

Firms as Tax Collectors*

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Abstract

We show that delegating tax collection duties to large firms can bolster tax capacity in weak-enforcement settings. We exploit two reforms in Argentina that dramatically *expanded* and subsequently *reduced* turnover tax withholding by firms. Combining firm-to-firm data with regression discontinuity and difference-in-differences methods centered on revenue eligibility thresholds, we find that: (i) appointing large firms as collection agents (CAs) does not hinder their economic activity, (ii) it leads to a significant increase in self-reported sales and tax payments among CAs' business partners, (iii) these effects are primarily concentrated among downstream firms that lack a traceable paper trail, and (iv) reductions in withholding lead to a decrease in self-reported sales, albeit to a lesser extent. Tax-collecting firms can thus help boost tax compliance and revenue.

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1 Introduction

Governments in developing countries struggle to raise revenue and build tax capacity. Increasing taxes and mitigating noncompliance through audits are the most common measures considered by authorities. Yet achieving large-scale capacity often requires fundamental transformations of tax administrations (Basri et al., 2021). The question of how taxes should be collected is usually at the forefront of tax authorities’ debates. Among the possible methods, withholding systems—in which third parties collect and remit taxes owed by related parties—have historically played a central role in easing the burden of tax administrations.

Tax withholding systems are ubiquitous. Part of the reason for the personal income tax’s global success, for example, is that employers withhold at source from employees’ paychecks (Besley and Persson, 2014; Bagchi and Dušek, 2021). Similarly, the built-in withholding mechanism of the value-added tax (VAT) has been shown to enhance compliance (Pomeranz, 2015; Waseem, 2022). Withholding of business income taxes is particularly common in developing countries where governments lack the resources and capacity to accurately measure and tax firm activity (Slemrod and Velayudhan, 2018). Indeed, [Figure 1](#), which uses data scraped from Ernst & Young’s Tax Guides, shows that the use of this device to collect indirect taxes has surged over the last decade. While withholding regimes may simplify tax collection, little is known about how firms acting as tax withholders and linked firms respond to them.

This paper asks what the effects are of delegating tax collection duties to firms. We bring novel evidence to the discussion by exploiting two reforms in the City of Buenos Aires, Argentina, that dramatically *expanded* and subsequently *reduced* turnover tax withholding by large firms and banks, respectively. Withholding entails changes to two main aspects of tax collection: *who* remits the tax and *when* it is paid. Under the standard filing procedure, firms report their monthly sales and then apply the corresponding tax rate to determine and remit the tax owed. Under the withholding scheme, financial institutions (e.g., banks and credit card companies) and large companies are appointed as collection agents (CAs) and collect part of the tax in advance from their commercial partners whenever there is a transaction. While in a first-best economy the point of collection of the tax is irrelevant, in the real world changes in the collection mechanism can matter for compliance (see Slemrod, 2008; Kopczuk et al., 2016). Our goal is to provide insights into the implications of withholding for the collecting party as well as linked suppliers and clients.

Our empirical analysis relies on two administrative sources processed by the local tax

authority: (1) monthly turnover tax declarations for nearly the entire universe of firms operating in the City of Buenos Aires; and (2) transaction-level details of purchases and sales, provided by firms acting as CAs. These tax records allow us to trace out the commercial linkages between firms and build a business-to-business database, which is a key feature for our analysis. By combining the two data sources, we obtain a monthly panel of 180,000 firms and 1.6 million client-supplier pairs spanning 2015 to 2020. We combine these data with regression discontinuity and difference-in-differences methods that leverage eligibility thresholds created by the two reforms—based on sales from the preceding year—to estimate the direct and indirect effects of withholding.

The first reform, implemented in October 2016, introduced an unprecedented rule to appoint firms as CAs based on size: firms whose sales in the preceding year were greater than AR\$60 million (the 97th percentile) were automatically appointed as tax collectors. As a consequence of this change, the number of CAs more than doubled from one month to the next, and immediately started to withhold the tax from their commercial partners. This implied an increase in the share of taxpayers' bills collected indirectly at source by CAs in lieu of direct payments to the tax authority. This setting allows us to estimate both the *direct effects* of expanding the withholding scheme on the firms tasked with collecting taxes and the *indirect effects* on those that now face an increase in the amount of taxes withheld at source. To our knowledge, we are one of the first to study the full rollout of a policy of this kind; existing papers analyzing the withholding of indirect taxes omit the effects on the withholding agents, who bear the administrative burden of the task.

The second reform, implemented in September 2018, consists of a temporary change in tax collection that—unlike the previous reform—*waived* all firms with 2017 sales less than AR\$10 million (the 80th percentile) from tax withholding on bank transactions. While for firms below the threshold banks no longer withheld turnover tax on payments received from other firms, firms above the threshold remained subject to bank withholding. This second reform allows us to study whether firms respond symmetrically to a decrease in withholding.

We first analyze whether appointing firms as CAs affects their economic activity. We use a fuzzy regression discontinuity design that exploits the discrete change in the probability of acting as a CA caused by the 2016 reform, in which appointments were decided by applying the AR\$60 million cutoff rule to 2015 sales.¹ We estimate whether CAs change

¹We show that the rule was followed closely but with some exceptions: firms belonging to some specific industries were either left out or included in the collection scheme regardless of their 2015 sales, making our setup fuzzy. We later show that newly appointed firms quickly took up their roles and started collecting the tax from clients and suppliers very much like other preexisting CAs.

their reported sales by comparing firms on either side of the cutoff. Our evidence shows no visible discontinuity in reported sales in the years 2017, 2018, and 2019, suggesting that CAs' business activity was not affected by their new tax-collecting role even three years later. We attribute this result to the fact that appointed firms were among the largest and most formal firms in the economy, with highly streamlined tax-filing practices, such that collecting taxes from partners and remitting them to the tax administration might not imply an increased burden or a change in enforcement perceptions (Kleven et al., 2016).

Next, we analyze the indirect effect of withholding on linked taxpayers. We focus on firms that regularly trade with newly appointed CAs and, as a result of the reform, experience an increase in the amount of tax collected through withholding. We use a difference-in-differences approach that relies on the fact that some firms were more exposed to the reform than others. Firms in the control group are only linked to preexisting CAs and do not experience any change in the way their tax is collected; firms in the treatment group are linked to newly appointed CAs, and thus some of their direct payments to the tax authority are withheld in advance after the reform goes into effect.

We find a large and statistically significant increase in withholding and tax compliance. The first-stage results show that both the number of linked CAs and the share of taxes withheld at source increase sharply among firms more exposed to new CAs, confirming that the reform only had a bite for the treated group. In particular, the number of CAs connected to treated firms rose by an average of 3.5 agents and the share of the tax bill withheld by CAs increased by about 15 percentage points following the reform. In contrast, withholding remained virtually unchanged for firms only linked to preexisting CAs despite presenting similar pre-reform levels.

The second-stage results show an increase in self-reported sales in response to higher withholding. Our estimates show that the reported sales of both groups were evolving in parallel trends before the reform. Hence, our control group provides a credible counterfactual of the trend that treated firms would have followed absent the reform. After the increase in exposure to new CAs, however, sales for the treated group rose by 5.8 percentage points. We also show an increase in tax collected from treated firms that is similar in magnitude. The increase in self-reported sales is more pronounced for downstream firms, at 7.9 percent, compared to a more modest and not significant effect of 2.5 percent for upstream firms.

Lastly, we find that firms also respond to a decrease in withholding by reporting lower sales, albeit to a lesser extent. In this case, we compare firms with 2017 sales between AR\$5 million and AR\$10 million (treated) against firms with 2017 sales between AR\$10 million

and AR\$20 million (untreated) using a difference-in-differences approach to gain power. We first show that the share of the total tax bill withheld by banks decreased from about 20 percent to 10 percent for treated firms, while remaining largely unchanged for control firms above the cutoff. Second, we find that treated firms responded by decreasing self-reported sales by 2.5 percentage points relative to the control group. Indeed, firms that report more sales in response to higher withholding by CAs in 2016, exhibit a reduction in their reported sales when bank withholding was waived in 2018.

The aggregate impact on reported sales and tax collection should be interpreted as a joint effect of third-party information and withholding itself—as CAs do both simultaneously. On the one hand, withheld taxes may act as a lower bound on self-reported sales: if firms were underreporting sales, having a larger part of the tax remitted by a CA may force them to report more sales. On the other hand, withholding enables every business transaction to be recorded in two places. This may alter enforcement perceptions since the information could be used by the subnational tax authority to detect non-complying firms. Although our setting precludes us from separating the role of withholding vis-à-vis information reporting, the joint effect is of first-order policy interest as implementing or expanding withholding typically encompasses both features (Bagchi and Dušek, 2021).

Regardless of the mechanism at play, our findings suggest that withholding by large firms and financial institutions can be an effective tax collection tool. Appointing firms to collect taxes does not seem to hurt their activity directly. Substituting direct tax payments with withholding at source increases reported sales of firms linked to CAs, which, in turn, increases total tax revenue collected by the government. Indeed, using fiscal tabulations we document a 20% increase in turnover tax revenue in the City of Buenos Aires relative to the Province of Buenos Aires where withholding remained unchanged.

Our paper contributes to a growing literature on tax compliance and enforcement (Slemrod, 2019). We build on recent papers that emphasize two critical aspects of modern tax systems: the role of firms as fiscal intermediaries and the interdependence of tax compliance with automatic features, such as withholding (Kleven et al., 2016; Slemrod, 2008; Jensen, 2022; Brockmeyer and Hernandez, 2019; Waseem, 2022).²

We contribute to this work in five key aspects. First, our scope extends broadly, encompassing the impact of withholding on firms across sectors and throughout the supply chain, where tax compliance can vary markedly (Pomeranz, 2015). Our results thus offer a

²Waseem (2022) studies the response of manufacturing firms to an increase in input VAT withholding in Pakistan. Brockmeyer and Hernandez (2019) focus on retailers and withholding by credit and debit card companies in Costa Rica.

more nuanced reflection of the average effect of withholding in the economy. Second, the appointment rule based on pre-reform sales enables us to gauge the *direct* effects experienced by CAs when collecting taxes on behalf of the tax authority. Such direct effects have been largely overlooked by the existing literature. Third, our research design is particularly well-suited to examine the *indirect* effects of withholding on firms linked to newly appointed CAs. The sharp and massive appointment of CAs is an arguably exogenous event from the perspective of their trade partners. Fourth, we leverage two policy reforms going in opposite directions, allowing us to document the effects on compliance resulting from both an increase and decrease in withholding. Fifth, we focus on the turnover tax—the largest subnational revenue source—in a context where a federal VAT, with its self-enforcing mechanisms as described by Waseem (2022), was already in place. Our findings thus suggest that businesses might follow disparate compliance strategies when reporting their sales in subnational and federal tax returns.

On a broader scale, our contribution aligns with the growing literature on optimal tax administration and tax collection under weak enforcement (Keen and Slemrod, 2017). For instance, in the realm of business taxation and administrative reforms, recent work has studied the monitoring effects of large taxpayer offices on compliance, proving highly effective (Almunia and Lopez-Rodriguez, 2018; Basri et al., 2021).³ As low- and middle-income countries develop, the barriers to implementing more sophisticated tax collection systems decrease, and appointing large firms to collect taxes from trade partners in advance could become a viable tool to raise more revenue, as our work shows.

The paper is organized as follows. Section 2 provides details about the turnover tax, data sources, and the two reforms. Section 3 presents a conceptual framework to assess how changes in tax collection might affect firm behavior. Section 4 documents the expansion of the withholding scheme and its direct effect on CAs. Sections 5 and 6 study the indirect effect on linked taxpayers from increases and decreases in withholding. Section 7 concludes.

³For cutting-edge research on property tax collection see Khan et al., 2016, Balán et al., 2022, and Bergeron et al., 2021.

2 Context, Data, and the two Reforms

2.1 Subnational Turnover Taxes in Argentina

The turnover tax (TT) is a subnational tax levied on firms' revenue with no deductions for costs. It applies to all transactions taking place in the supply chain—that is, business-to-business and business-to-consumer transactions. This implies that it creates “cascading effects” in which final goods are taxed multiple times throughout production and thus incentivizes vertical integration. Despite its distortive effects, the tax is simple to calculate and administrate relative to other taxes, which explains why it is used in all of the twenty-four jurisdictions in Argentina.⁴ In fact, it constitutes the main subnational revenue source, accounting for about 75% of the total tax collected in the City of Buenos Aires.

