$ as an indicator equals to 1 for those firms that anticipated the wealth tax (i.e., firms that adjusted their wealth between the bins of COP 945 million and COP 1,065 million) and 0 otherwise, according to the results of the bunching exercise. $Bank_{f,q-1}$ are bank characteristics of capitalization, liquidity credit risk, size, among others (see Table 2).

The model includes firm fixed effects (FE) (γ_f) and bank FE (γ_b) to control for the unobserved heterogeneity at the firm and bank level, respectively. Bank-time FE ($\gamma_{b,q}$) are included to control for liquidity shocks that affect the supply of bank credit. We also include region-industry-time FE ($\gamma_{r,s,q}$) to control for the demand of credit at the industry and region level over time, which is crucial to correctly identify supply effects (Jiménez et al., 2014; Amiti and Weinstein, 2018; Degryse et al., 2019).

4.2 Credit conditions around the wealth tax reform

The baseline results are presented in Table 4. Panel A, columns (1) to (3) correspond to all loans granted during the period. Panel B, columns (4) to (6) include only the new loans observed during the evaluated period. We find that banks increase lending to affected firms (taxpayers) relative to unaffected firms (non-taxpayers), but at higher loan rates. In column (1), the interaction of $Post*Treated_f$ indicates that the affected firms received 2.6 percentage points (pp) more credit compared to the unaffected firms (control group). In columns (2) and (3), the estimated coefficients suggest that affected firms paid 59 basis points (bps) more for their loans, and that those loans have a higher maturity of 16 pp, compared to the control group. Note that the specifications include, in addition to bank and firm FE, region*industry*time FE allowing to control for demand effects.

We find that among the new taxpayers, those firms that anticipated the wealth tax

are associated with tight credit conditions. The coefficient of the triple interaction of $Anticipation_{f,q-1} * Post * Treated_f$ indicates that firms that anticipated the wealth tax received 3.9 pp less credit than taxpayers who did not anticipate the wealth tax (column 1). Moreover, these firms paid 61 bps more for their loans and received loans with shorter maturities in 31 pp (columns 2 and 3, respectively). This suggests that among the new taxpayers, those who anticipated the wealth tax faced more credit restrictions during the wealth tax reform. The parallel trends tests are reported in Figure 8 and confirm that after the implementation of the wealth tax reform, affected firms that anticipated the tax exhibit lower credit, higher loan rates, and lower loan maturity compared to taxpayer firms that did not anticipate the tax. The observed effects remain after several quarters.

In panel B, columns (4) to (6), we replicate the model in equation (2) using a sample composed of new loans (i.e, loan disbursements throughout the period). We confirm that credit conditions for new loans were tighter for new taxpayer firms. The new taxpayers firms received 4.4 pp more credit and with longer maturities (27.2 pp) than the non-taxpayer firms (control group), but at higher interest rates (104 bps). Those firms that anticipated the wealth tax are associated with lower loan volumes in 6.4 pp, higher loan rates (28 bp), and lower loan maturity (14 pp).

4.3 Credit conditions for firms with ex-ante high-leverage

We perform a second exercise to compare whether credit conditions for new taxpayer firms were tighter, considering their ex-ante leverage. To do this, in Table 5 we replicate the baseline analysis using a measure of high leverage instead of anticipation as a firm characteristic. We find that firms with ex-ante high leverage are associated with less bank credit and tighter credit conditions. In panel A, the coefficient of the triple interaction of $Post * Treated_f * High\text{-}Leverage_{f,q-1}$ indicates that taxpayers with high leverage received 4.0 pp less credit (column 1), paid 68 bps more on their loans (column 2) and received loans with 2.6 pp shorter maturities compared to taxpayers with low leverage (column 3). In panel B, we observe that

the new loans for firms with high ex-ante leverage have significantly lower loan volumes (8.1 pp), higher loan rates (32 bps), and shorter loan maturities (42 pp), relative to taxpayers with low leverage. The large contraction in loan maturities for new loans indicates that, among new taxpayers, those with ex-ante high leverage faced a higher rollover risk during the wealth tax reform.

4.4 Credit from banks with high wealth tax contributions

We also examine whether banks with significant wealth tax contributions adjust their credit supply to new taxpayer firms. As discussed in section 2, larger firms and banks pay the higher tax rate (4.8%) plus the 25% surcharge. In this exercise, we define the variable High-Bank-Tax$_b$ as one if the bank is located in the top decile of the wealth tax at the end of 2010, and 0 otherwise. This group is composed by 8 banks out of the 28 banks in the sample. Then, we replicate the model in (2) using the high tax measure as a bank characteristic. The results are presented in Table 5. We find that banks with the high tax rate contract their credit in 6.4 pp, charge 33 bps more on loan rates, and lend at lower maturity in 3.2 pp compared to banks with a lower tax rate. Interestingly, we observe that these high-tax banks lend 7.2 pp less and charge 22 bps more on loan rates to firms affected by the wealth tax. The observed effects on firms that anticipated the tax are higher on loan rates (452 bps) and significant in loan maturity (3.6 pp). Since the largest banks are those with the highest tax contributions, the results can explain the tighter credit conditions faced by firms around the time of the tax reform, especially the higher loan rates, which are a way for banks to increase income in order to pay their tax contributions.

4.5 Trade Credit

In this section, we evaluate whether trade credit (non-financial firm-to-firm credit) changes as a source of financing among firms affected by the wealth tax. We examine whether firms increased their use of trade credit as an alternative to finance their inputs. Evidence

indicates that SMEs affected by fiscal shocks tend to rely on trade credit, especially those financially constrained firms (Restrepo et al., 2019). In trade credit, goods (inputs) act as collateral and there are less information asymmetries than in bank credit (Klapper et al., 2012). During the global financial crisis, supplier with high liquidity increased the provision of trade credit to their clients, specially to those financially constrained (Garcia-Appendini and Montoriol-Garriga, 2013). In our sample, the ratio of trade credit to total liabilities is around 24%, indicating that trade credit is an important source of finance for SMEs. We employ firm-level-year data and the tax reports to evaluate the use of trade credit before and after the wealth tax reform.

The specification is presented in equation (2):

$$\begin{aligned} TradeCredit_{f,y} = \alpha + \beta_1 Post_y + \beta_2 Treated_f * Post_y + \\ \beta_3 Treated_{f,y} * Post_y * High\text{-}Leverage_{f,y-1} + \gamma_f + \gamma_{s,y} + \gamma_{r,y} + e_{f,s,y} \end{aligned} \tag{2}$$

where $TradeCredit_{f,y}$ is the log of the amount of credit (in COP million) contracted (granted) by (to) firm f with non-financial firms at year y. $Post_y$ is 1 if the observation is between 2011 and 2012 and 0 if it is between 2009 and 2010. $Treated_f$ is 1 if the firm's liquid capital is between COP 1 billion and COP 1.5 billion (and the firm was subject to the wealth tax since 2011) and 0 if the firm's liquid capital is between COP 500 million and COP 999 million (i.e., below the tax threshold). $Anticipation\text{-}_f$ is an indicator equals to 1 for those firms that anticipated the wealth tax and 0 otherwise, according with the bunching exercise in section 2. $High\text{-}Leverage_{f,y-1}$ is an indicator variable equals 1 for those firms with a Debt-to-Cash ratio above the percentile 75^{th} of the distribution across firms, and 0 otherwise in the previous year. The model includes firm FE (γ_f), industry*region*time FE ($\gamma_{s,r,y}$), to control for unobservable firm heterogeneity and the demand of trade credit at the industry and region over time.

The results are displayed in Table 7. In column (1) the positive and statistically significant coefficient of the interaction $Post_y * Treated_f$ indicates that affected firms by the wealth tax increased the reliance on trade credit on around 9.5 pp compared to non-taxpayers (i.e., firms below the tax threshold). We also find that those firms with high leverage received less trade credit. The estimated coefficient of the triple interaction of $Treated_{f,y} * Post_y * High\text{-}Leverage_{f,y-1}$ indicates that after the reform, taxpayers with ex-ante high leverage received less trade credit from their suppliers in about 3.8 pp relative to non-taxpayers. Firms that anticipated the wealth tax also received less trade credit in around 3.3 pp compared to those that did not anticipated the tax.

The results in column 2 suggest a relative decline of 7.3 pp in the provision of trade credit by the new taxpayers compared to non-taxpayers. The decline in the provision of trade credit is higher for firms that anticipated the tax and for those with ex-ante high leverage in around 4.7 pp and 2.8 pp, respectively. Overall, the results indicate that firms affected by the wealth tax increased their reliance on trade credit, suggesting a substitution of bank credit for trade credit. However, among new taxpayers, those firms that had anticipated the tax and firms with high leverage reduced their use of trade credit. The overall decrease in the provision of trade credit by affected firms suggests that the wealth tax may be associated with a liquidity shock for SMEs.

4.6 Real Effects

In this section, we study the associated real effects of the wealth tax reform over the new taxpayers. To do this, we compute several measures of firm-level outcomes including: $Income_{f,y}$, $Investments_{f,y}$, $TotalDebt_{f,y}$ and one of the firms' growth: capital accumulation ($\Delta Capital_{f,y}$). In addition to this, we employ two standard measures of productivity at the firm level (OP) and (WP) following Olley and Pakes (1992), Wooldridge (2009), and Rovigatti

and Mollisi (2018).[12] All variables are defined in logarithms of firm f in year y, respectively. We first analyze whether the wealth tax reform changes the firms' performance of the new taxpayers relative to non-taxpayers. Then, we study the effects over those taxpayer firms that anticipated the tax. Lastly, we test the effects on firms with ex-ante high leverage relative to firms with low leverage.