How is the TT collected? The TT is filed monthly and it can be paid directly by taxpayers (standard method) or collected indirectly by third parties (withholding method). Under direct payment, taxpayers log on to the tax administration's website at the end of the month, and self-report the gross income accrued in each activity over that month; the system applies the corresponding tax rate and generates a payment coupon. Under the withholding method, the tax administration can designate firms, banks, or credit and debit card companies to operate as collection agents (CAs). In the case of CA firms, every time a client purchases inputs from a CA or a supplier sells goods or services to a CA, part of the invoice amount is withheld by the CA and remitted to the tax authority. Hence, these are regular firms that have the extra task of withholding from their trading partners. In the case of CA banks, every time a payment is deposited in the bank account, the bank withholds part of it and remits the funds to the tax authority. In the case of CA card companies, every time a transaction is made with a debit or a credit card, the card company withholds part of it. In all these cases, taxpayers still have to file taxes at the end of each month but the withheld amount constitutes a credit in favor of the taxpayer who can discount it from the tax liability before making any payments.⁵

⁴For recent research about such distortions see Bilicka et al. (2022) and Hansen et al. (2021). Hansen et al. (2021) show that the tax is re-emerging in the US, where nine states are currently using it. They attribute this to the following facts: (i) the large tax base (the TT taxes services, while retail sales taxes do not) can generate large revenues with low rates, (ii) retail sales taxes share its main drawback of taxing inputs, and (iii) its broad tax base limits firms' tax evasion opportunities.

⁵For more details about the TT and the way it is collected, see [Appendix A](#).

2.2 Administrative Data

We combine two data sets derived from information collected by the Tax Administration Office in the City of Buenos Aires (*Administración Gubernamental de Ingresos Públicos* or AGIP, for its Spanish acronym). The first data source consists of monthly tax declarations for nearly the entire universe of firms operating in the city in the period 2015-2020.⁶ These declarations are filed electronically through an account that each taxpayer has with the tax administration. We observe all line items completed in a standard filing procedure (anonymized taxpayer identifier; sales;⁷ tax liability; the amount of tax withheld from different sources; outstanding credits or debits) and a series of firm characteristics used to determine the corresponding tax and withholding rates (firm type: small or large; industry: 995 six-digit codes; location: local or out of province).

To construct our second data set, we leverage a unique feature of our setting: firms acting as CAs are required to file a supplementary “invoice summary” that lists all their purchases and sales in a given month. The line items included in this form are: the taxpayer identifiers of both parties involved in the transaction, the total value of the transaction, the amount withheld, and whether the transaction was a purchase or a sale. We use these filings to trace out commercial linkages between CAs and their commercial partners. A limitation of this data source is that trade linkages are only observed when a firm becomes a CA—that is, when it starts filing the supplementary form that records the transactions. This implies that for some firms we observe linkages since the beginning of our sample in 2015, while for firms linked to CAs appointed under the reform, we observe linkages only at or after November 2016.⁸ In Section 5, we elaborate more on how this limitation might affect our estimates.

Combining the two sources of data, we obtain a panel of over 180,000 firms and 1.6 million client-supplier pairs spanning 2015 to 2020. Table 1 presents summary statistics for the period prior to the 2016 reform. Panel A describes the full sample, which contains over 180,000 firms and over 9,000 CAs. Overall, the firm-size distribution in terms of revenue is right-skewed. CAs are orders of magnitude larger than regular firms which corroborates the enrollment heuristics followed by the government of having large firms act as CAs. Panel B corresponds to the estimating sample used in Sections 5 and 6. When evaluating the response of taxpayers, we restrict the sample of firms to those that file taxes

⁶Appendix B explains in detail the way in which data were pulled from AGIP’s servers.

⁷Technically, the tax base is “gross income”—which is the amount that a business earns from the sale of goods or services, before the deduction of expenses. For simplicity, we refer to the tax base as “sales.”

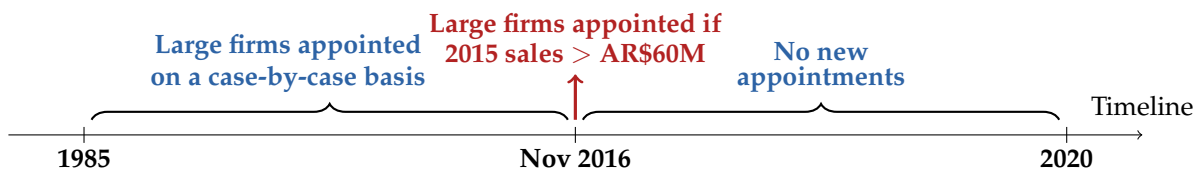
⁸Figure H.1 illustrates the process by which we construct our full data set and stresses the sequence in which the information is revealed.

regularly (we drop firms that report positive sales in less than 50 percent of the periods).⁹

Our main focus is on withholding by firm CAs. However, we also analyze a policy reform that temporarily eliminated the withholding by banks on a subset of firms. In Section 3, we provide more details and describe the practical implications of the tax collection mechanisms—here, instead, we focus on describing the expansion of the withholding scheme by CAs, the main source of variation in our analysis.

2.3 Reform 1: A Sharp Expansion in the Net of Tax Collectors

Withholding by CAs was introduced in the City of Buenos Aires in 1985; between 1985 and 2016 some large firms were appointed as CAs on a case-by-case basis. These firms had to withhold part of the taxes owed by their commercial partners whenever there was a purchase or a sale. In July 2016, a resolution was passed to expand the set of firms acting as tax collectors.¹⁰ It established a new appointment criterion based on sales: firms whose annual sales in 2015 were greater than AR\$60 million would be automatically enrolled as CAs.¹¹ Newly appointed firms were notified in October and started their collection duties in November 2016. Importantly, all the firms who were operating as collectors before this reform, remained in the tax collection scheme regardless of their revenue and, since this was a one-time reform, no new appointments were made from 2017 through 2020. For clarity, we summarize the timeline in the diagram below.



The immediate implication of the reform was a sharp increase in the number of CAs. Figure 2 plots the number of firms acting as CAs over time.¹² Its pattern exactly matches the timeline described above: the number of active CAs gradually increased in the period

⁹We provide further insight about the data in Appendix D, where we document the variation used in the paper in more detail and without imposing any sample restrictions.

¹⁰AGIP resolutions number 364, 421, and 486 from 2016. Figure H.2 shows a newspaper article describing the reform as a major tax change in the jurisdiction.

¹¹This corresponds to roughly USD 6 million in 2015 affecting the top 3% of firms of the sales distribution.

¹²Figure H.3 shows an example of the register of withholding agents published monthly by the tax administration. We digitized these files and constructed a database which we merged with our main data. The list of CAs is quite diverse in terms of sector with coffee producers, pharmaceutical firms, insurance companies, footwear manufacturers, and construction wholesalers, among others.

prior to the reform; between October 2016 and November 2016, however, the number of CAs more than doubled (it increased from 3,656 to 8,664 from one month to the next), and remained mostly unchanged afterward (the slight decrease is explained by a few firms exiting the sample, which is standard behavior). These newly appointed CAs began to withhold the tax from their commercial partners which increased the share of taxpayers' tax liability collected indirectly at source by CAs *in lieu* of direct payments.

2.4 Reform 2: A Decrease in Withholding by Banks

We analyze another policy change that took place during the period of our study that—unlike the reform described so far—reduced exposure to withholding for a group of firms. In September 2018, the city's tax authority suspended the withholding by banks on the financial transactions of firms whose sales in 2017 were below AR\$10 million (the 80th percentile). This measure was part of a relief plan targeted at small and mid-sized enterprises during a mild economic downturn. Although this suspension was initially meant to last six months, it was extended twice until January 2020.¹³ We use this second reform to the city's tax collection mechanism as a quasi-experiment to test whether a reduction in the share of taxes collected via withholding leads to a fall in reported tax liability.

2.5 Macro Evidence of the Reform

A striking feature of the reforms analyzed in this paper is that the implied changes in tax collection can be visualized in aggregate time series. Such changes indeed highlight their economic relevance at the time.

Interestingly, the 2016 expansion of the withholding system—although neutral in theory—ended up increasing tax revenue for the government. [Figure 3](#) provides macro evidence of the reform using aggregate and public time series data from the tax authority.¹⁴ The first two panels show the growth in the relative importance of withholding by CAs: both the share of TT collected through withholding and the amount of revenue raised by CAs experienced a sharp increase right at the time of the first reform. The series keeps increasing during 2017, suggesting some sluggish adjustment of newly appointed firms (which we confirm in the microdata analysis).

¹³The first update was in March 2019, extending the waiver for six months. The eligibility threshold was also updated to AR\$15 million based on sales from 2018.

¹⁴We find it striking that the effects of the reform were large enough to be visible in aggregate time series. These figures are in fact the reason that motivated us to pursue this project.

The third panel in [Figure 3](#) shows the aggregate effect on revenue. It compares tax revenue in the City of Buenos Aires with that in the Province of Buenos Aires. These are the largest jurisdictions in the country in terms of economic activity, and their economic performances track each other closely, making each one a natural benchmark for the other. Specifically, the figure shows the percentage difference in tax revenue between the two jurisdictions relative to October 2016. This is analogous to running a difference-in-differences regression and, therefore, captures the aggregate causal effect of appointing firms as CAs (that is, it captures both direct and indirect effects). The graph shows that the City of Buenos Aires, relative to the province, was on a downward tax revenue trend, which reverted right after the first reform kicked in in November 2016. By 2019, the City’s tax revenue was 20% higher than the Province in the baseline period.

The macro evidence thus suggests that doubling the net of tax collectors had a large aggregate impact. Our goal in the remainder of the paper is to flesh out the direct and indirect effects across taxpayers.

3 Conceptual Framework

In this section, we describe how tax collection works in practice and provide some insights on how changing the tax collection mechanism might affect firm behavior. [Figure 4](#) summarizes the main features of the direct payment and withholding mechanisms in a simplified setting with four agents: supplier, retailer, consumer, and tax administration. The supplier sells inputs to the retailer, which pays X for the goods. In turn, the retailer takes the inputs and turns them into final goods, which are sold to the consumer, who pays Y for them. As described earlier, all firms along the supply chain are liable for the tax. In our setting, the supplier faces a tax rate τ_S and the retailer faces a tax rate τ_R , while the withholding rate (a fraction of τ) is represented by $\alpha \in (0, 1)$.

Under the direct-payment mechanism, taxpayers self-report their sales to the tax authority at the end of the month. The supplier reports X , and the total tax liability for the period is $\tau_S X$. Likewise, the retailer reports Y such that its liability is $\tau_R Y$.

Under the withholding scheme, firms acting as CAs are in charge of withholding a part of the total tax liability from their commercial partners and remitting this amount to the tax administration. This task is performed in addition to their own duties as taxpayers to remit their own tax payments.

Withholding may be performed by either the seller or the buyer. When the seller acts

as CA, it adds the withheld tax to the total sale amount. In our setting, this is represented by the supplier charging an extra amount for the sale to the retailer, $X(1 + \alpha\tau_R)$, which is then remitted to the tax administration (along with the seller’s own taxes). When the retailer’s tax is due, it will only pay the outstanding balance that remains after deducting the remitted amount from the total tax liability, $\tau_R Y - \alpha\tau_R X$. When the buyer acts as CA, it subtracts the withheld tax from the total purchase amount. In our setting, the retailer pays $X(1 - \alpha\tau_S)$ to the supplier and remits $\alpha\tau_S X$ to the tax administration. In this case, the supplier is entitled to deduct $\alpha\tau_S X$ from its tax bill $\tau_S X$ before making the final payment.

Withholding through CAs changes two main aspects of tax collection: *who* remits and *when* the tax is paid. Under the direct-payment mechanism, the tax is filed by the liable party on the due date. In contrast, under the withholding mechanism, the tax is paid by a third party in advance; the tax is withheld at source and remitted regularly. These changes carry associated implications for both the collecting party and the taxpayer.

For CAs, appointment leads to closer scrutiny and increased penalties if they do not fulfill their role as CAs. Thus, the appointment itself might trigger changes in enforcement perceptions that lead to an increase in reported sales for firms that were previously underreporting (see Brockmeyer and Hernandez, 2019). Additionally, withholding is an administrative burden, as it requires CAs to keep a register of transactions with trading partners and to file an additional form detailing such transactions. As pointed out by Slemrod (2008), this burden might be offset by the “cash-flow benefit” of withholding: CAs may hold onto the funds they withhold from the time of collection until the time of remittance, giving them the equivalent of an interest-free loan. However, in our setting, the magnitude of these two contrasting forces and the changes in enforcement perceptions are likely to be small for three reasons. First, the collection process is highly streamlined: when a firm is appointed CA, it is provided with tax collection software that automatically incorporates withholding into its transactions.¹⁵ Second, firms must transfer the withheld funds every month following a pre-specified schedule that only allows for a small window of time between the transaction and the remittance deadline during which they could dispose of the funds. Third, the authority appoints very large firms as CAs (the top 3%) for which evasion rates are usually close to zero (e.g., Kopczuk and Slemrod, 2006; Best et al., 2021). Firms with such scale tend to truthfully report their gross sales (the tax base in our setting) and, at best, might engage in another type of creative accounting (e.g., Alstadsæter et al., 2019).

For linked firms, on the other hand, there are three implications of switching to the

¹⁵The software [e-ARCIBA](#) constitutes the source from which our business-to-business data are extracted.

withholding collection mechanism. First, withholding enables each business-to-business transaction to be recorded in two places, generating third-party information. This may alter enforcement perceptions since the information could be used by the subnational tax administration to detect non-complying firms. Note, however, that the self-enforcing properties of a coexistent federal VAT somehow limit the extent of this channel, at least for VAT-registered firms whose transactions were already leaving a paper trail. Any response driven by this channel would thus require firms to report sales differently to the federal and subnational agencies. Presumably, sales are lower in the City of Buenos Aires if firms believe that VAT information is not shared across agencies. Second, the withheld amount itself may act as a lower bound on self-reported sales. If a firm reports sales such that the tax owed is lower than withholdings, the resulting difference will accumulate as a credit. This behavior is usually regarded as an indicator of underreporting by the tax authority and may lead to future audits if it persists over time. For this reason, taxpayers will try to avoid reporting sales such that their tax liability falls below the withheld amount. Hence, the withheld amount defines a lower bound on reported sales.

These two implications can be further rationalized using the framework of firm tax evasion under third-party reporting developed by Carrillo et al. (2017), Brockmeyer and Hernandez (2019), and Waseem (2022). These papers primarily consider settings in which there is a VAT or sales tax, which allow for cost deduction. Our setting is slightly less complex because the TT does not allow for any type of deduction. Consider a firm that is already operating with CAs and thus subject to some withholding. If evasion costs are sufficiently low, it will underreport sales up to the point at which the tax owed is completely offset by withheld funds. When a new trading partner is appointed CA and additional transactions become subject to withholding, the firm can only avoid falling into negative liability territory by increasing reported sales. Therefore, we should expect to see an increase in reported sales for firms more exposed to withholding. We should also expect to see an upward shift in the distribution of tax liability as firms try to bunch close to the lower bound set by withheld funds. As shown in Pomeranz (2015), we would expect the response of reported sales to be stronger in sectors in which informality is high or at the retail stage in which the cost of evasion is lower.

The final set of implications has to do with the commercial linkages maintained by CAs and their partners. If withholding implies that a firm subject to it ends up facing a higher effective tax rate or closer scrutiny, the firm may decide—whenever possible—to switch/substitute trading partners to non-CAs to minimize its tax burden. Thus, over time, we might expect some trade links to break, become less frequent, or decrease in

volume. This reasoning goes in line with Gadenne et al. (2020) who document how tax systems can distort firm-to-firm trade decisions in markets where VAT and non-VAT-paying firms co-exist leading to segmentation of supplier networks. Moreover, whenever the commercial link is maintained between two firms, the incidence of the withholding-induced tax cost could be shared between the two parties depending on the relative bargaining strength of each side. Additionally, it is conceivable that third-tier commercial partners are affected through a ripple effect across the supply chain, even if they are not directly involved with CAs.

4 Expanding the Net of Tax Collectors: Implementation and Direct Effects

We start the analysis by documenting the expansion of the withholding scheme. We provide graphical evidence of whether the appointment rule worked in practice and how quickly the newly appointed CAs started withholding from linked firms; we find that take-up was high and firms took on their new role quickly. Next, we analyze the response of appointed firms using a fuzzy regression discontinuity design (RD) based on the discrete change in the probability of acting as a CA at the eligibility threshold. Our results suggest that CAs' business activity evolved similarly around the threshold over time. We interpret this as evidence that the policy did not cause any significant changes in their business structure.

4.1 Documenting the Expansion of the Withholding Scheme

Implementation of the appointment rule. The appointment rule of the 2016 reform to the withholding scheme established that firms whose sales in 2015 were at least AR\$60 million would be automatically enrolled as tax collectors. [Figure 5a](#) shows the 2015 sales distribution around the appointment-rule eligibility cutoff. It is immediately apparent from its inspection that firms targeted by the reform were among the largest in the economy: the AR\$60 million cutoff roughly corresponds to the 97th percentile of the firm-size distribution. More importantly, the graph displays no discontinuities or bunching around it, which confirms that firms were not able to manipulate the assignment variable used by the authority to appoint firms into the withholding scheme. This result is unsurprising as the resolution that set the guidelines for the reform was enacted in July 2016, leaving

virtually no space for firms to adjust their 2015 sales. Hence, we can safely use firms with sales in 2015 close to AR\$60 million to explore the direct effect of being appointed as a CA.

According to the appointment rule, all the firms above the AR\$60 million threshold should have been appointed to act as tax withholders. In practice, however, the tax administration reserved the right to include or exclude firms in specific industries from the collection scheme, regardless of their 2015 sales (AGIP resolution 364, articles 1 and 29). [Figure 5b](#) illustrates with raw data how binding this rule was. On the horizontal axis, we place the running variable and split it into equally-spaced bins of size AR\$10 million; the vertical axis shows the probability of treatment (that is, of being appointed as a CA) for firms within these bins. The figure shows that the rule was followed closely, albeit imperfectly. About 40 percent of firms with sales between AR\$50 and AR\$60 million (the first bin below the cutoff) were enrolled as CAs despite being ineligible and about 80 percent of firms above the cutoff were effectively enrolled.¹⁶ Importantly, although the assignment was not sharp, there is a discrete jump in the probability of treatment at the threshold which, together with the smooth density around the cutoff, allow us to use a fuzzy regression discontinuity design.

Expansion of the withholding net. Appointment of CAs by itself may not lead to any changes in tax collection if the firms selected for the task do not fulfill their duties. To ensure compliance, the tax administration closely supervises their activities and has set up fines for those who omit to withhold or delay the remittance of funds. The next figures are intended to show that appointed firms rapidly took up their new duties. To do so, we compare CAs appointed in November of 2016 with a group of preexisting CAs appointed in 2012 who we use as a benchmark of what we would expect to be a “normal” behavior from firms that are already established in their roles as CAs.

[Figure 6a](#) analyzes the extensive margin of collection duties: for each month it shows the proportion of CAs in each group that are withholding from their commercial partners. It takes roughly a year for newly appointed CAs to fully take on their role which matches the behavior documented in [Figure 3](#) for the aggregate outcomes. Nevertheless, their starting point is very high: in the first month after the appointment, about 75 percent of new CAs are actively withholding from other firms. [Figure 6b](#), in turn, shows the intensive margin of collection duties: for each month it shows the average number of firms whose

¹⁶In Appendix [Figure H.5](#) we re-create [Figure 5b](#) grouping firms by industry classification. The figure highlights the varied treatment observed across different sectors. Some industry groups exhibit minimal deviations from the appointment rule, as evidenced by Hotels, Food and Recreation Services, and Financial and Real Estate Services. Conversely, others, such as Manufacturing and Transportation, demonstrate a less stringent adherence to the rule. We see this as suggestive evidence of the level of discretion exercised by the tax administration in the formulation of the collection scheme.

taxes are withheld by old CAs (light blue line) and new CAs (dark blue line). On average, newly appointed CAs trade with more than 50 firms, either purchasing inputs from them or selling goods to them. This is remarkably stable during the period of analysis. In each transaction, the new CAs now withhold part of the tax on behalf of their trade partners as an advance payment. Note also that new CAs withhold from fewer firms than old CAs. This might be because they are smaller or younger than preexisting CAs.¹⁷ Taken together, the evidence suggests that the policy was successfully implemented in practice.

4.2 Direct Effects on Newly Appointed Collection Agents

We now analyze whether newly appointed CAs respond by adjusting their reported sales after the reform. The sign of this response is in principle ambiguous, as explained in Section 3. Notwithstanding, a muted response would constitute suggestive evidence that the activity of large firms is not affected when they are tasked with collecting taxes from their commercial partners.

Following the description in Section 4.1, we use a fuzzy RD framework focusing on firms whose sales in 2015 were close to AR\$60 million. We identify the response of firms to enrollment as CAs by running regressions of the following form:

$$y_i = \alpha + \beta \cdot 1(R_i \geq c) + \gamma \cdot (R_i - c) + \varepsilon_i. \quad (1)$$

where y_i denotes the outcome of interest for firm i for any given year, $c = \text{AR\$60 million}$ is the cutoff set by the reform, and R_i is the running variable, 2015 sales. The coefficient of interest capturing the effect of the discontinuity at c is β . In the first stage, we estimate a discrete change in the probability of a firm above the threshold to be appointed as a CA in November 2016. We then analyze whether firms adjust their (log) reported sales in response to enrollment.

Table 2 reports the first stage and the reduced form effects at the cutoff, as well as the 2SLS estimates from a fuzzy RD specification. Column 1 shows the first-stage change in the probability of a firm above the threshold being appointed as a CA in November 2016 (the coefficient is analogous to the size of the jump in the probability of treatment shown

¹⁷Table H.1 provides an in-depth comparison of new and old CAs across a series of characteristics. Overall they appear to be similar. The main differences are the type of activity (new CAs are more likely to be of the primary sector), the type of withholding (new CAs are more likely to be the sellers in the transaction and withhold downstream), the degree of compliance with the withholding duties (new CAs are more likely to experience delays in remitting the withheld funds, but for shorter periods), and the transaction partners they have (for new CAs they are more likely to be of the primary sector and relatively larger).

in [Figure 5b](#)). Columns 2 through 5 correspond to the effect on reported annual sales (these coefficients are represented graphically in [Figure 7](#)). Column 2 excludes the two treated months of 2016, November and December, and thus the results can be interpreted as a placebo test, as the column only contains pre-reform sales.

Although the 2017 coefficient for the extensive margin effect is statistically significant at the 10% level, our interpretation leans towards a null effect, as illustrated convincingly in the graphical evidence, suggesting that new CAs did not respond by changing their reported sales. Due to the small sample size, our point estimates are rather imprecise. To gauge the magnitudes of the effects we can rule out consider, for example, the year 2019. In the case of the extensive margin, the mean below the cutoff is 0.90, and the 95% confidence interval ranges from 0.80 to 1.26. Similarly, for the intensive margin, the mean below the cutoff is 11.02, and the confidence interval spans from -5.27 to 19.49. We attribute these null results to the fact that appointed firms were among the largest and most formal firms in the economy, so tax collection duties might not saddle them with significant compliance costs nor change their perception of tax enforcement (Kleven et al., 2016).¹⁸

The results shown in this section suggest that firms that became CAs did not change their behavior in response to enrollment. If tax collection duties did not induce any large changes in the business structure of newly appointed CAs, then it is likely that there were no other fundamental changes in their interactions with trading partners. In our view, this helps to reduce the concerns about potential confounding factors in the analysis that follows, where we study how taxpayers react when their business partners become CAs.

5 How Do Firms Respond to an Increase in Withholding?

In this section, we study the indirect implications of expanding the withholding scheme. We ask how firms who were previously paying the tax through direct payments respond to an increase in withholding by CAs. The ideal policy experiment would randomly allocate CAs throughout the economy and compare the response in reported sales of firms that are commercially linked to these CAs to those that are not. However, alas, this is politically unfeasible. Notwithstanding, we can leverage the design of the reform and

¹⁸We recognize that solely examining reported sales may not tell the whole story. Large firms, for example, might be affected by the tax collection task in other non-pecuniary dimensions. Nonetheless, [Appendix Figure H.6](#) shows that new and old CAs exhibit remarkably similar and minimal delays in remitting tax withholdings after the due date. Additionally, CAs might potentially shift the incidence to other tax bases (e.g., profits), prices, or wages. We leave these potential margins of responses as areas for future research.

use the built-in variation in exposure to CAs to identify a causal effect of withholding on reported sales.

More specifically, we rely on the following quasi-experiment: for regular taxpayers, the expansion of the withholding scheme and the consequent increase in the number of CAs meant that it became more likely to be subject to withholding by CAs in their commercial network and, therefore, tax collection became less reliant on direct payments of the tax as it was replaced by withholding at source.

The key econometric challenge that must be tackled to estimate the effect of withholding on self-reported sales is to distinguish it from other time-varying shocks that might have taken place around the time of the reform. To address this issue we implement a difference-in-differences (DD) design relying on taxpayers' differential exposure to newly-appointed CAs. Since firms can have different commercial partners, those that happened to be connected to firms above the revenue size threshold became more exposed to CAs than others. While the choice of trade partners itself is not exogenous, firms certainly could not influence whether their partners were appointed as CA or not. Hence, the increase in exposure to CAs was arguably exogenous to taxpayers.

We use trade linkages to construct two distinct groups of firms: those that are connected to newly appointed CAs (our treatment group, T) and those that are not (our control group, C). Firms in T have commercial ties with CAs appointed in November 2016 and therefore experienced an increase in the number of CAs in their network at the time of the reform. Firms in C only trade with preexisting CAs and do not experience a change in the number of CAs in their network of commercial partners. Note that firms in T might also have commercial ties with preexisting CAs; the key difference between T and C is the presence of linkages to newly appointed CAs.

In an ideal setting, the two groups would be constructed according to commercial linkages observed in a baseline period prior to the reform. However, as explained in Section 2.2, due to the way the transaction-level data is reported, we do not observe a firm's commercial linkages unless one of its business partners becomes a CA. For firms connected to new CAs, this implies that the first observed transaction is in November 2016 at the earliest. To circumvent this issue, we assume that trade links remain stable for six months and, therefore, any purchase or sale observed up to six months after the reform is informative about pre-existing commercial linkages before the reform. Then, we classify into T any firm that transacts with a newly appointed CA between November 2016 and April 2017 and classify into C those that only transact with preexisting CAs during the same period. Our results are robust to changing the bandwidth of months used to

construct the two groups.