The specification is presented in equation (3):

$$\begin{aligned} Z_{f,y} =& \alpha + \beta_1 Post + \beta_2 Post * Treated_f + \beta_3 Post * Treated_f * Firm_f + \\ & \gamma_f + \gamma_{s,y} + \gamma_{r,y} + \epsilon_{f,y} \end{aligned} \tag{3}$$

Where $Z_{f,y}$ are measures of firm-level outcomes including log of total income ($Income_{f,y}$), log of total investments ($Investments_{f,y}$), log of liabilities ($TotalDebt_{f,y}$) and the change in net capital excluding depreciations ($\Delta Capital_{f,y}$) of firm f in year y. As before, $Firm_{f,y}$ includes the two firm characteristics namely, $High\text{-}Leverage_{f,y-1}$, that is an indicator variable equals 1 for those firms with a Debt-to-Cash ratio above the percentile 75^{th} of the distribution across firms, and 0 otherwise in the previous year, and $Anticipation\text{-}_f$ that is equals to 1 for those firms that anticipated the wealth tax and 0 otherwise, according with the bunching exercise. *Post* is 1 if the observation is between 2011 and 2012 and 0 if it is between 2009 and 2010. Similar to our previous exercises, we define $Treated_f$ equals to 1 if the firm's liquid capital is between COP 1 billion and COP 1.5 billion (and the firm was subject to the wealth tax since 2011) and 0 if the firm's liquid capital is between COP 500 million and

[12]The Olley and Pakes (1992) (OP) method employs investment as a proxy for unobserved productivity, under the assumption that firms observe their productivity before making investment decisions. The estimation proceeds in two stages: The first isolates productivity using a nonparametric function, and the second recovers structural parameters via GMM. In contrast, the Wooldridge (2009) approach (WP) reformulates the estimation into a single-step GMM procedure, leveraging lagged input variables and polynomial approximations of the productivity process. This results in improved more robust standard errors, and greater flexibility for use in short and unbalanced panels. Apendix B explains the methodology and the estimation process.

COP 999 million at the end of 2010. The model includes firm FE (γ_f), sector*time FE ($\gamma_{s,y}$), and region*time FE ($\gamma_{r,y}$) to control for unobserved heterogeneity and common shocks across industries and regions, respectively.

Table 8 report the results. In columns 1 we observe that treated firms (taxpayers) are associated with lower income compared to control group (non-taxpayers). The interaction of $Post_y * Treated_f$ indicates that firms affected by the wealth tax in 2011 exhibited lower income in 6.2 pp compared to non-affected firms. The estimated coefficient in column 2 indicates that firms affected by the wealth tax reduced their investment by 9.3 pp compared to non-taxpayers' firms. Similarly, the estimated coefficients in columns 3 and 4 suggest that the new taxpayers reduced their total debt and capital accumulation by 7.5 pp and 4.2 pp, respectively, compared to firms below the tax threshold. We observe that after the reform, firms that anticipated the wealth tax exhibited less capital accumulation on around 3.0 pp, while those with high leverage accumulated less capital in 2.5 pp. Overall, the results suggest that SMEs affected by the wealth tax exhibited negative real effects, and a significant contraction in investment and accumulation of capital. The effects are more pronounced over firms that anticipated the tax and those with high leverage. As discussed in the introduction, the wealth tax is a 'confiscation' of the firm's capital and, therefore, reduces its current and expected return, discouraging new investments.

Table 8 shows the results of estimating equation (3) using as outcomes the two measures of productivity and the log of total employees at the firm level.[13] The results indicate that after the tax reform, affected firms that anticipated the wealth tax have lower productivity in approximately 0.2% relative to firms that do not anticipate the tax. The effects are more pronounced for firms with high leverage, including a relative decline of 4.5% in employment.

[13]To make both productivity measures comparable, we normalize the resulting estimates so that the value of the TFP index equals 100 in 2009.

5 Conclusion

Wealth taxation is a tax policy used by governments in both advanced and emerging economies to raise revenue, replace other taxes or reduce wealth inequality. However, this type of tax policy has not been implemented without cost, as this study shows. In 2010, the Colombian government implemented a wealth tax reform to deal with the unexpected climate shock of "La Niña". The government almost doubled the revenue from such a tax by including new taxpayers, mostly SMEs with low equity. This paper assesses how taxing the wealth of relatively small non-financial firms with a high dependence on bank credit affects their capital structure, by influencing the supply of bank credit and the use of trade credit, and their real outcomes, such as corporate debt, income, investment, capital accumulation, productivity and employment.

Using administrative data at the bank-firm level from the loan register, matched with regulatory balance sheet data and firm-level tax returns, we find that SMEs (i.e. the new taxpayers) were more affected by the wealth tax than similar SMEs below the tax threshold (control group). Our results suggest that the increase in the wealth tax leads to several financial and real distortions. Affected firms (new taxpayers) that anticipated the wealth tax received significantly less bank credit and had higher loan interest rates than firms that did not anticipate the tax. Similarly, firms with high ex-ante leverage have tighter credit conditions. The results are similar for the segment of loans granted by new lenders. We also show that the reallocation of credit is higher for banks with high tax contributions. The results are consistent with a reallocation of bank credit within the SME segment and with less risk taking as these firms operate with high leverage.

In addition, the new taxable firms increased their reliance on trade credit, suggesting a partial substitution of trade credit for bank credit, but significantly reduced the provision of trade credit to their counterparts. We find that affected firms had lower total debt, confirming that firms were unable to fully substitute credit. We also document substantial real effects

(i.e. lower income, investment, capital accumulation, productivity and employment) and show that these effects were significantly higher for those firms that anticipated the tax and for those with high ex-ante leverage. Overall, our results suggest that the wealth tax causes several financial and real distortions on SMEs. This tax acts as a 'confiscation' of the firm's capital and therefore reduces its current and expected return, discourages new investment, but also affects the provision of both bank and trade credit.

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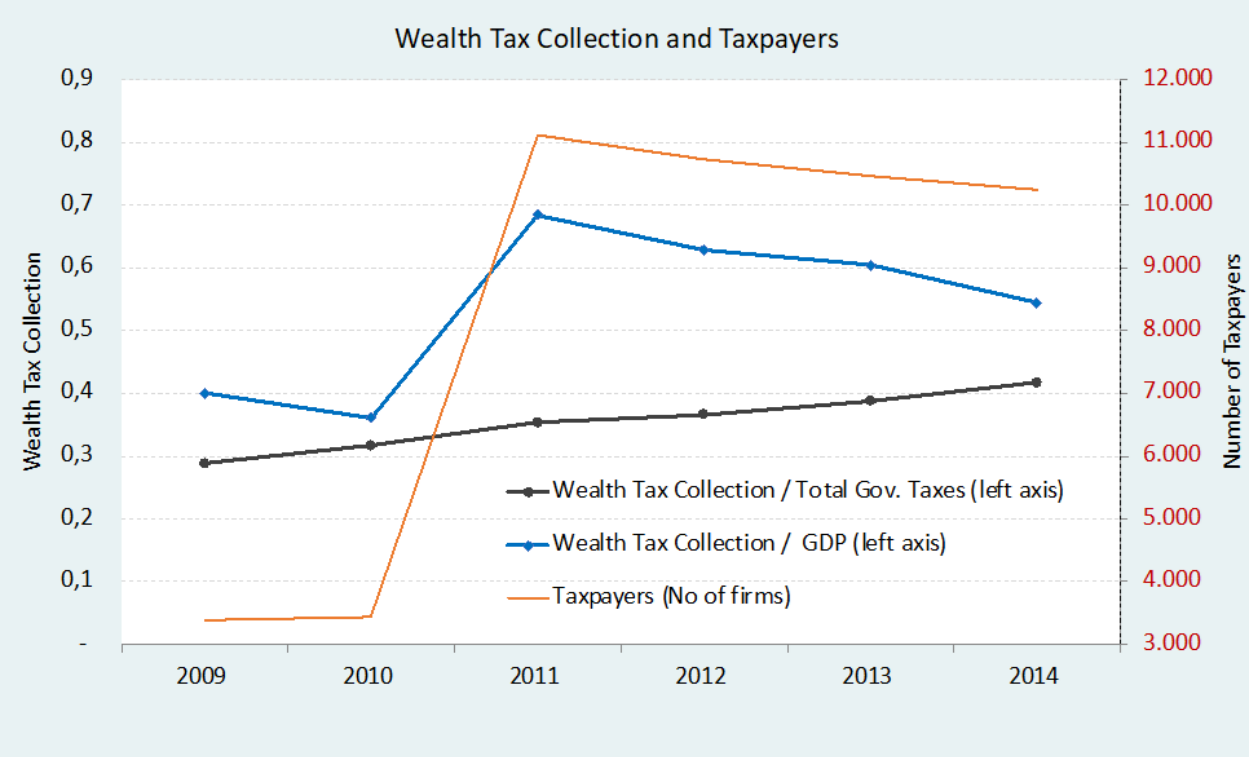
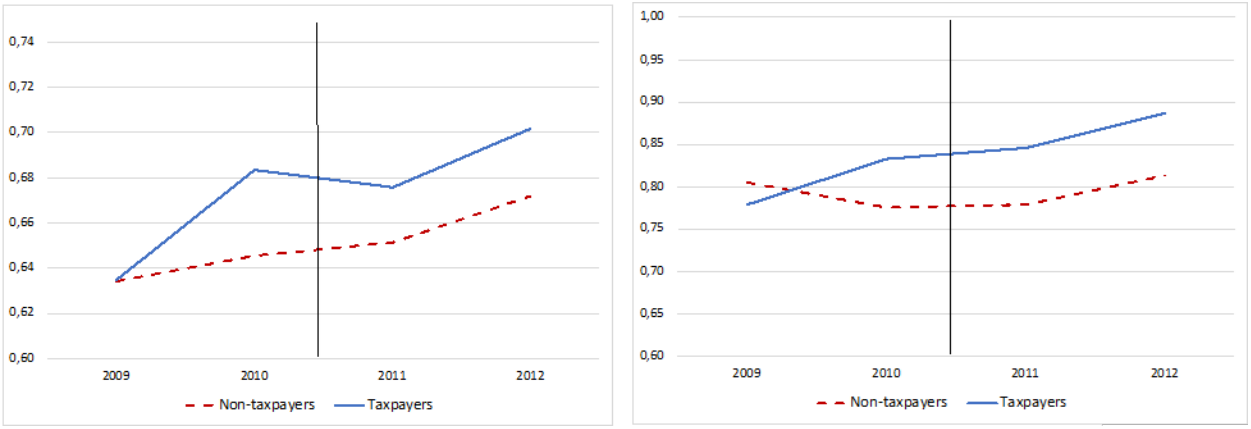
Figure 1: Wealth tax collection in Colombia



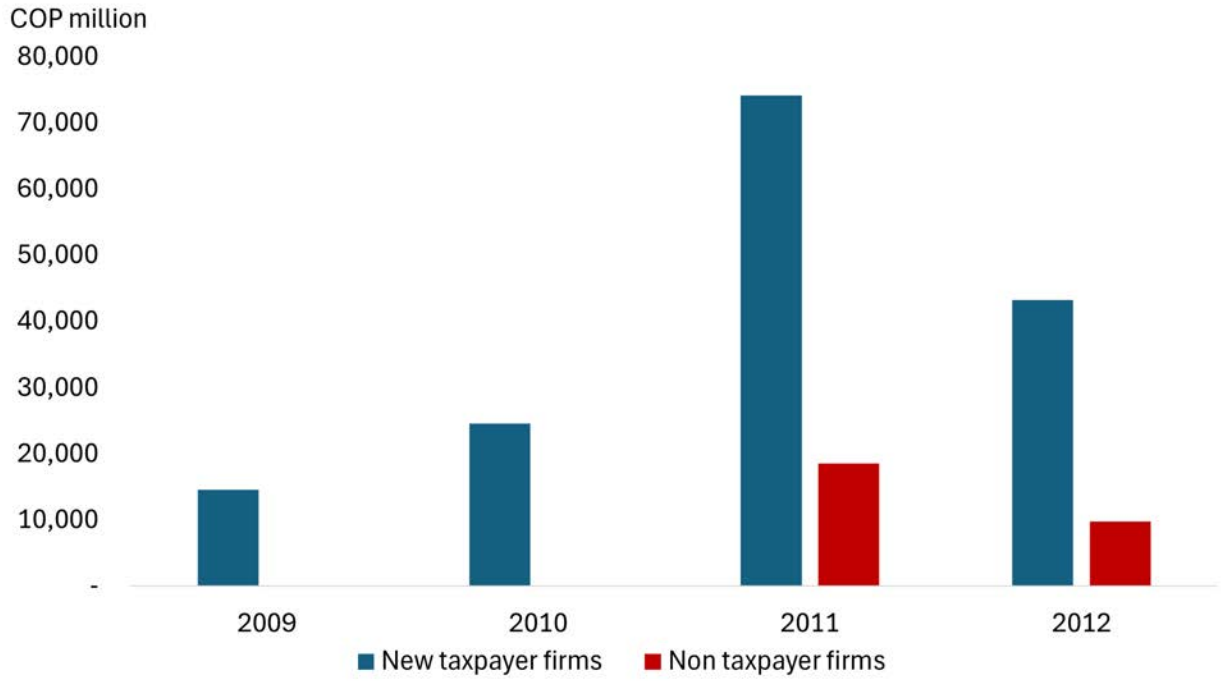
Source: Authors calculations based on figures from the Ministry of Finance and DIAN.

Figure 2: Evolution of leverage among taxpayers and non-taxpayers of the wealth tax



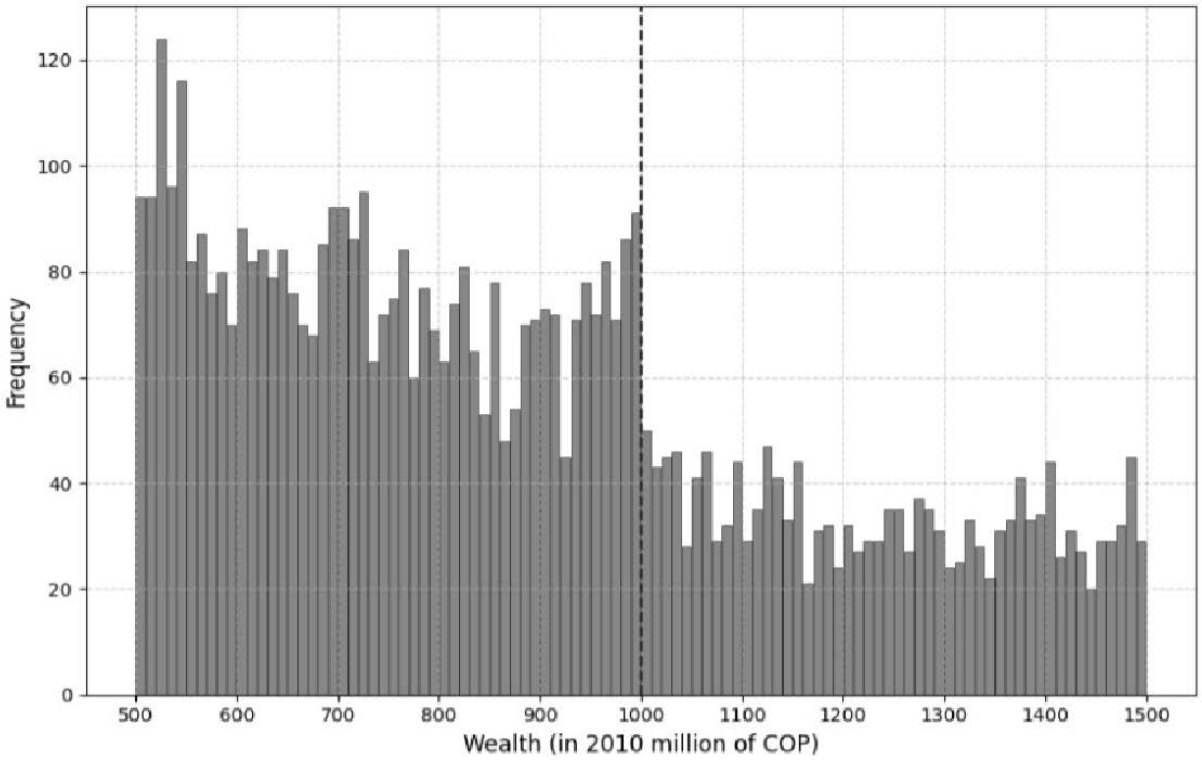
Notes: Panel A depicts the ratio of total financial obligations over operational income (Debt-to-Cash ratio) and panel B shows the ratio of total debt to total tangible assets at the firm-level (Debt-to-Assets ratio). Both figures show the median computed for the period 2009 to 2012. Vertical line corresponds to 2011 (i.e., the year of the implementation of the wealth tax reform). Taxpayers are those firms subject to the wealth tax and with capital between COP 1 billion and COP 1.5 billion, while non-taxpayers firms are those with liquid capital between COP 0.5 billion and COP 0.99 billion, and that did not pay the wealth tax in 2011. Source: Authors' calculations using data from SS and DIAN.

Figure 3: Distributions of dividends among taxpayers and non-taxpayers firms of the wealth tax



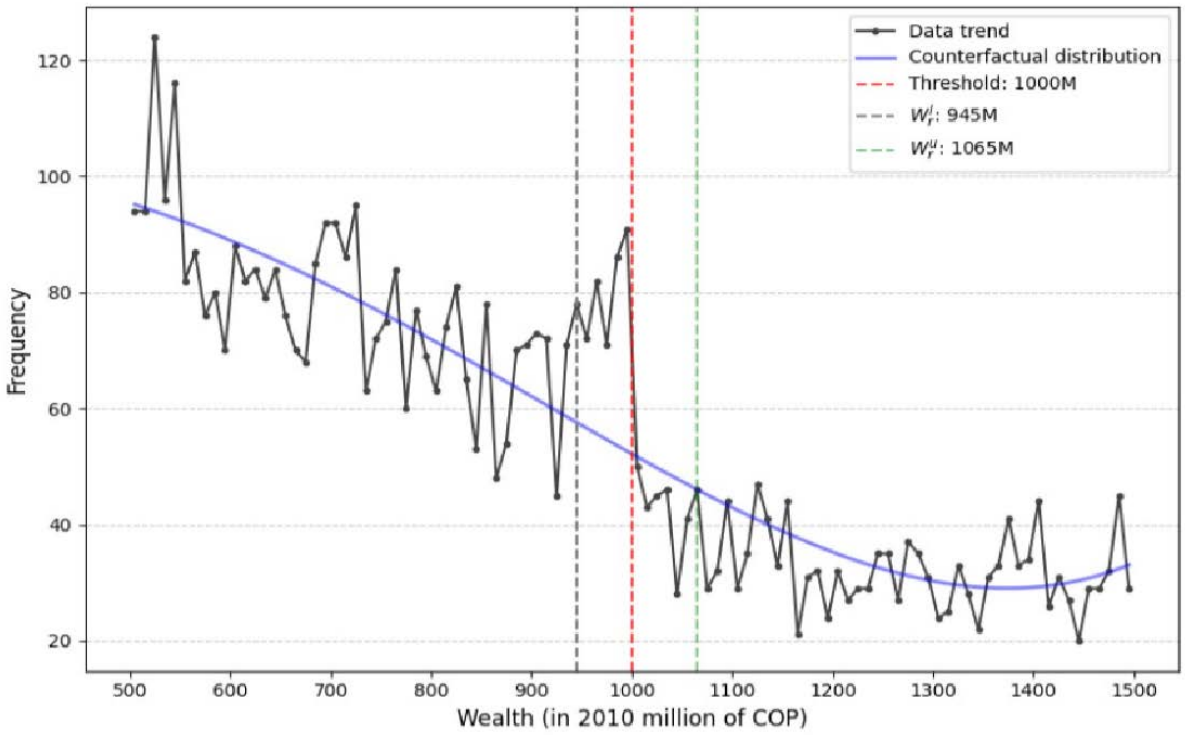
Notes: This figure depicts the total amount of dividends paid by firms to shareholders in each year. The sample is composed by the firms with liquid capital between COP 0.5 billion and COP 1.5 billion. New taxpayer firms are those firms that are above the threshold (COP 1.0 billion) and paid the wealth tax since 2011. Source: Authors' calculations using data from SS and DIAN.