Our DD design compares firms that experienced an increase in the number of CAs relative to firms that did not. Under the assumption that the two groups would have behaved similarly in the absence of the policy change, their comparison will reveal the causal effect of an increase in the share of tax collected through withholding on taxpayer behavior. Coefficient β in the following regression captures this effect:

$$y_{it} = \beta \cdot Treat_i \cdot Post_t + \theta_i + \gamma_t + \varepsilon_{it}. \quad (2)$$

Here y_{it} is the outcome for firm i in period t , $Treat_i$ is an indicator for firms in the treatment group, $Post_t$ is an indicator for time periods after November 2016 (the reform date), θ_i are firm fixed effects, and γ_t are time-period fixed effects. We focus on the following outcomes. To gauge the first-stage results of the reform for taxpayers, we look at the number of CAs (extensive margin) and the share of tax withheld (intensive margin). The behavioral response is captured by self-reported sales and tax liability.¹⁹ Although the data are provided at the monthly level, we aggregate them to the quarterly level to avoid some issues that are present in the most granular definition, such as the fact that some firms report zero sales in a given month and that large seasonal fluctuations in economic activity are related to the combination of the holiday season and the end of the fiscal year. In doing so, we define quarters relative to the reform (that is, the quarter of the reform, $t = 0$, corresponds to November 2016 through January 2017). We restrict the time frame of our regressions to all available quarters from the pre-period (starting November 2015) to the last quarter of 2019 (ending January 2020, before the COVID-19 pandemic began to take a toll on economic activity). Having defined the time variable in this way, we construct a balanced panel of firms that report positive sales in at least half of the periods in which they are present in the data.

To trace out the dynamics of T and C both before and after the reform, as well as the DD effect, we estimate a dynamic DD relative to the quarter before the reform:

$$y_{it} = \sum_{t=-q}^{-2} \delta_t \cdot D_{it} + \sum_{t=0}^m \beta_t \cdot D_{it} + \theta_i + \varepsilon_{it}. \quad (3)$$

Here D_{it} is an indicator for each quarter relative to the baseline period, August-October 2016 ($t = -1$). The coefficients δ_t and β_t estimate the effect on the outcome of interest

¹⁹Recall that the TT does not allow for the deduction of costs, then tax liability is equal to the tax rate multiplied by the tax base (reported sales). Nevertheless, analyzing both reported sales and tax liability will allow us to cross-validate our results.

for each period relative to the baseline, net of firm fixed effects. This specification provides compelling visual evidence of the validity of the identification assumption, as the coefficients δ_t reveal pre-reform trends.

5.1 Empirical Results

Figures 8 and 9 show the dynamic DD estimates. The left panels show the levels for T and C (i.e., the time dummy coefficients plus the constant for each group). The right panels display the δ_t and β_t coefficients of Equation 3. In addition, Table 3 Panel A reports the DD estimates from Equation 2.

Figure 8 provides evidence on the first stage of the reform: the change in the number of commercial partners acting as CAs and in the share of due taxes withheld at source. The first panel shows that the number of CAs connected to firms in T rose by an average of 3.5 in the months after the reform, while remaining unchanged in C, and that this post-reform gap persists throughout the study period. The second panel shows that the share of tax withheld by CAs exhibits a similar pattern, rising by about 15 percentage points in the T following the reform while remaining practically unchanged for C. Since the two groups track each other closely in the year prior to the reform and diverge immediately after, the evidence is consistent with the quasi-random assignment of the new CAs.

Figure 9 shows the analogous plots for the response of self-reported sales and tax bills to the increase in withholding. While both treatment and control exhibit nearly identical outcomes in the pre-reform period, they diverge markedly thereafter. Panel (a) shows that the sales of firms linked to newly appointed CAs outgrew those of firms unaffected by the withholding expansion. On average, sales are 5.8 percentage points higher relative to the pre-reform period and statistically significant.²⁰ Panel (b) shows that, as a result, these firms face higher tax liabilities. In consequence, the tax administration saw an increase in total tax collected after the reform, consistent with the macro evidence shown in Section 2.5. These findings strike us as remarkable and suggest that replacing direct tax payments with withholding by large commercial partners can be of first-order importance in efficiently enforcing and administering a tax system (Slemrod, 2019).

Is the effect compatible with a real increase in sales or rather an increase in reported sales? Since the data does not provide information on the volume of sales, it is impossible

²⁰The observed jump in the 7th quarter post-reform coincides with the onset of the second reform, which disproportionately impacted the control group from the first reform. This group, characterized by lower annual sales in 2017, was more likely to fall within the treatment zone of the second reform. As demonstrated in Section 6, this reform prompted firms to report lower sales.

to provide a definitive answer. Nevertheless, we interpret the evidence as suggestive of pre-reform sales underreporting: the sharp increase in reported sales in the first quarter following the reform, after nearly identical trends before the reform, is consistent with firms correcting their tax filings to match the withheld amounts collected and remitted by CAs. In addition, it would be hard to conceptually rationalize a real increase in sales due to higher withholding.

5.2 Firm-to-Firm Linkages and Treatment Assignment

As mentioned before, a limitation of our data and DD approach is that we do not observe whether newly appointed CAs and linked firms were indeed trading before November 2016. Hence, the assignment of treated units is based on post-reform data, which might introduce some misclassification bias.

In [Appendix E](#), we discuss the nature of this potential misclassification bias and conduct various robustness exercises that alleviate these concerns. First, we conduct two empirical exercises indicating that commercial linkages do not seem to break either immediately on impact or over time. We show that the number of linkages for new and old CAs remained unchanged for three years. Second, we show that our results are robust to alternative definitions of treatment and control, based on the number of months post-reform used to construct the trade linkages (ranging from one to twelve months).

5.3 Position in the Supply Chain

Our distinctive reform and dataset enable us to explore heterogeneous responses along the supply chain. We analyze the impact of an increase in withholding on downstream firms (withheld by CAs acting as sellers) versus upstream firms (withheld by CAs acting as buyers). Our strategy relies on isolating two subsets of treated taxpayers that have linkages with only one type of CA and comparing their outcomes to those of the baseline control group. Further details of this exercise are provided in [Appendix G](#).

[Figure G.5](#) reveals that the post-reform increase in self-reported sales, as documented in [Figure 9](#), is mostly driven by downstream firms, and is considerably weaker for upstream firms—7.9 percentage points and 2.5 percentage points, respectively. This finding is consistent with prior research indicating that firms positioned at the end of the supply chain are less likely to leave detectable paper trails and more prone to tax evasion (e.g., [Pomeranz, 2015](#); [Waseem, 2023](#); [Naritomi, 2019](#)).

6 How Do Firms Respond to a Decrease in Withholding?

We analyze the second reform to the city’s tax collection mechanism described in Section 2.4 as a quasi-experiment to test whether a reduction in the share of taxes collected via withholding leads to a decrease in reported sales and tax liability. Specifically, this reduction in withholding, combined with the AR\$10 million threshold used to determine eligibility, allows us to implement a difference-in-discontinuity design that uses firms’ sales in 2017 to construct treatment and control groups and then compare the groups’ outcomes before and after the policy change.

Figure 10 plots the assignment rule for the policy. We take bins of firm sales in 2017 and calculate the average share of tax withheld by banks in each bin for August and September 2018 (before and after the waiver, respectively). The share of taxes withheld by banks has no relation to the running variable in the month before the waiver. In the following month, however, there exists a decisive downward shift in the bank withholding share for firms just below the AR\$10 million threshold relative to those just above. Conditional on a firm’s sales in 2017, being granted an exemption from bank withholding is as good as randomly assigned for those that are close to the cutoff, therefore, this setting allows us to address any potential endogeneity concerns that remained from the previous analysis.

Moving on to the identification of firms’ responses, recall from Section 3 that noncompliant firms will try to underreport sales up to the point at which the tax liability offsets any withheld funds. If the coverage of withholding decreases, then the firm will be able to underreport more. We use a similar DD strategy to the one used in Section 5 to test this hypothesis. In this case, we compare firms on either side of the waiver eligibility cutoff: firms with 2017 sales between AR\$5 million and AR\$10 million are part of the treatment group, while firms with 2017 sales between AR\$10 million and AR\$20 million are part of the control group.

Figures 11 and 12, and Table 3 panel B display the results for this approach. Figure 11 shows the first-stage results for the share of taxes withheld by banks. The share of tax collected through bank withholding falls sharply right at the time of implementation for treated firms relative to those above the threshold. During the four-quarter period that preceded the waiver, the contribution of bank withholding to turnover taxes is very similar in the treatment and control groups and displays identical patterns. After the waiver, it falls from above 20 percent to just under 10 percent for the treated firms while remaining largely unchanged for the control firms; and this effect persists throughout the length of the waiver. Figure 12a shows that there is a corresponding 2.5 percentage point decline

in the reported sales of the treatment group relative to the control group after the waiver, even as the two groups track each other exactly before the waiver.

We find these results remarkable as they suggest that firms that were on the tax administration's radar until recently, immediately respond by reporting less truthfully after the coverage of withholding is reduced. This could be taken as evidence in favor of withholding predominantly serving as a lower bound on self-reported sales. We explore this mechanism further in [Appendix F](#). There, we take a stable subsample of firms exposed to both reforms and test whether their responses are symmetric to an increase and a decrease in withholding.²¹ While the size of the first stage is similar, self-reported sales respond more strongly to an increase than a decrease in withholding, at 4.6 versus -3.1 percentage points, respectively ([Figure F.2](#)). This may suggest that once firms "appear" on the radar of the tax authority in new ways, there may be a sustained compliance effect even as the extent of withholding decreases.²²

7 Concluding Remarks

In this paper, we studied the effects of delegating tax collection duties to firms. We analyzed the expansion of the withholding scheme used to collect the TT in the City of Buenos Aires, Argentina, which entailed an increase in the share of taxpayers' tax liability collected indirectly at source by CAs in lieu of direct payments to the tax authority. The setting allowed us to estimate both the direct effects of expanding the withholding scheme on the firms that were tasked with collecting taxes and the indirect effects on those that now faced an increase in the amount of taxes being withheld at source. We also studied a subsequent reduction in withholding and how firms respond to it.

Our results show that relying on large firms to withhold taxes from their commercial partners is an effective tax collection tool for two reasons. First, appointing firms to collect taxes did not hurt their activity. Second, substituting direct payments for withholding at source increased reported sales, which, in turn, increased tax revenue. Moreover, when the tax authority decreased withholding, firms responded by lowering their self-reported sales. Our interpretation is that, in weak-enforcement settings, withholding taxes in advance somehow forces firms to report their sales more truthfully (less truthfully when withholding decreases).

²¹We thank an anonymous referee for suggesting this exercise.

²²In [Appendix G](#) we further explore heterogeneity in responses by firm size and industry. Overall, larger firms in the primary sector exhibit slightly larger responses.

Taken together, our findings bolster the argument of recent research by Basri et al. (2021) showing that administrative reforms can be highly effective in raising revenue and building tax capacity. Moreover, we believe that our results could have important implications for the way countries determine how to collect taxes. At the initial stages of development, countries might lack the administrative and enforcement capacity to use firms as tax collectors but, as countries develop and improve their IT systems, substituting direct means of payment with indirect withholding schemes that rely on firms seems to be a promising path. Our findings and the nature of the studied reforms can thus guide other middle- and low-income countries on ways to determine who the right tax collector is as a function of the level of development.

However promising our results might be, we also consider that more research is needed to understand the broader implications of relying on firms to collect taxes. One clear limitation of this tax collection device is the fact that not all firms will be good candidates to perform as CAs. The question that remains open is: what are the limits to appointing firms as CAs? For sufficiently small firms, the burden associated with this task may outweigh the benefits accrued to the tax administration. Addressing this question is essential for refining tax collection strategies and ensuring they are both efficient and equitable.

Finally, the nuances and consequences of overwithholding emerge as an intriguing, yet unexplored, topic in our study. We have noted that tax administrations typically view a reported tax liability that is lower than the amount withheld as a sign of potential underreporting, prompting taxpayers to avoid such situations. In addition, it is conceivable for taxpayers to experience overwithholding without necessarily underreporting. Notably, a widespread practice among subnational tax authorities involves applying higher withholding rates on out-of-state taxpayers, thereby increasing the likelihood of these taxpayers accumulating credit balances. Since reclaiming these credits is often a cumbersome process, taxpayers might face liquidity constraints, potentially impairing their activities. This complex interplay between overwithholding and firms' finances represents the 'Achilles heel' of tax withholding systems and constitutes a critical avenue for future research.