Figure 4: Density distribution of firms along their wealth and around the COP 1 billion cutoff



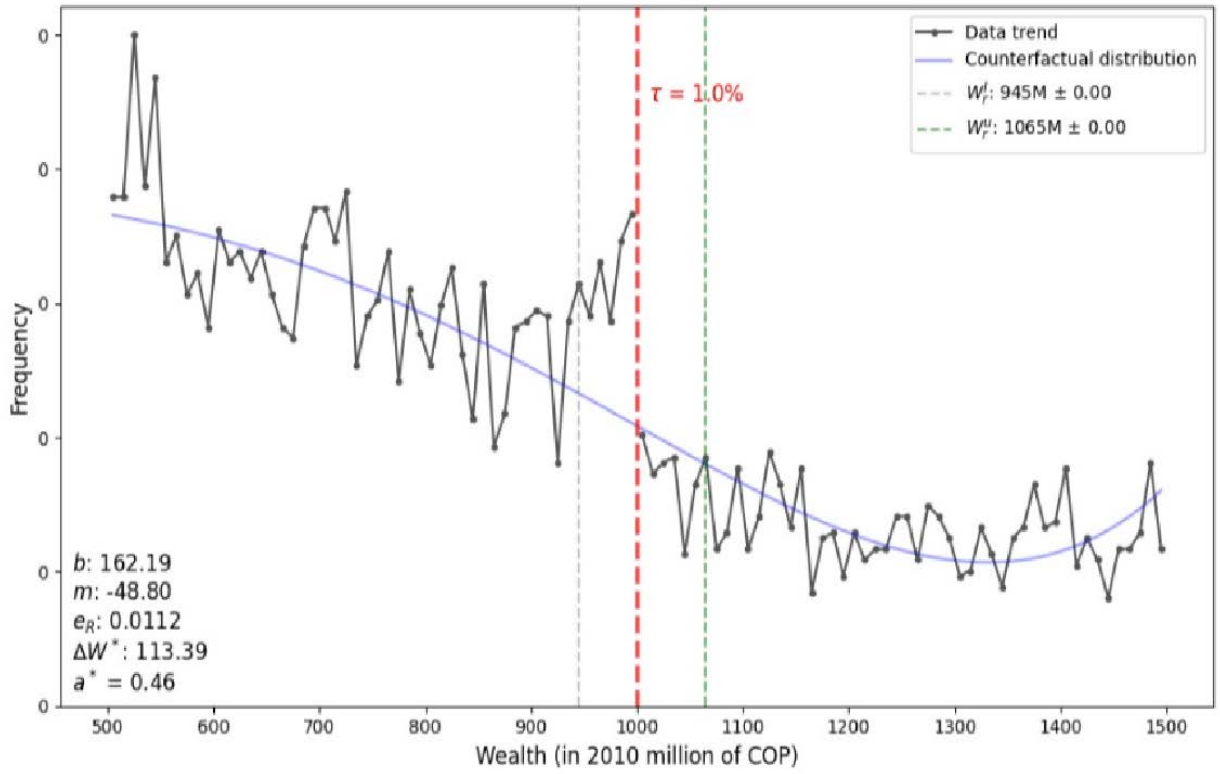
Notes: The density distribution or clustering of firms according to their wealth in millions of Colombian Pesos (COP). These visualizations allow the identification of patterns in the distribution of firms a long their wealth. The range includes firms with wealth between COP 0.5 billion and COP 1.5 billion, highlighting the bracket cutoff at COP 1 billion. The histogram organizes the data in intervals (bins) of COP 10 million. The x-axis represents the wealth levels, while the y-axis shows the frequency of firms grouped in each interval. The vertical line indicates the COP 1 billion cut-off point, which allows us to observe how the concentration of firms varies with the cut-off point. Source: Authors' calculations using data from SS and DIAN.

Figure 5: Observed and contrafactual density distribution of firms along their wealth and wealth tax cutoff



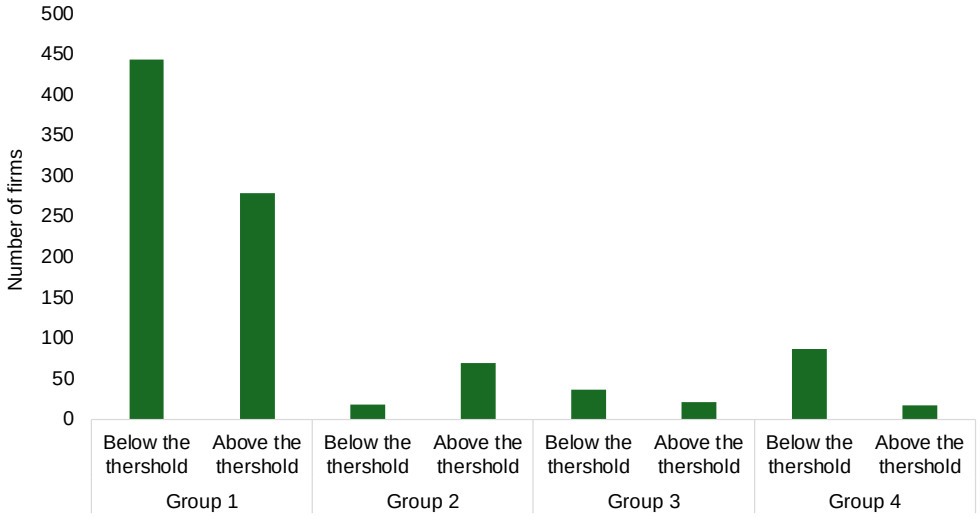
Notes: The observed trend (gray line) of the clustering of firms and its counterfactual trend (blue line). This is estimated using a polynomial fitted outside the ranges affected by the tax. The dashed gray lines (below the bracket cutoff at COP 1 billion) and (above the bracket cutoff at COP 1 billion) represent the points at which firms begin to adjust their wealth to avoid hitting or exceeding the cutoff (dashed red line) and at which concentration decreases. The concentration thresholds and , with COP 945 million COP 1,065 million, show a clear strategy by firms to under-report wealth to stay below the cutoff, or to reduce it to decrease the tax base above the cutoff. Notice that there is a significant jump in the density of firms near the cutoff, reflecting the presence of bunching behavior in response to the wealth tax. Source: Authors' calculations using data from SS and DIAN.

Figure 6: Identification of firms that anticipate the wealth tax at the COP 1 billion cutoff



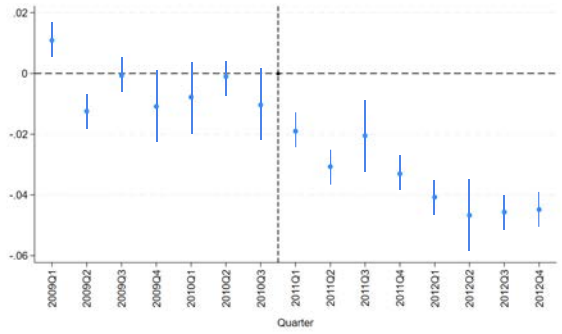
Notes: The parameter estimates to identify the firms that anticipated the wealth tax at the COP 1 billion cutoff. τ is the statutory tax rate at this cutoff. The estimated excess of mass parameter b indicates an increase in the concentration of firms just below the cutoff, reflecting firms' wealth adjustments to conceal a part to the tax authority. The estimated lack of mass parameter m shows a smaller number of firms above the cutoff, suggesting that firms prefer to adjust downwards. Source: Authors' calculations using data from SS and DIAN.