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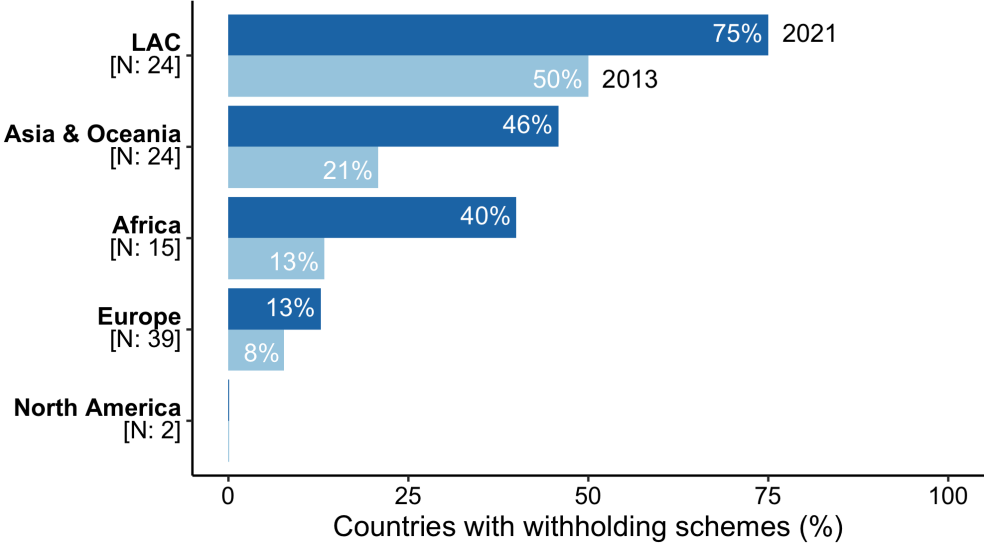
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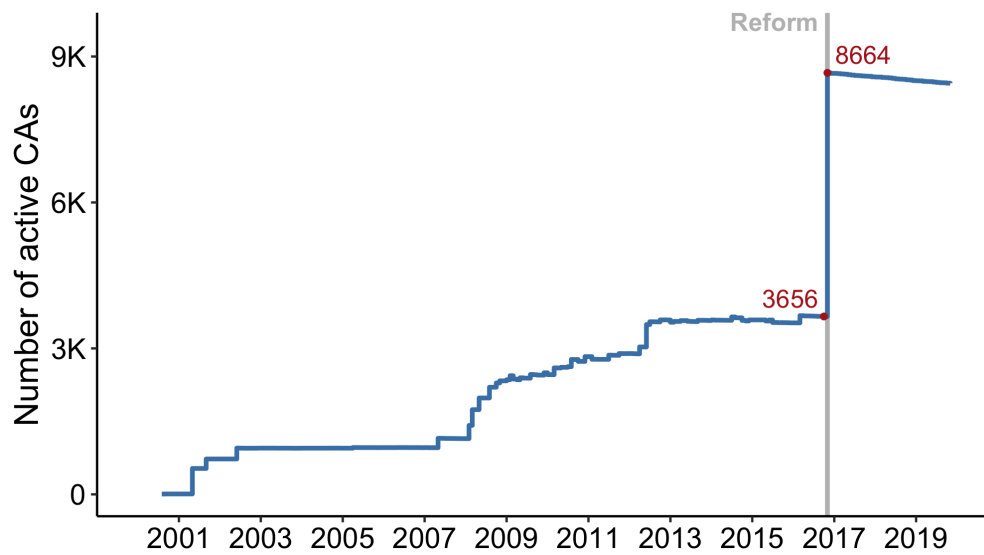
Figures

Figure 1: Withholding of indirect taxes has surged in less developed economies over the last decade



Note: This figure shows the prevalence of tax withholding by region and how it changed between 2013 and 2021. It groups countries into geographical regions and calculates the share of countries classified as having a withholding scheme for indirect taxes in 2013 (light blue bar) and 2021 (dark blue bar). We constructed this database using text-analysis techniques based on the information published by Ernst & Young in their yearly reports “Worldwide VAT, GST and Sales Tax Guide”. [Appendix C](#) explains in detail the process followed to scrape these data.

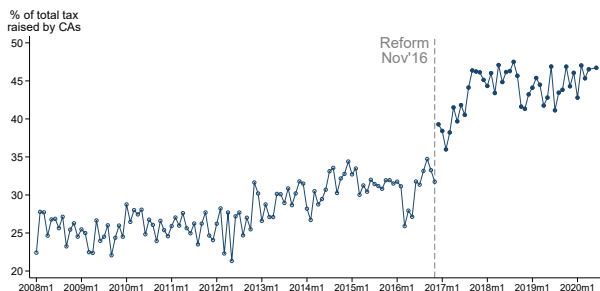
Figure 2: Number of firms acting as collection agents



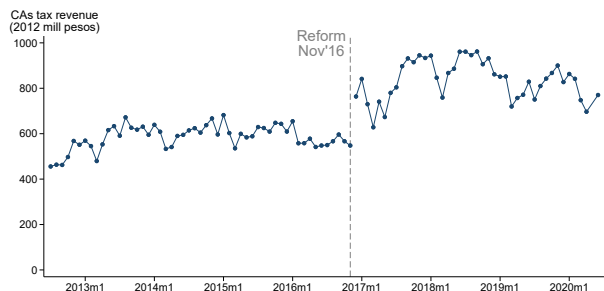
Note: This figure shows the number of firms that are part of the collection agent (CA) register at any point in time. It was constructed using the monthly CA register published by the tax administration as public information. By comparing successive months, we obtain the entry or exit status for each firm, independent of whether it is observed in our administrative tax records. See [Figure H.3](#) for more details on how we scraped the information. The gray vertical line corresponds to November 2016, the date at which the expansion of the withholding scheme entered into effect. Highlighted in red are the number of CAs in October 2016 and November 2016.

Figure 3: Macro evidence that documents the expansion of withholding

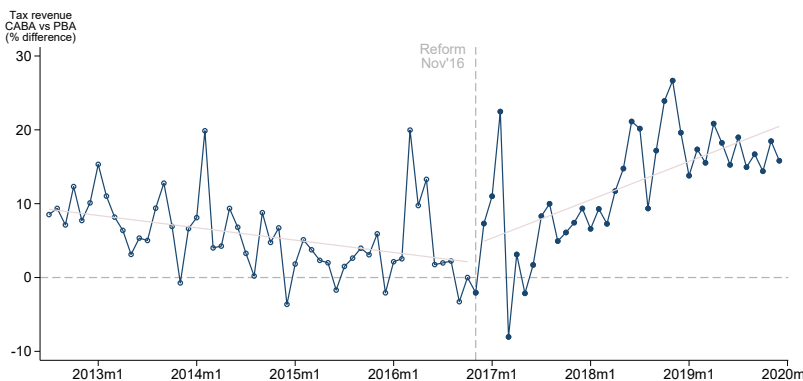
(a) Share of tax withheld by CAs



(b) Tax revenue raised by CAs



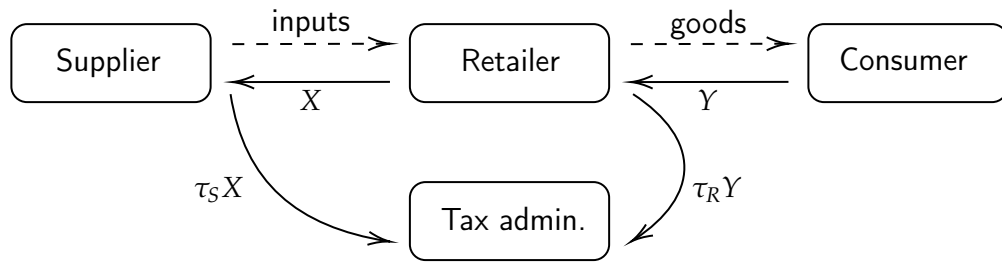
(c) Tax revenue: City of Buenos Aires vs. Province of Buenos Aires



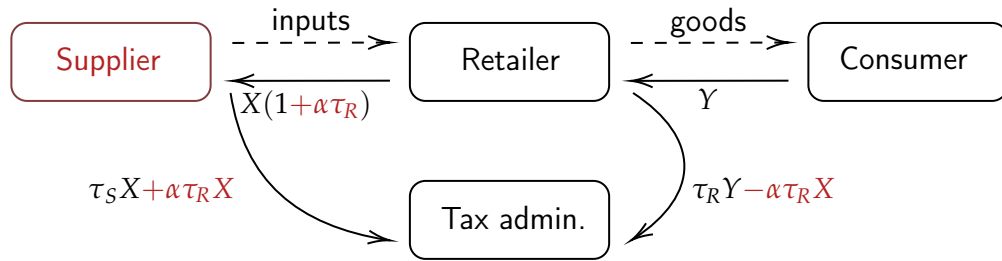
Notes: This figure documents the expansion of the withholding scheme in the City of Buenos Aires by plotting the evolution of aggregate outcomes over time. Panel (a) shows the share of total turnover tax revenue raised via withholding by collection agents (CAs). Panel (b) shows the levels of revenue raised by CAs in real terms. Panel (c) shows the percentage difference in turnover tax revenue between the City of Buenos Aires and the Province of Buenos Aires relative to October 2016, the month before the reform. The graph includes a separate linear fit before and after the reform. The dashed vertical lines indicate the timing of the reform. Source: Own elaboration based on aggregate data from “Dirección General de Estadística y Censos (Ministerio de Hacienda y Finanzas GCBA).”

Figure 4: Tax collection mechanisms

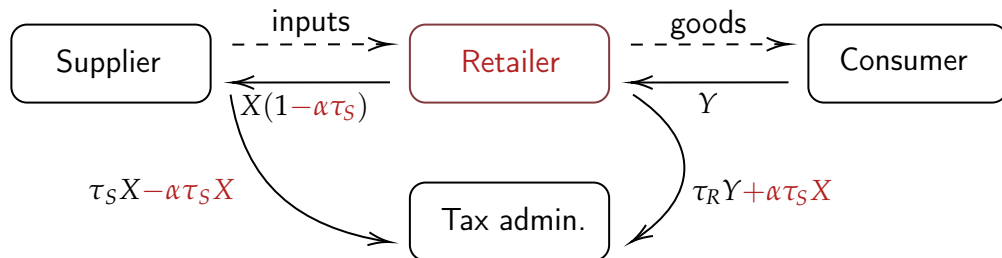
Direct payment



Withholding by seller (supplier)



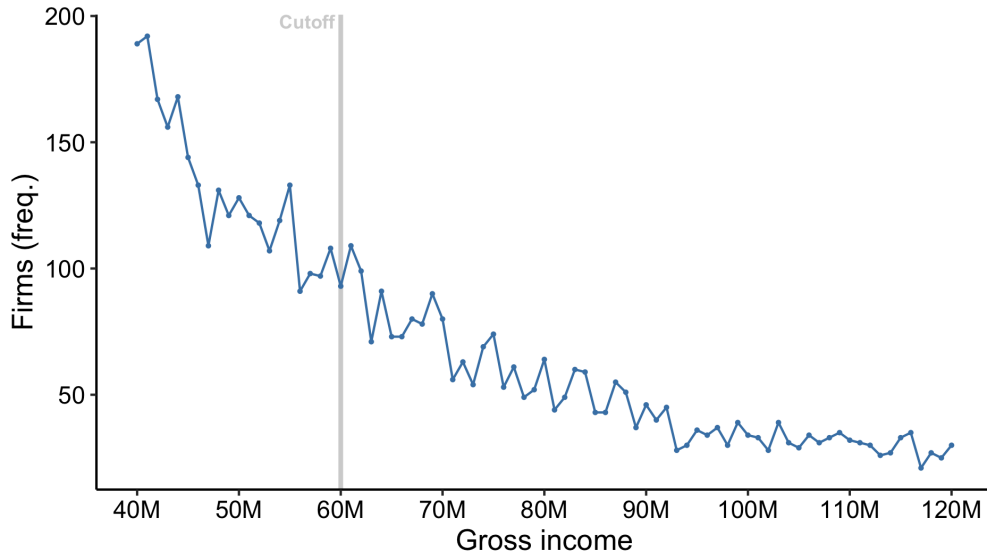
Withholding by buyer (retailer)



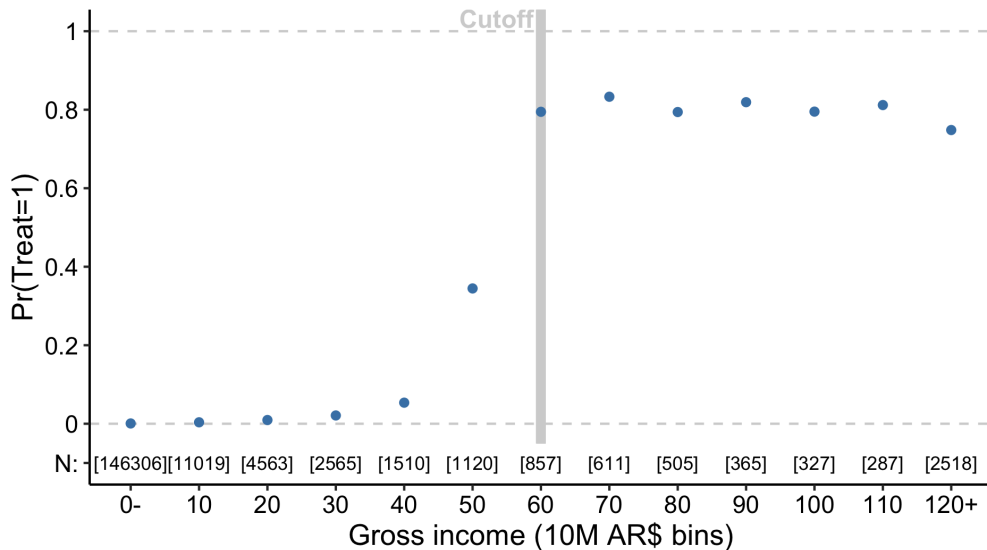
Note: This figure summarizes the main features of the direct-payment and withholding tax collection mechanisms. The supplier and retailer have sales that are liable for the turnover tax. The first diagram represents a setting where the supplier and retailer self-report their sales to the tax administration. The other two diagrams depict scenarios where either the supplier or the retailer act as a collection agent (CA). In each of these cases, the party acting as CA is highlighted in red as are the amounts withheld and remitted by the CA.