Figure 7: Distribution of firms that anticipated the wealth tax at different cutoffs

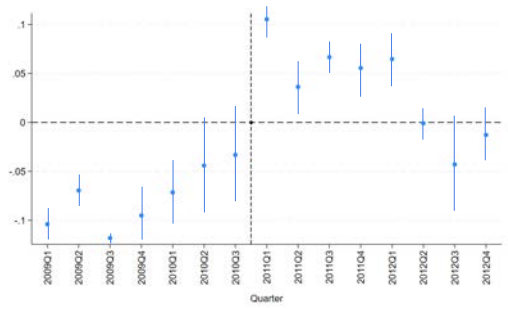


Notes: This figure depicts the number of firms that anticipated the wealth tax according to the bunching exercise in each of the different cutoffs. Group 1 includes firms with liquid capital between COP 500 million and COP 1.5 billion with tax rate of 1.0%. Group 2 is composed by firms with liquid capital between COP 1.5 billion and COP 2.5 billion with tax rate of 1.4%. Group 3 includes firms with liquid capital between COP 2.5 billion and COP 3.5 billion with tax rate of 2.4%. Group 4 includes firms with liquid capital between COP 4.5 billion and COP 5.5 billion with tax rate of 4.8%. Firms with liquid capital above COP 3.0 billion also have a 25% surcharge on the tax rate (i.e., firms in groups 3 and 4).Source: Authors' calculations using data from SS and DIAN.

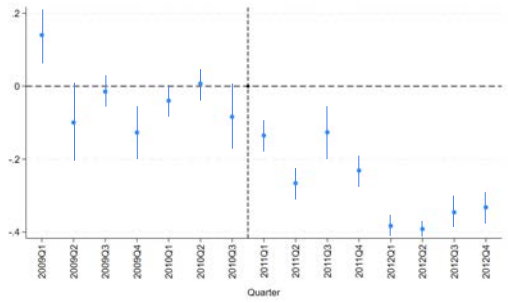
Figure 8: Credit conditions to SMEs around the wealth tax reform



(a) Loan Volume



(b) Loan Rates



(c) Loan Maturity

Notes: The figure displays the coefficients β_q estimated from a regression conducted at the loan-level (i.e., bank-firm-quarter) including two years immediately before and after the implementation of the wealth tax reform (i.e., from 2009Q1 to 2012Q4). Panel A depicts the results for loan volume, panel B for loan rates, and panel C for loan maturity. We exclude the quarter prior to the implementation of wealth tax reform—2010Q4—so that all coefficients of interest are estimated relative to that quarter. The vertical bar in all panels includes the quarters around the implementation of the wealth tax reform. Standard errors are double clustered at the firm-bank and quarter level. The vertical bars display the 95 percent confidence levels. Source: Authors' calculations using data from SFC, SS and DIAN.

Table 1: The sample: Financial variables at the firm-level

	Treated					Control					Mean differences
	Mean	SD	P25	P75	P90	Mean	SD	P25	P75	P90	
Loan volume*	219	416	36	239	466	148	331	25	150	300	71**
Loan rate*	16.66	6.48	11.74	20.51	27.56	17.25	6.49	12.46	21.25	27.98	-0.59**
Loan maturity*	3.34	1.42	0.48	4.36	5.83	3.21	1.56	0.67	3.87	4.31	0.13**
Assets	4,249	4,336	2,333	4,650	7,107	2,792	6,133	1,375	2,913	4,674	1,456**
Liabilities	2,981	4,333	1,069	3,369	5,795	2,052	6,126	661	2,141	3,909	930**
Liquid capital	1,267	142	1,146	1,388	1,457	741	145	613	864	946	527**
Debt-to-Cash	0.65	0.13	0.02	0.77	0.81	0.65	0.13	0.35	0.75	0.92	-0.01**
Debt-to-Assets	0.59	0.19	0.46	0.73	0.93	0.60	0.19	0.48	0.74	0.84	-0.02**
Investment	620	1,008	106	800	1,397	398	654	60	510	930	222**
Revenues	7,122	10,914	2,506	7,971	14,532	4,598	7,121	1,558	5,050	9,499	2,525**
Trade Credit to Liabilities	0.23	0.21	0.05	0.36	0.53	0.24	0.22	0.05	0.39	0.56	-0.01**
TFP OP	0.98	0.07	0.93	1.03	1.07	0.95	0.08	0.90	1.00	1.04	0.03
TFP Wdrg	0.99	0.04	0.96	1.01	1.05	0.96	0.05	0.93	0.99	1.02	0.03
Employment	56	127	12	52	105	52	129	10	44	98	4**
Trade credit	460	1,482	123	439	1,084	321	985	-	314	764	139**
Provision of Trade Credit	4.6	197.3	54.0	596.0	875.0	1.6	91.8	23.0	156.0	658.0	
Number of Firms	3,757					1,815					

Notes: This table presents summary statistics of the variables at the firm level and mean differences tests. Difference in means is treated minus control firms. Bank credit is the annual amount of credit from all banks to firms, while loan rate and loan maturity are the weighted average loan rate in percentage (%) and loan maturity in years, respectively. Treated firms are those subject to the wealth tax with liquid capital between COP 1 billion and COP 1.5 billion, while non-treated (control) firms are those with liquid capital between COP 0.5 billion and COP 0.99 billion at the end of 2010. Values in COP million. The sample includes 5,320 firms during the 2009-2012 period. *p<0.00.1. Source: Authors' calculations using data from SFC, SS and DIAN.

Table 2: Summary Statistics

Variable	Mean	SD	P25	P50	P75	Min	Max	Obs
Panel A: Bank Characteristics								
Assets*	15,621	33,260	795	1,994	15,015	48.1	185,454	1,344
Liabilities*	13,451	28,647	615	1,627	11,540	1.1	158,867	1,344
Equity ratio	17.23	4.21	11.67	13.71	18.26	11.06	19.34	1,344
Liabilities-to-assets	0.76	0.23	0.81	0.89	0.92	0.02	0.94	1,344
Deposits-to-assets	0.63	0.26	0.52	0.71	0.77	0.13	0.84	1,344
Loans-to-assets	0.61	0.32	0.63	0.74	0.81	0.14	0.94	1,344
Liquid assets-to-total-assets	0.17	0.22	0.09	0.12	0.19	0.03	0.90	1,344
Loan-provisions-to-total loans	0.05	0.06	0.02	0.04	0.06	0.03	0.11	1,344
Non-performing-loans-to-total loans	0.03	0.04	0.04	0.05	0.07	0.01	0.13	1,344
Panel B: Bank-Firm Loan Level Credit								
Loan volume	275	123	4	26	123	0.35	5,152	71,406
Loan rate	17.56	9.72	6.38	12.95	24.17	8.65	28.74	71,406
Maturity	3.28	1.24	0.4	1.78	4.22	0.03	6.84	71,406
Panel C: Firm Characteristics								
Assets	2,786	3,646	1,252	1,842	2,923	608	7,489	22,312
Liabilities	1,865	3,609	375	900	1,934	149	6,450	22,312
Liquid capital	920	281	676	885	1,143	500	1,500	22,312
Debt-to-Cash	0.05	0.15	0.32		0.77	0.19	0.93	22,312
Debt-to-Assets	0.61	0.21	0.47		0.74	0.32	0.96	22,312
Investment	1,532	3,411	61	321	1,187	15	17,800	22,312
Revenues	669	1,629	19	133	512	7	8,364	22,312
Trade-Credit-to-Liabilities	0.18	0.23	0	0.08	0.29	0	1.00	22,312
Productivity_OP	0.96	0.06	0.90	0.98	1.04	0.81	1.14	22,312
Productivity_W	0.95	0.07	0.86	0.94	1.02	0.79	1.16	22,312
Employment	53	116	10	53	89	5	105	22,312
Trade credit	371	142	89	326	524	50	4,730	22,312
Provision of Trade Credit	298	103	53	77	593	1	4,116	22,312

Notes: This table reports the summary statistics for the sample used in the baseline analysis. Panel A includes monthly data at the bank level from SFC. Panel B reports quarterly data at the bank-firm loan level from SFC. Panel C includes annual firm level data from SS. Cols. 1 to 5 report the mean, the standard deviation (Std. Dev.), and the percentiles 25, 50, and 75 of the respective distributions. The final columns report variables' minimum and maximum and the number of observations. Values are in COP million. *Values in COP billion. Source: Authors' calculations using data from SFC, SS and DIAN.

Table 3: Variable Definitions

Firm-Level Variables	
Assets	Monetary value of the firm's assets
Revenues	Monetary value of total sales
Liabilities	Financial obligations to third parties, such as suppliers or banks
Liquid capital	Difference between a firm's assets and liabilities
Debt	Monetary value of the firm's debt to the bank
Investments	Annual amount invested by the firm in property, plant and equipment
Trade Credit	Value of credit extended (provided) by suppliers allowing deferred payment for goods/services
Debt to Cash	Measures how many times the firm's total debt exceeds its cash and cash equivalents
Debt to Assets	Proportion of total assets financed by debt
Trade Credit to Liabilities	Share of total liabilities composed of trade credit from suppliers
Bank-Level Variables	
Liquidity	Ease with which an asset can be converted into cash at any time
Deposits to Assets	Proportion of total bank assets financed through customer deposits
Loans to Assets	Share of a bank's assets allocated to loan portfolios
Loan Provisions to Total Loans	Proportion of loans provisioned for expected credit losses
Equity Ratio	Proportion of total assets financed through equity
Liabilities to Assets	Proportion of total assets financed through liabilities
Liquid Assets to Total Assets	Share of assets held in liquid or near-cash form
Non-Performing Loans	Loans for which the borrower has failed to meet contractual obligations for over 90 days
Bank-Firm Variables	
Loan Volume	The logarithm of the amount of credit (COP million) grated by bank b to firm f at time q
Loan Rate	The loan rate (in percentage points) charged by bank b to firm f in quarter q
Loan Maturity	The log of maturity of the loan (in years)

Notes: This table depicts the variable definitions used in the baseline analysis. Panel A includes firm level variables from SS. Panel B reports bank level variables from SFC. Panel C reports bank-firm loan level variables from SFC. Source: Authors' calculations using data from SFC, SS and DIAN.

Table 4: Bank credit and the wealth tax on SMEs: Effects of anticipation

	Panel A: Outstanding loans			**Panel B: New loans**		
VARIABLES	$LoanVolume_{b,f,q}$	$LoanRate_{b,f,q}$	$Maturity_{b,f,q}$	$LoanVolume_{b,f,q}$	$LoanRate_{b,f,q}$	$Maturity_{b,f,q}$
Post*Treated	0.0262**	0.5903***	0.1558***	0.0445**	0.1044*	0.2721***
	(0.0478)	(0.1214)	(0.0363)	(0.0292)	(0.0515)	(0.0549)
Post*Treated*Anticipation	-0.0394***	0.6072**	-0.3211***	-0.0648***	0.2851**	-0.1415**
	(0.0091)	(0.2613)	(0.1262)	(0.0271)	(0.1328)	(0.7135)
Observations	79,673	79,673	79,673	15,853	15,853	15,853
R-squared	0.835	0.766	0.723	0.823	0.750	0.703
Firm Controls x Post	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Region-Industry-Time FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Results of D-in-D regressions using quarterly bank-firm-loan level data. The dependent variables are the log of loan amount, loan rate (%), and log of loan maturity (years) of loans granted to firm f by bank b at quarter q. *Post* is 1 when the observation is between 2011q1 and 2012q4 and 0 if it is between 2009q1 and 2010q4. $Treated_f$ is 1 if the firm's liquid capital is between COP 1 billion and COP 1.5 billion (and the firm was subject to the wealth tax since 2011) and 0 if the firm's equity is between COP 500 million and COP 999 million at the end of 2010. $Anticipation_f$ is an indicator equals to 1 for those firms that anticipated the wealth tax and 0 otherwise, according to the results of the bunching exercise. Panel A includes total loans. Panel B only includes new loans granted in the period. Robust standard errors clustered at the bank level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: Authors' calculations using data from SFC, SS and DIAN.

Table 5: Loan rates and the wealth tax on SMEs: Leverage

	Panel A. Outstanding loans			**Panel B. New loans**		
VARIABLES	$LoanVolume_{b,f,q}$	$LoanRate_{b,f,q}$	$Maturity_{b,f,q}$	$LoanVolume_{b,f,q}$	$LoanRate_{b,f,q}$	$Maturity_{b,f,q}$
Post*Treated	0.0298***	0.527***	0.1162***	0.0478**	0.1033**	0.2291***
	(0.0104)	(0.1590)	(0.0278)	(0.0234)	(0.0521)	(0.0570)
Post*Treated*High_Leverage	-0.0402***	0.6873*	-0.0262**	-0.0814***	0.3196**	-0.4271***
	(0.0122)	(0.3791)	(0.0147)	(0.0214)	(0.1577)	(0.1392)
Observations	79,673	79,673	79,673	15,853	15,853	15,853
R-squared	0.832	0.773	0.747	0.816	0.764	0.738
Firm Controls x Post	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Region-Industry-Time FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Results of D-in-D regressions using quarterly bank-firm-loan level data. The dependent variables are the log of loan amount, loan rate (%), and log of loan maturity (years) of loans granted to firm f by bank b at quarter q. *Post* is 1 when the observation is between 2011q1 and 2012q4 and 0 if it is between 2009q1 and 2010q4. $Treated_f$ is 1 if the firm's liquid capital is between COP 1 billion and COP 1.5 billion (and the firm was subject to the wealth tax since 2011) and 0 if the firm's equity is between COP 500 million and COP 999 million at the end of 2010. $High\text{-}Leverage_{f,q-1}$ is 1 for firms with ex-ante high leverage, and 0 otherwise. Panel A includes total loans. Panel B only includes new loans granted in the period. Robust standard errors clustered at the bank level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: Authors' calculations using data from SFC, SS and DIAN.

Table 6: Loan terms and the Wealth Tax: The effect of taxing banks' wealth

VARIABLES	$LoanVolume_{b,f,q}$	$LoanRate_{b,f,q}$	$Maturity_{b,f,q}$	$LoanVolume_{b,f,q}$	$LoanRate_{b,f,q}$	$Maturity_{b,f,q}$
Post*Bank High Tax	-0.0638**	0.3361***	-0.0336*	-0.0644**	0.3363***	-0.0322*
	(0.0264)	(0.1578)	(0.0161)	(0.0271)	(0.1591)	(0.0167)
Post*Bank High Tax*Treated	-0.077**	0.2217**	-0.0231	-0.072**	0.2224**	-0.0259
	(0.0372)	(0.1113)	(0.0114)	(0.0293)	(0.1015)	(0.0233)
Post*Bank High Tax*Anticipation	-0.0212**	0.4061***	-0.0328*	-0.0296***	0.4524***	-0.0357**
	(0.0114)	(0.1192)	(0.0156)	(0.0102)	(0.1264)	(0.0172)
Observations	79,673	79,673	79,673	79,673	79,673	79,673
R-squared	0.73	0.74	0.75	0.76	0.75	0.79
Firm Controls x Post	Yes	Yes	Yes	Yes	Yes	Yes
Bank Controls x Post	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Region-Industry-Time FE	No	No	No	Yes	Yes	Yes

Notes: Results of D-in-D regressions using quarterly bank-firm-loan level data. The dependent variables are the log of loan amount, loan rate (%), and log of loan maturity (years) of loans granted to firm f by bank b at quarter q. *Post* is 1 when the observation is between 2011q1 and 2012q4 and 0 if it is between 2009q1 and 2010q4. $Treated$ is 1 if the firm's liquid capital is between COP 1 billion and COP 1.5 billion (and the firm was subject to the wealth tax since 2011) and 0 if the firm's equity is between COP 500 million and COP 999 million at the end of 2010. *Anticipation* as an indicator equals to 1 for those firms that anticipated the wealth tax and 0 otherwise, according to the results of the bunching exercise. $Bank\text{-}High\_Tax$ is one if the bank is located in the top decile of the wealth tax at the end of 2010, and 0 otherwise. Robust standard errors clustered at the bank level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: Authors' calculations using data from SFC, SS and DIAN.

Table 7: Trade Credit and the Wealth Tax

VARIABLES	Trade Credit$_{f,y}$	Trade Credit$_{f,y}$	Provision of Trade Credit$_{f,y}$	Provision of Trade Credit$_{f,y}$
Post x Treated$_f$	0.095***	0.093***	-0.073***	-0.070***
	(0.020)	(0.021)	(0.018)	(0.024)
Post x Treated$_f$ x Anticipation$_f$	-0.035***	-0.033***	-0.037**	-0.047***
	(0.010)	(0.012)	(0.019)	(0.013)
Post x Treated$_f$ x High-Leverage$_f$	-0.020**	-0.026***	-0.023***	-0.028***
	(0.011)	(0.012)	(0.010)	(0.007)
Observations	22,312	22,312	22,312	22,312
R-squared	0.62	0.64	0.62	0.64
Firm Controls	Yes	Yes	Yes	Yes
Sector-Time FE	Yes	Yes	Yes	Yes
Region-Time FE	No	Yes	No	Yes

Notes: Results of D-in-D regressions using firm-level data. The dependent variable is the log of the amount of trade credit (in COP million) contracted and provided by firm f at year y, respectively. Post$_y$ is 1 when the observation is between 2011 and 2012 and 0 if it is between 2009 and 2010. Treated$_f$ is 1 if the firm's liquid capital is between COP 1.0 billion and COP 1.5 billion (subject to the wealth tax since 2011) and 0 if the firm's liquid capital is between COP 500 million and COP 999 million at the end of 2010. $High\text{-}Leverage_f$ is an indicator equals to 1 for firms with cash-to-assets ratio above percentile 75th and 0 otherwise. $Anticipation_f$ as an indicator equals to 1 for those firms that anticipated the wealth tax and 0 otherwise, according to the results of the bunching exercise. Robust standard errors clustered at the firm level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: Authors' calculations using data from SS and DIAN.

Table 8: Real Effects of the Wealth Tax on SMEs

VARIABLES	$\text{Income}_{f,y}$	$\text{Investment}_{f,y}$	$\text{Total Debt}_{f,y}$	Δ $\text{Capital}_{f,y}$
Post_y x Treated_f	-0.0621***	-0.0935***	-0.0749**	-0.0419**
	(0.0247)	(0.0326)	(0.0354)	(0.0226)
Post_y x Treated_f x Anticipation	-0.0135**	-0.0238**	-0.0166***	-0.0302***
	(0.0058)	(0.0120)	(0.0541)	(0.01201)
Post_y x Treated_f x $\text{High-Leverage}_{f,y-1}$	-0.0278***	-0.0394***	-0.0347**	-0.0247**
	(0.0120)	(0.0125)	(0.0180)	(0.0139)
Observations	22,312	22,312	22,312	22,312
R-squared	0.36	0.46	0.46	0.39
Firm Controls	Yes	Yes	Yes	Yes
Sector-Region-Time FE	Yes	Yes	Yes	Yes

Notes: Results of D-in-D regressions using firm-level data. The dependent variables are firm-level outcomes of firm f in year y. *Post* is 1 when the observation is between 2011 and 2012 and 0 if it is between 2009 and 2010. Treated_f is 1 if the firm's liquid capital is between COP 1 billion and COP 1.5 billion (subject to the wealth tax since 2011) and 0 if it is between COP 500 million and COP 999 million at the end of 2010. $Anticipation_f$ as an indicator equals to 1 for those firms that anticipated the wealth tax and 0 otherwise, according to the results of the bunching exercise. $High\text{-}Leverage_f$ is 1 for firms with ex-ante high leverage. Robust standard errors clustered at the firm level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: Authors' calculations using data from SS and DIAN.