Figure 5: Running variable and the probability of becoming a collection agent

(a) Pre-reform annual sales distribution around the appointment-rule cutoff

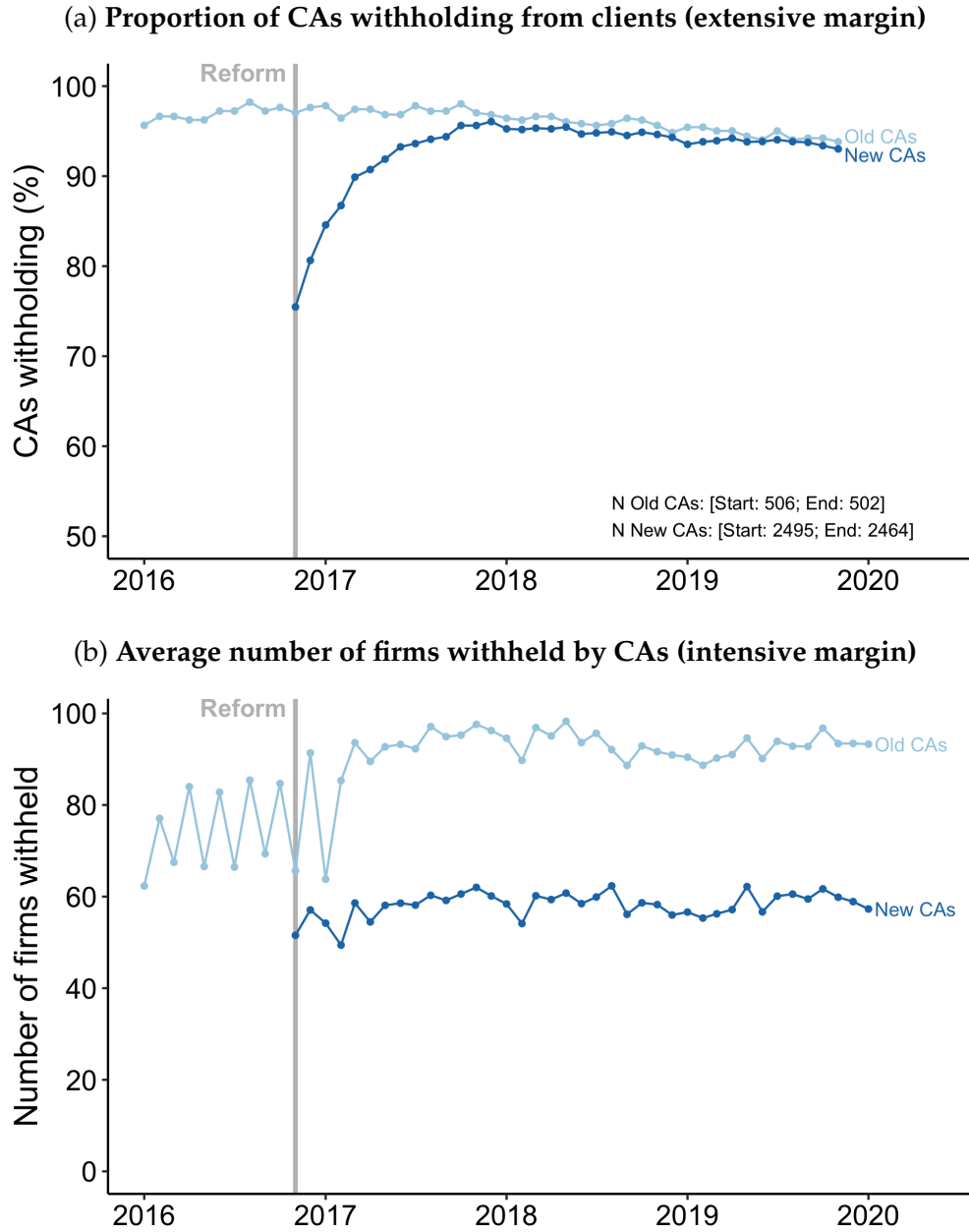


(b) Probability of appointment as collection agent



Note: The reform enacted in November 2016 automatically appointed as collection agents (CAs) firms whose gross income in 2015 was greater than AR\$ 60 million. Panel (a) shows the firm size distribution for gross income (sales) in 2015, which the subnational tax authority used to appoint large firms into the collection agent regime. The figure uses firms with reported sales between AR\$40 million and AR\$120 million, and bins of size AR\$ 1 million (~US\$ 80,000). The full distribution is reported in [Figure H.4](#). For reference, p50 is equal to AR\$ 1.1 million, p95 is equal to AR\$ 37.4 million, p97 is equal to AR\$ 62.9 million, and p99 is equal to AR\$ 162.6 million. Panel (b) shows the probability of appointment as CA by 2015 gross income bin, where each bin is of size AR\$10 million. The numbers in brackets at the bottom of the plot indicate the total number of firms in each bin. The solid gray line labeled “Cutoff” indicates the sales threshold of AR\$60 million used to determine appointment (located at the 97th percentile).

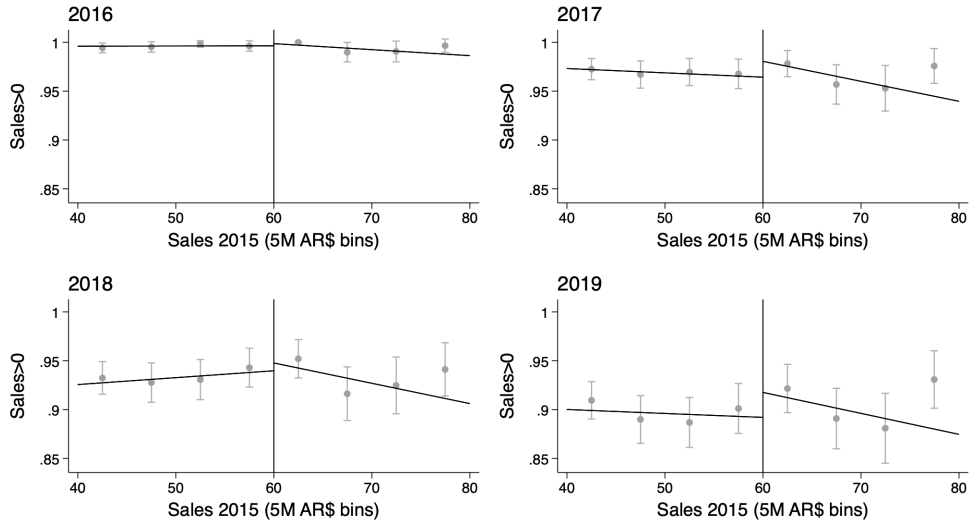
Figure 6: Withholding by collection agents: extensive and intensive margins



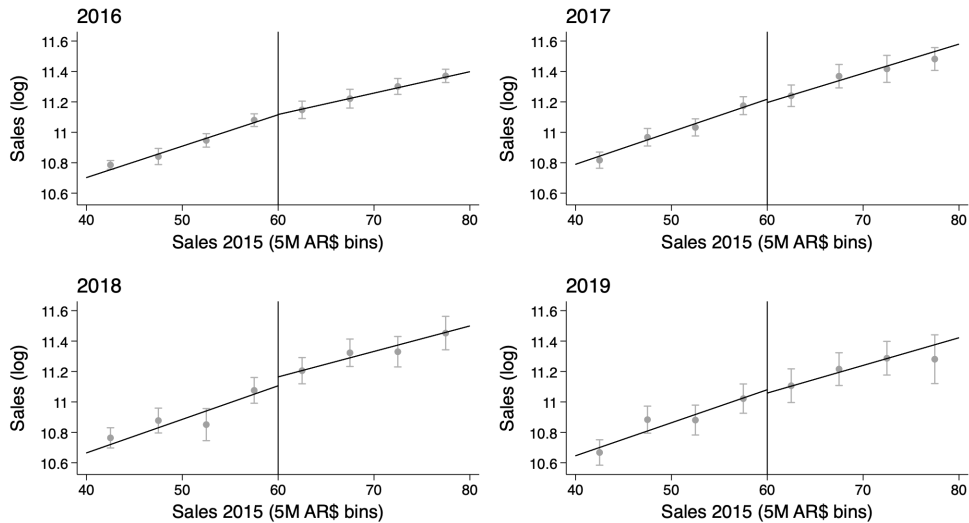
Note: This figure describes the behavior of newly appointed collection agents (CAs), appointed in November 2016, by comparing them to a group of old CAs, appointed in 2012. Panel (a) plots the proportion of new and old CAs that are withholding from commercial partners each month. Panel (b) shows the average number of firms that get withheld from new and old CAs each month. The gray vertical line corresponds to November 2016, the date at which the expansion of the withholding scheme entered into effect and, therefore, the first month of activity for new CAs.

Figure 7: Gross income of newly appointed collection agents vs. non-eligible firms

(a) Share of firms with positive annual sales (extensive margin)



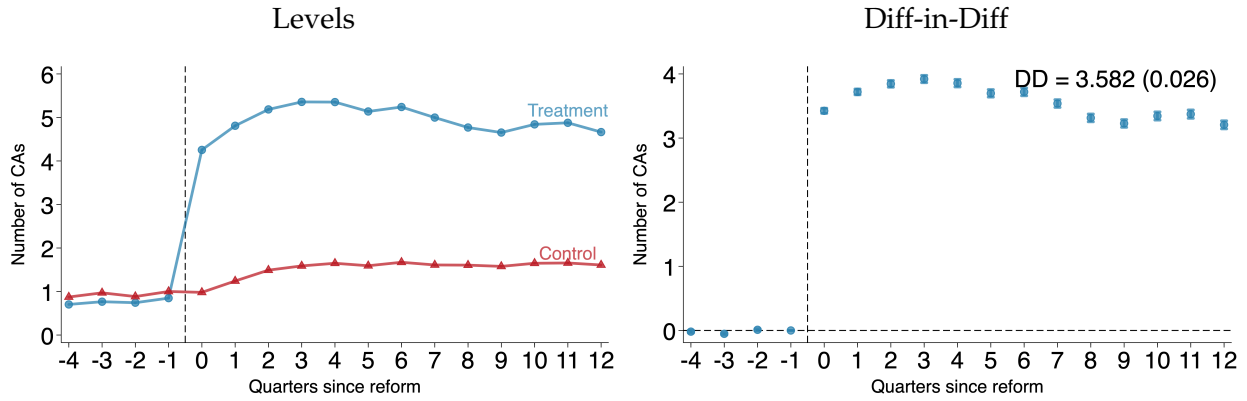
(b) Average (log) annual sales (intensive margin)



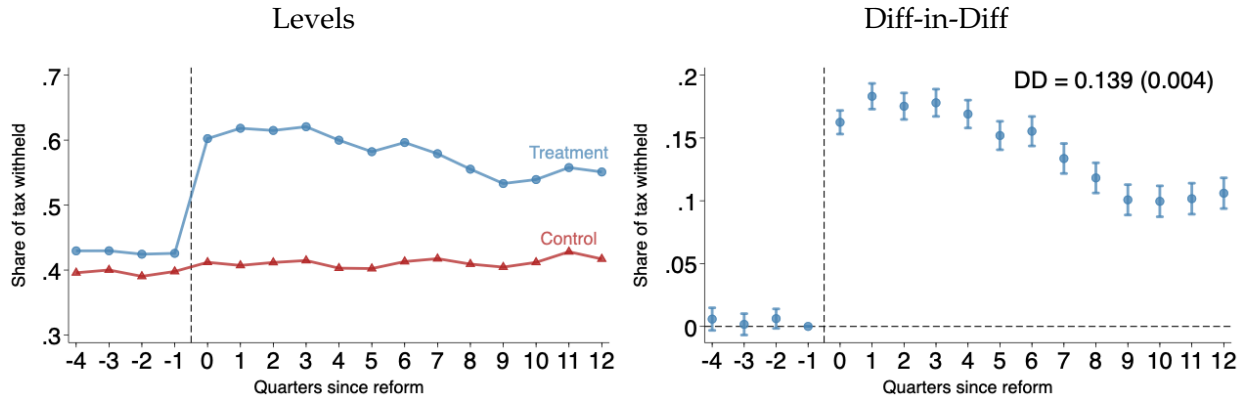
Note: This figure shows the estimates from a regression discontinuity (RD) specification. The running variable is the annual gross income (sales) in 2015. The RDD cutoff value is AR\$60 million, marked with a vertical line in each plot. The dots represent the estimates for the outcome variables using eight equally spaced bins (width AR\$5 million) of the running variable, the spikes represent 95% confidence intervals, and the horizontal lines are the linear fit at each side of the cutoff. The top panel shows the extensive margin effect, using a binary dependent variable that takes value one if annual sales were positive, while the bottom panel shows the intensive margin effect, using the logarithm of reported annual sales as the dependent variable. The top-left quadrant in each panel shows 2016 outcomes that exclude the two treated months of that year (November and December), such that it only reflects pre-reform outcomes, and therefore, it can be interpreted as a placebo test. The remaining quadrants show outcomes for 2017, 2018, and 2019. These estimates are displayed in [Table 2](#).