Table 9: Real Effects of the Wealth Tax on SMEs: Employment and Productivity

VARIABLES	$\text{Employment}_{f,y}$	$\text{Productivity}_{OPf,y}$	$\text{Productivity}_{Wf,y}$
Post_y x Treated_f	0.0357	0.0041	0.0045
	(0.0223)	(0.0056)	(0.0030)
Post_y x Treated_f x Anticipation	-0.0786	-0.0016**	-0.0012***
	(0.0693)	(0.0007)	(0.0004)
Post_y x Treated_f x $\text{High-Leverage}_{f,y-1}$	-0.0445***	-0.0017**	-0.0016***
	(0.0104)	(0.0007)	(0.0003)
Observations	22,312	22,312	22,312
R-squared	0.40	0.42	0.43
Firm Controls	Yes	Yes	Yes
Sector-Region-Time FE	Yes	Yes	Yes

Notes: Results of D-in-D regressions using firm-level data. The dependent variables are firm-level outcomes of firm f in year y. *Post* is 1 when the observation is between 2011 and 2012 and 0 if it is between 2009 and 2010. Treated_f is 1 if the firm's liquid capital is between COP 1 billion and COP 1.5 billion (subject to the wealth tax since 2011) and 0 if it is between COP 500 million and COP 999 million at the end of 2010. $Anticipation_f$ as an indicator equals to 1 for those firms that anticipated the wealth tax and 0 otherwise, according to the results of the bunching exercise. $High\text{-}Leverage_f$ is 1 for firms with ex-ante high leverage. Robust standard errors clustered at the firm level in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Source: Authors' calculations using data from SS and DIAN.

A Online Appendix

Table A.1: The wealth tax in OECD countries, 2000–2021

(a) Wealth tax revenue as percentage of GDP[1]

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Belgium					0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2
Canada	0,4	0,3	0,3	0,2	0,2	0,2	0,2	0,2	0,1	0,1	0,1	0,1										
Colombia			0,5	0,5	0,2	0,1	0,1	0,3	0,7	0,4	0,4	0,7	0,6	0,6	0,5	0,7	0,5	0,4	0	0,1	0,1	0,1
Finland	0,1	0,1	0,1	0,1	0,1	0,1																
France	0,2	0,2	0,2	0,1	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,1	0,1	0,1	0,1
Greece	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,6	0,6	0,6	0,6	0,6	0,6	0,7	0,7	0,7	0,7	0,7	—
Hungary											0,5	0,5	0,5	0,4	0,4	0,4	0,2	0,1	0,1	0,1	0,2	0,1
Iceland	0,7	0,7	0,7	0,3	0,4	0,3	0	0	0	0	0,2	0,4	0,5	0,5	0,5							
Luxemburg	2,8	2,6	2,2	2	2	2,3	2,3	2,3	1,8	1,8	2	1,9	1,9	2	2,1	2,4	2,5	2,6	2,8	3	2,9	3
Norway	0,5	0,5	0,5	0,5	0,6	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,6	0,6	0,6	0,5	0,5
Spain	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,3	0,1	0,1	0,1	0,1	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2
Switzerland	1,1	1,2	1,2	1,2	1,2	1,2	1,2	1,2	1,1	1,2	1,1	1,1	1,1	1,1	1,2	1,2	1,3	1,3	1,3	1,4	1,4	1,4

(b) Wealth tax over total tax revenues[2]

Country	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Belgium	0,0	0,0	0,0	0,0	0,1	0,1	0,1	0,2	0,2	0,1	0,2	0,2	0,2	0,3	0,3	0,4	0,6	0,5	0,5	0,5	0,5	0,5
Canada	1,1	0,9	0,8	0,7	0,8	0,7	0,7	0,6	0,4	0,4	0,3	0,2	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Colombia	0,0	0,0	3,1	2,7	0,8	0,8	0,7	1,4	3,5	2,1	2	3,6	3,2	3,0	2,8	3,3	2,7	2,2	0,2	0,4	0,5	0,5
Finland	0,3	0,2	0,2	0,2	0,2	0,2	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0
France	0,4	0,4	0,4	0,3	0,4	0,4	0,5	0,5	0,5	0,4	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,2	0,2	0,2	0,2
Greece	1,5	1,5	1,4	1,5	1,6	1,7	1,6	1,6	1,6	1,8	1,8	1,8	1,8	1,7	1,6	1,7	1,7	1,7	1,6	1,6	1,8	—
Hungary	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	1,3	1,3	1,2	1,1	1,1	1	0,4	0,3	0,3	0,3	0,6	0,3
Iceland	2,0	2,1	2,1	0,9	1,0	0,7	0,0	0,0	0,0	0,0	0,7	1,1	1,5	1,3	1,4	0,0	0,0	0,0	0,0	0,0	0,0	0,0
Luxemburg	7,4	6,9	5,8	5,3	5,4	6,2	6,6	6,5	5,2	5,1	5,5	5,4	5,3	5,5	5,8	7	7,1	7,1	7,1	7,5	7,5	7,7
Norway	1,2	1,2	1,3	1,3	1,3	1,3	1,2	1,3	1,3	1,3	1,2	1,2	1,3	1,3	1,4	1,2	1,4	1,5	1,4	1,5	1,4	1,2
Spain	0,7	0,6	0,6	0,5	0,5	0,5	0,6	0,6	0,8	0,2	0,2	0,2	0,4	0,6	0,5	0,5	0,5	0,5	0,5	0,5	0,6	0,5
Switzerland	4,1	4,5	4,6	4,6	4,7	4,5	4,6	4,7	4,5	4,5	4,4	4,2	4,2	4,3	4,5	4,5	4,8	4,8	4,8	5,0	5,1	4,9

[1]Source: https://stats.oecd.org/index.aspx?DataSetCode=REV Note: Level of government: Total; Tax revenue: 4200 Recurrent taxes on net wealth; Indicator: Tax revenue as % of GDP.
[2]Source: https://stats.oecd.org/index.aspx?DataSetCode=REV Note: Level of government: Total (Supranational + Federal o central government + State/regional + Local government + Social security funds); Tax revenue: 4200 Recurrent taxes on net wealth; Indicator: Percentage of total tax revenues.

Table A.2: Colombian wealth tax normativity, cutoffs, and rates, 2002-2010

Tax reform	Year	Nominal cutoff	Tax rate	Taxpayers
Decrees 1837/2002 y 1838/2002	2002	All income taxpayers	1.2%	Individuals and fims
Law 863/2003	2004	> COP 3,000 million	0.3%	Individuals and fims
	2005	> COP 3,000 million	0.3%	Individuals and fims
	2006	> COP 3,000 million	0.3%	Individuals and fims
Law 1111/2006	2007	> COP 3,000 million	1.2%	Individuals and fims
	2008	Same taxpayers that met the 2007 cutoff	1.2%	Individuals and fims
	2009	Same taxpayers that met the 2007 cutoff	1.2%	Individuals and fims
	2010	Same taxpayers that met the 2007 cutoff	1.2%	Individuals and fims
Law 1370/2009	2011	COP 3,000 million $\leq$ net wealth $<$ COP 5,000 million	2.4%	Individuals and fims
		> COP 5,000 million	4.8%	Individuals and fims
Decree 4825/2010	2011	COP 1,000 million $\leq$ net wealth $\leq$ COP 2,000 million	1.0%	Individuals and fims
		COP 2,000 million $<$ net wealth $\leq$ COP 3,000 million	1.4%	Individuals and fims
Law 1430/2010	2011	COP 3,000 million $<$ net wealth $\leq$ COP 5,000 million	2.4%	Individuals and fims
		> COP 5,000 million	4.8%	Individuals and fims

Source: Authors' compilation based on information from the Dirección de Impuestos y Aduanas Nacionales (DIAN)

Table A.3: Timeline of announcements ("news") about the wealth tax, 2008-2010

Date	Announcements
Jan. 29, 2008	Wealth tax, countdown begins to pay the first installment... The two installments corresponding to 2008 will be paid between May 23 and 30 and between September 22 and 26. Those who as of January 1, 2007, would have had liquid assets exceeding 3,000 million pesos must be responsible for this tax, the rate of which is 1.2 percent.
Aug, 04, 2008	The government has had abundant new revenues such as those generated by the wealth tax.
Aug, 29, 2008	Next year's fiscal outlook finds adverse situations. That is, Colombians would be surprised by a new tax reform.
Jan, 29, 2009	The wealth tax that finances Democratic Security is valid until 2010. Experts believe that it would be irresponsible to extend the life of the wealth tax, and they see it as necessary to start a debate on investment in defense: if it was enough, with what it would continue to be financed and how much the gap could be if more resources are required.
May, 04, 2009	The director of the Dian, Néstor Díaz, expressed his opposition to this tax [the wealth tax] being assumed by all citizens. He added that in this case it must be progressive: that those who earn the most are those who respond. This tax, from which a collection of 8.2 billion pesos is expected, still has four installments to collect: two this year, and another two in 2010.
May, 12, 2009	Everything leads to a new tax reform. But the Minister of Finance pointed out yesterday, when asked about the wealth tax, that the tax discussion will correspond to the next Government and that the current rules will be respected.
Jun, 16, 2009	Government opens the door to a new tax reform; wealth tax will be permanent. Although there is no specific proposal from the Government, Minister Zuluaga said that since the wealth tax is charged from assets exceeding 3,000 million.
Jun, 17, 2009	President Álvaro Uribe announced that a tax reform bill will be filed on July 20. The sources for new resources remain to be discussed and defined, because the president is not referring to a new wealth tax, which in principle leaves the doors open for any of the taxes to be touched. But the Minister of Finance, Óscar Iván Zuluaga, believes that it should be a wealth tax and not other taxes. For him, this source has worked, and that is why he suggests that there are new people with assets exceeding 3,000 million pesos who do not pay it today and who can do so.
Jul, 03, 2009	The Government would be considering lowering the amount of wealth from which a new wealth tax would be charged starting in 2011, but not to the levels that others such as Anif have talked about of 200 million pesos, but rather it would be thinking about liquid assets from 2,000 million pesos. And there, the universe of taxpayers would change, since those who today have 2,000 million pesos in assets add up to a little more than 9,000 people.
Jul, 16, 2009	The potential taxpayers of the wealth tax would be about 17,200 between natural and legal persons, this is because the estimates made by Dian indicate that people with liquid assets between 2,000 million and 3,000 million pesos add up to 8,000, while those who have more than 3,000 million pesos reach 9,200. The 8,000 new taxpayers would have a rate of 0.4 percent.
Jul, 20, 2009	The Government submitted the tax reform bill to Congress. The tax rate [of the new wealth tax] will be 0.6 percent for assets exceeding 3,000 million pesos and will apply between the years 2011 to 2014.
Jul, 27, 2009	After many hesitation, the proposal for the new wealth tax was left for those with liquid assets exceeding 3,000 million pesos.

Nov, 11, 2009	It is talked of the possibility of increasing the proposed rate for the wealth tax from 0.6 percent to 1 percent. One project essentially seeks to extend the wealth tax until 2014, as it expires next year. In this way, 1.2 billion pesos would be raised.
Nov, 19, 2009	Yesterday the tax authority's presentation was signed with the Government's original proposal that proposes three specific topics: extending the wealth tax between 2011 and 2014 for assets greater than 3,000 million pesos and with a rate of 0.6 percent, and 1% should be the wealth tax for capital over $5,000 million, congressmen propose.
Nov, 24, 2009	One day before the Congress of the Republic sits down to discuss the tax reform project that extends the wealth tax until 2014. The current tax that is charged for assets exceeding 3,000 million pesos at a rate of 1.2 percent ends next year, which is why the Government filed a bill that would create a tax between 2011 and 2014, which in practice is extending what we have today. The difference is that the Government proposes that the rate be 0.6 percent; but Congressmen will propose other rates for the tax.
Nov, 27, 2009	The joint third commissions will decide next week the fate of the proposal to extend the wealth tax until 2014.
Dec, 01, 2009	Economic Commission approved the extension of the wealth tax. The initiative, which is missing two plenary sessions, states that assets between 3,000 and 5,000 million would pay a rate of 0.6 percent between 2011 and 2014 and those over 5,000 million would pay a rate of 1.2 percent.
Dec, 17, 2009	After a debate in Congress, last night the initiative that extends the wealth tax until 2014 passed for presidential sanction. This time it will be paid by 9,300 taxpayers who, as of January 1, 2011, have liquid assets exceeding 3,000 million pesos. In this new version there will be two rates: one of 0.6 percent for assets between 3,000 and 5,000 million pesos and another of 1.2 percent for those greater than 5,000 million.
May, 28, 2010	The main presidential candidates for the period 2010-2014 hold different perspectives on their possible tax reforms. Regarding the wealth tax: Gustavo Petro would increase its collection, German Vargas would eliminate it, Rafael Pardo would leave it only to natural persons and not to companies, and Juan Manuel Santos would eliminate it starting in 2012.
Jun, 09, 2010	The resources that the Government received in May from the wealth tax were less than projected. Dian figures show that in the first five months of the year 15,000 million pesos less than estimated were received. The figure is also lower by 7,000 million pesos than that registered between January and May 2009.
Jun, 16, 2010	Santos-Garzón: winning formula, would eliminate the wealth tax starting in 2012.
Jun, 19, 2010	The campaign of candidate Juan Manuel Santos proposes reducing or eliminating the corporate wealth tax.
Jul, 07, 2010	All roads lead to tax reform.
Nov, 18, 2010	The presentation of the tax reform has been filed. A modification is also made to the wealth tax, with the argument that "it is necessary to correct an ambiguity in the Tax Statute and point out that the tax rate is established based on the value of the liquid wealth regardless of the tax base."
Nov, 25, 2010	The tax reform now goes to plenary. Regarding the wealth tax, which will be in force until 2014, a correction was made to improve its collections, as explained by the Minister of Finance.
Nov, 30, 2010	The government says that it is thinking about extending the wealth tax for another year and increasing it so that certain people who are not paying it today, which is up to 3,000 million pesos, pay one time only, for example between 1,500 and 3,000.
Dec, 24, 2010	The wealth tax will increase. The tax will apply a rate of 1 percent for people or companies with liquid assets between 1,000 and 2,000 million pesos. For assets between 2,000 and 3,000 million pesos the rate will be 1.4 percent. 32,000 new taxpayers will begin to pay it starting in January
Dec, 30, 2010	Wealth tax from one billion to address the winter wave... The resources... will come from the increase in the wealth tax, which 32,000 new taxpayers will begin to pay starting in January.

Source: Authors' compilation from main Colombian newspapers and news magazines: *Portafolio, El Tiempo,* and *Semana.*

B Productivity Estimation Methods

The estimation of productivity in the manufacturing industry is a central issue directly relates to firms' efficiency and competitiveness. However, this task faces the problem of simultaneity: firms make their input decisions based on private information about their own productivity, introducing endogeneity that biases estimates when using traditional methods. Olley and Pakes (1992) developed a control function approach, widely known as the Olley-Pakes (OP) method, which uses investment as a proxy for unobserved productivity shocks. This method has been influential in empirical applications, including analyses of manufacturing industries in both developed and developing countries (Kim et al., 2021; Ayelign and Singh, 2019). The OP approach is particularly effective in addressing selection bias due to firm exit and has contributed to more nuanced decompositions of productivity dynamics.

To further enhance the reliability of productivity estimates, Wooldridge (2009) proposed an efficient one-step GMM estimator that addresses both simultaneity and serial correlation, allowing simultaneous estimation of input elasticities. This estimator is especially valuable in settings with potential measurement error or serially correlated shocks. As shown by Ayelign and Singh (2019), the Wooldridge method provides more efficient and robust estimates than traditional or two-step approaches, especially in data-constrained environments typical of many developing countries. Martin and Riley (2024) underscores the importance of robust estimation methods, as methodological choices significantly influence our understanding of productivity trends and their policy implications. This section discusses these methodologies, building on the framework provided in Rovigatti and Mollisi (2018).

Olley and Pakes

The OP method addresses simultaneity bias by exploiting investment as a proxy for unobserved productivity. The central idea is that firms observe their productivity before making investment decisions, allowing investment to be modeled as a strictly increasing function of

productivity:

$$\omega_{jt} = h(I_{jt}, K_{jt})$$

where ω_{jt} denotes unobserved productivity, I_{jt} is investment, and K_{jt} is capital. This relationship allows for the substitution of productivity in the production function, mitigating bias due to unobservable inputs.

The estimation proceeds in three steps. First, a semiparametric regression is estimated, using investment as a proxy to control for productivity. This enables consistent estimation of the labor coefficient:

$$Y_{jt} = \beta_L L_{jt} + \phi_t(I_{jt}, K_{jt}) + \epsilon_{jt}$$

where Y_{jt} is output, L_{jt} is labor, and $\phi_t(\cdot)$ is a nonparametric function capturing productivity.

Second, the method corrects for sample selection bias due to firm exit. Since low-productivity firms are more likely to leave the market, the sample may be truncated. OP address this by estimating a survival probability conditional on productivity. In the final stage, productivity is assumed to follow a first-order Markov process:

$$\omega_{jt} = h(\omega_{jt-1}) + \eta_{jt}$$

where η_{jt} is the innovation in productivity. This allows for consistent estimation of capital and labor coefficients using a GMM framework.

While the OP estimator has advantages, it also presents limitations. Notably, it requires positive investment values across all periods, which reduces the usable sample. Moreover, in

industries where investment is not responsive to productivity shocks, the method may yield biased estimates.

Wooldridge

Wooldridge proposes an alternative to the two-step estimators by reformulating the control function approach within a single-step GMM framework. His method builds on the insight that unobserved productivity can be controlled for using a system of moment conditions without separating the estimation into multiple stages.

The production function is modeled as:

$$Y_{jt} = \beta_L L_{jt} + \beta_K K_{jt} + \omega_{jt} + \epsilon_{jt}$$

with ω_{jt} evolving according to a first-order Markov process. Wooldridge proposes estimating the following system simultaneously:

$$Y_{jt} = \beta_L L_{jt} + \beta_K K_{jt} + h(K_{jt}, M_{jt}) + v_{jt}$$
$$Y_{jt} = \beta_L L_{jt} + \beta_K K_{jt} + f(h(K_{jt-1}, M_{jt-1})) + \eta_{jt}$$

where M_{jt} denotes intermediate inputs. Both h and f are approximated using polynomial functions, and instruments are drawn from lagged inputs and state variables.

This approach resolves the identification concerns highlighted by ACF, while enabling robust inference in a computationally efficient single-step estimation. Moreover, the method accommodates unbalanced panels and short time dimensions, making it well-suited for empirical firm-level studies.