Figure 8: First-stage change in withholding for firms linked to newly appointed CAs

(a) Number of collection agents

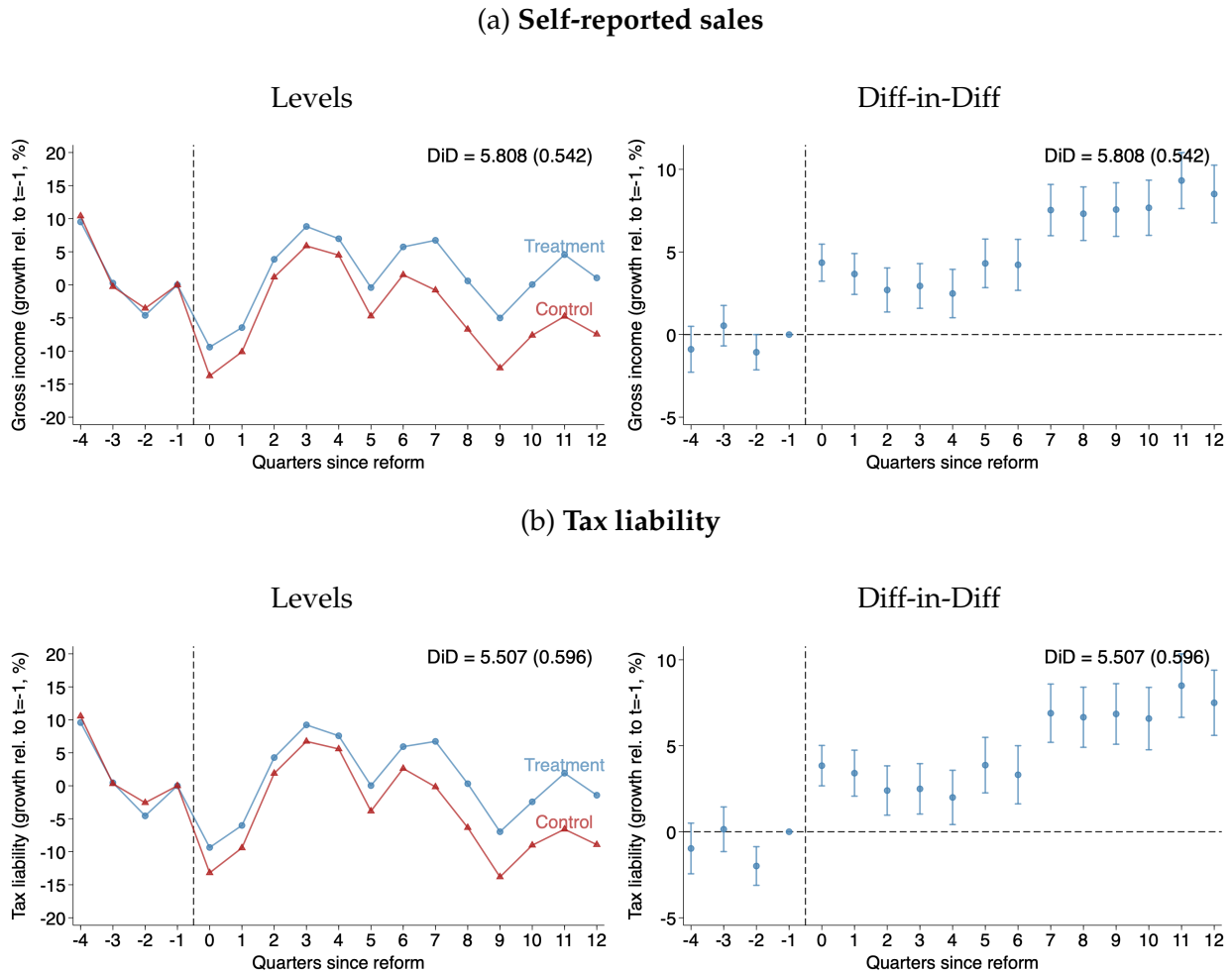


(b) Share of tax withheld by CAs



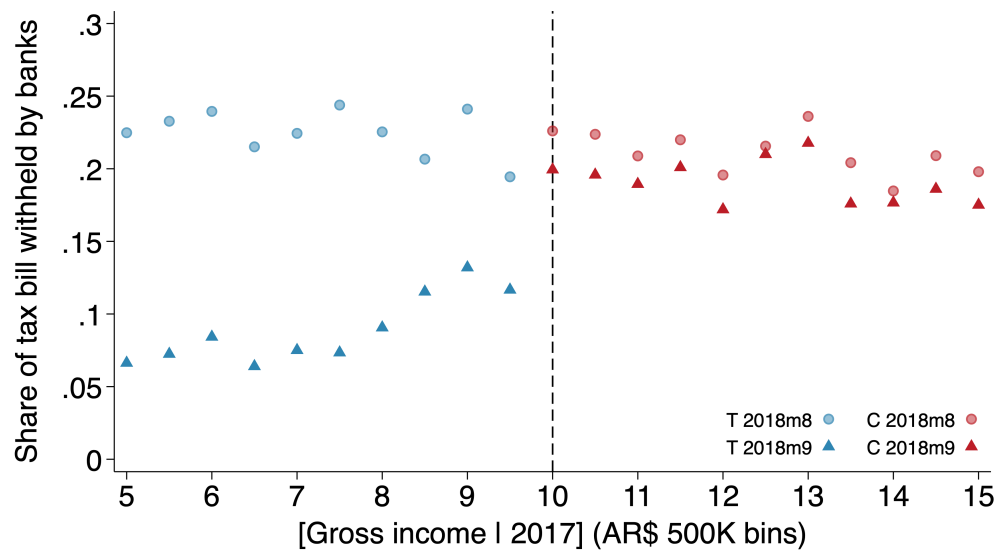
Note: This figure compares the first stage outcomes for firms connected to newly appointed collection agents (treatment group, T) and firms that are not connected to newly appointed collection agents (control group, C). Each panel shows the regression estimates for a different outcome. The plots on the left correspond to the regression of the outcome of interest on the full set of firm and quarter fixed effects, dropping the dummy for the baseline period (run separately for the two groups of firms). These plots show the coefficients on the time dummies plus the constant, where each coefficient represents the average outcome within-firm relative to the baseline. The plots on the right correspond to the dynamic DD regression, Equation 3, where each coefficient represents the difference between the two groups in a given quarter relative to the pre-reform quarter. The vertical spikes indicate the 95% confidence interval. The DD estimates found in Table 3 are displayed at the top right corner of these figures. All regression specifications contain a balanced panel of firms that filed taxes in at least six months every year. The dashed vertical line indicates the timing of the reform.

Figure 9: Self-reported sales and tax liability of firms linked to newly appointed CAs



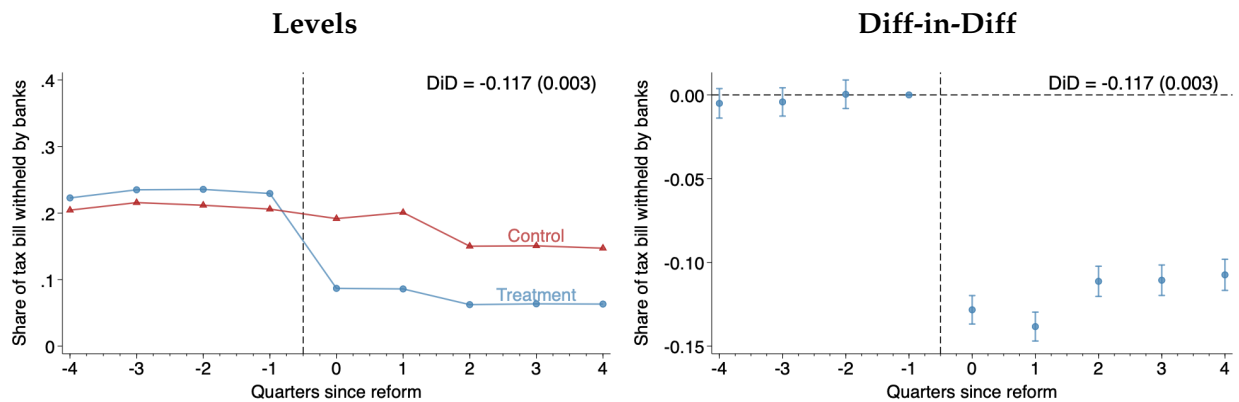
Note: This figure compares the response on self-reported sales and tax liability for firms connected to newly appointed collection agents (treatment group, T) and firms that are not connected to newly appointed collection agents (control group, C). Each panel shows the regression estimates for a different outcome. The plots on the left correspond to the regression of the outcome of interest on the full set of firm and quarter fixed effects, dropping the dummy for the baseline period (run separately for the two groups of firms). These plots show the coefficients on the time dummies plus the constant, where each coefficient represents the average outcome within-firm relative to the baseline. The plots on the right correspond to the dynamic DD regression, Equation 3, where each coefficient represents the difference between the two groups in a given quarter relative to the pre-reform quarter. The vertical spikes indicate the 95% confidence interval. The DD estimates reported in Table 3 are displayed at the top right corner of these figures. All regression specifications contain a balanced panel of firms that filed taxes in at least six months every year. The dashed vertical line indicates the timing of the reform.

Figure 10: Tax withheld by banks



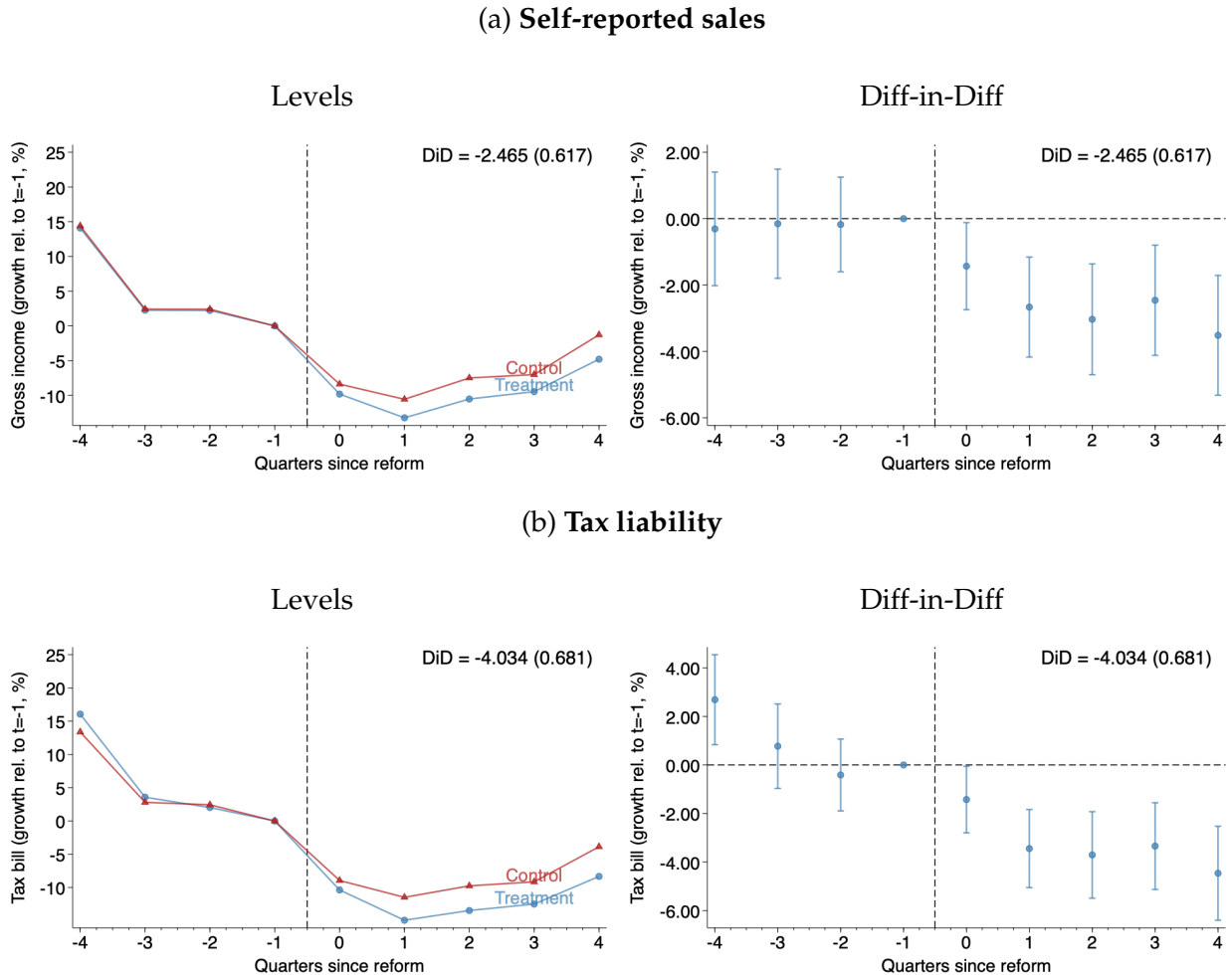
Note: In September 2018 withholding by banks was waived for firms whose sales in 2017 were below AR\$10 million. This figure takes bins of firm sales in 2017 (the policy's running variable) and calculates the average share of tax withheld by banks in each bin. Bins below the threshold are colored in blue; bins above the threshold are colored in red. The circles correspond to August 2018, the month before the policy change, and the triangles correspond to September 2018, when the policy change took effect.

Figure 11: First-stage change in bank withholding for firms below and above the eligibility cutoff



Note: This figure compares the first stage outcome for firms below the 2017 sales threshold used to determine eligibility for the waiver on bank withholding (treatment group, T) and firms above the threshold (control group, C). The plot on the left corresponds to the regression of the outcome of interest on the full set of firm and quarter fixed effects, dropping the dummy for the baseline period (run separately for the two groups of firms). This plot shows the coefficients on the time dummies plus the constant, where each coefficient represents the average outcome within-firm relative to the baseline. The plots on the right correspond to the dynamic DD regression, where each coefficient represents the difference between the two groups in a given quarter relative to the pre-reform quarter. The vertical spikes indicate the 95% confidence interval. The DD estimates found in [Table 3](#) are displayed at the top right corner of these figures. All regression specifications contain a balanced panel of firms that filed taxes in at least six months every year. The dashed vertical line indicates the timing of the reform.

Figure 12: Self-reported sales and tax liability of firms affected and non-affected by the suspension in bank withholding



Note: This figure compares the response on self-reported sales and tax liability for firms below the 2017 sales threshold used to determine eligibility for the waiver on bank withholding (treatment group, T) and firms above the threshold (control group, C). Each panel shows the regression estimates for a different outcome. The plots on the left correspond to the regression of the outcome of interest on the full set of firm and quarter fixed effects, dropping the dummy for the baseline period (run separately for the two groups of firms). These plots show the coefficients on the time dummies plus the constant, where each coefficient represents the average outcome within-firm relative to the baseline. The plots on the right correspond to the dynamic DD regression, where each coefficient represents the difference between the two groups in a given quarter relative to the pre-reform quarter. The vertical spikes indicate the 95% confidence interval. The DD estimates found in [Table 3](#) are displayed at the top right corner of these figures. All regression specifications contain a balanced panel of firms that filed taxes in at least six months every year. The dashed vertical line indicates the timing of the reform.

Tables

Table 1: Summary statistics

	No. firms	Gross revenue (1,000 of AR\$)				Tax liability (1,000 of AR\$)			
		p5	p50	mean	p95	p5	p50	mean	p95
Panel A: Full sample									
Firms	183,503	0	42	249	1,052	0	1	6	28
Collection agents	9,366	3	2,757	19,209	39,947	0	85	942	1,451
Panel B: Estimating sample									
Firms	80,208	7	123	415	1,664	0	3	11	45

Note: This table reports summary statistics calculated in the period January–October 2016, before the expansion of the withholding regime. Gross revenue and tax liability are expressed in thousands of 2016 Argentinian pesos. Panel A corresponds to the full sample. Panel B corresponds to the sample used to estimate firm responses to withholding, as described in Sections 5 and 6.

Table 2: Regression discontinuity effects on large firms tasked with collecting taxes

	First Stage	Reported Sales			
	(1)	2016 (2)	2017 (3)	2018 (4)	2019 (5)
<i>Panel A: First Stage</i>					
CA appointment	0.325*** (0.065)				
Mean	0.407				
N firms	4088				
<i>Panel B: Extensive Margin (sales > 0)</i>					
Reduced form		0.010 (0.010)	0.060* (0.026)	0.033 (0.039)	0.050 (0.040)
2SLS		0.027 (0.028)	0.172* (0.074)	0.087 (0.103)	0.148 (0.130)
Mean		0.996	0.968	0.943	0.901
N firms		4088	4088	4088	4088
<i>Panel C: Intensive Margin (log(sales))</i>					
Reduced form		0.056 (0.078)	-0.071 (0.148)	-0.052 (0.144)	-0.118 (0.178)
2SLS		0.151 (0.240)	-0.224 (0.416)	-0.168 (0.413)	-0.355 (0.573)
Mean		11.080	11.175	11.076	11.022
N firms		4066	3959	3816	3683

Note: This table reports the first stage, reduced form, and two-stage least squares estimates of a regression-discontinuity design. The running variable is the annual gross income (sales) in 2015. The reform to the withholding system enacted in November 2016 stated that firms whose gross income in 2015 was greater than AR\$60 million (with some exceptions) would be automatically appointed as collection agents (CAs). Panel A reports the first-stage change in the probability of being enrolled as CA when a firm crosses the threshold (represented graphically in [Figure 5b](#)). Panel B shows the estimates for the extensive margin effect using a binary variable that takes value one if annual sales were positive, while Panel C shows the intensive margin effect using the logarithm of reported annual sales as the dependent variable (shown in [Figure 7](#)). Column 2 excludes the two treated months of 2016, November and December, to reflect pre-reform outcomes, serving as a placebo test. Each panel also reports the mean of the outcome variable for firms just to the left of the cutoff (in the range [50, 60]). The regression is estimated for the range [40, 60) to the left of the cutoff, and [60, 80) to the right of the cutoff using a linear approximation and a triangular kernel. RD estimates are computed with the `rdrobust` routine from Calonico et al., 2017. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels.

Table 3: Difference-in-differences effects of an increase and a decrease in withholding

	First stage (1)	Reported sales (2)	Tax revenue (3)
Panel A: Increase in withholding			
<i>Treat · Post</i>	0.139*** (0.004)	5.808*** (0.542)	5.507*** (0.596)
Observations	1,223,156	1,223,156	1,223,156
Number of firms	75,846	75,846	75,846
\bar{y}_{t-1}	11.623	965.219	33.437
Panel B: Decrease in withholding			
<i>Treat · Post</i>	-0.117*** (0.003)	-2.465*** (0.617)	-4.034*** (0.681)
Observations	181,699	179,135	172,883
Number of firms	20,643	20,052	19,349
\bar{y}_{t-1}	7.604	1291.005	37.190

Note: This table reports the first-stage change in withholding and the reduced-form estimates from a difference-in-differences specification. Column 1 shows the first-stage results. For Panel A, this corresponds to the share of taxes withheld by CAs, while for Panel B it corresponds to the share of taxes withheld by banks. Columns 2 and 3 correspond to the gross income and the tax revenue growth relative to the baseline period (third quarter of 2016 and third quarter of 2018, respectively). The last row of each panel shows the average value of the variable reported in columns at baseline. Standard errors clustered at the firm level are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels.

Supplementary Materials for Online Publication for: “Firms as Tax Collectors”

A Turnover Tax: Further Details

The Turnover Tax (TT)—also known as gross receipts tax—is an indirect provincial tax imposed in each of the twenty-four jurisdictions in Argentina (twenty-three provinces and the City of Buenos Aires). It is levied on the gross sale of goods or services with no possibility of deducting costs. It therefore applies to all the transactions taking place in the supply chain—that is, business-to-business and business-to-consumer transactions. This type of tax is simple to collect but creates “cascading effects” whereby final goods are taxed multiple times throughout production.¹ The TT represents the main source of own revenue in all the jurisdictions (about 75% of total tax receipts in the City of Buenos Aires).² Each jurisdiction has its own subnational tax laws and TT regulations regarding the tax base, tax rates, apportionment rules, collection schemes, exemptions, and promotional regimes applicable to each activity.

Tax rates. The tax rates typically vary from 3.5% to 5% for the sale of goods and services depending on the taxpayer’s activity, annual turnover from the previous year, and location where the transaction takes place (inside versus outside the province). For example, in 2016, retailers with a 2015 revenue of less than forty-nine million pesos faced a 3% tax rate on total sales. This rate increased to 4% if their 2015 revenue was greater than forty-nine million pesos (that is, it operates as a notch rather than a kink). Importantly, firms selling out of the province might be taxed at higher tax rates (as if there were internal customs). This type of firm is informally called a “foreign jurisdiction” firm. When filing taxes, multiactivity firms must discriminate their tax base by the types of activity they carry out and apply the corresponding tax rate in each case. For example, a large footwear manufacturer that also sells shoes to final consumers could be taxed at 1% for its manufacturing sales and 4% for its retail sales.

Local versus multiprovince firms. Taxpayers are classified as *local* when they only sell goods or services within the jurisdiction (for example, a corner shop) or *multiprovince*

¹In environments with limited enforcement capacity this type of tax provides limited opportunities for firms to engage in tax evasion relative to profit-based taxes like the VAT and corporate income tax (Best et al., 2015).

²The other taxes levied at the provincial level are the stamp tax, property tax, vehicle tax, and other minor duties.

when they operate both inside and outside the jurisdiction (for example, a manufacturer from another province selling goods in the City of Buenos Aires). These firms are part of the so-called Multilateral Agreement.

Apportionment formula. For firms operating in multiple provinces, there exists an apportionment system to distribute the tax base across places. The formula is based on a sales factor and an expenditure factor determined at year t-1 (called “unified coefficient”). In particular, 50% of total sales are distributed according to the ratio of a taxpayer’s sales in the taxing province to its overall sales; and the other 50% are distributed according to the ratio of a taxpayer’s expenditures in the taxing province to its overall expenditure.

How is the TT collected. The TT can be paid directly by taxpayers (standard method) or collected indirectly by third parties (withholding method). In the standard method, taxpayers log on to the tax administration’s website at the end of the month, and self-report the gross revenue accrued in each activity over that month; the system applies the corresponding tax rate and generates a payment coupon. Under the withholding method, the tax administration can designate firms, banks, or credit and debit card companies to operate as collection agents (CAs). In the case of firms as CAs, every time a taxpayer purchases inputs from a CA or sells goods or services to a CA, part of the invoice amount is withheld by the CA and remitted to the tax authority. In the case of banks, every time a payment is deposited in the bank account, the bank withholds part of it and remits the funds to the tax authority. In the case of card companies, every time a transaction is made with a debit or a credit card, the card company withholds part of it. In all these cases, taxpayers still have to file taxes at the end of each month but the withheld amount constitutes a credit in favor of the taxpayer who can discount it from the tax liability before making any payments.

Withholding and reverse withholding. Withholding can operate both downstream and upstream. Upstream withholding is similar to that used for the collection of personal income tax in the US. In this case, the payer in the transaction (called “retaining agent”) withholds a fraction of the total amount of the sale and remits it to the tax administration in concept of future tax payments from the payee. In the downstream case, the supplier (called “perceiving agent”) withholds from the payer by adding the withheld tax to the total sale and remits it to the tax administration in concept of future tax payments from the payer. The remitted funds are accumulated in the withheld taxpayer’s account and can be used to deduct from future outstanding tax liabilities. Importantly, in all these cases, the CA must report very detailed information to the tax authority: the unique identifiers of the firms it traded with, the total amount of each transaction, and the withheld amount.

This information is automatically available for taxpayers when they file their monthly tax returns using the official processing software. If a CA fails to report a transaction, then taxpayers can report it themselves so that they can claim the advance payment back. When that happens, CAs can face severe penalties. Hence, CAs have strong incentives to perform their collection duties accurately.

Overwithholding. In practice, the sum of withheld amounts could be smaller or greater than the tax liability. On the one hand, not all transactions are subject to withholding, and, generally, the withholding rate is lower than the statutory tax rate. This implies that taxpayers are usually able to compensate a fraction of the tax liability with the advance payments withheld at source. On the other hand, it could happen that the monthly withheld amount exceeds the monthly liability, thus generating a credit balance in favor of the taxpayer that can be rolled over for future tax payments. These funds cannot easily be withdrawn and are essentially an interest-free loan from taxpayers to the tax authority. The main reason why this could happen is that credit card companies and banks also act as CAs. So, a given transaction between two trading partners might be subject to withholding multiple times (for example, by a supplier, by a credit card company, and finally when the money is deposited in a bank account).

TT collection over time. Until the early 2000s, the tax was collected via direct monthly payments. From that point on, the tax administration started appointing firms to act as CAs on an ad hoc basis—usually targeting the biggest firms in the economy. As the tax authority developed its IT system, the appointment of firms became more widespread and eventually expanded their net in a discrete way as was shown in [Figure 2](#). That is precisely the main reform we exploit in our analysis.

Who becomes a CA? The 2016 reform we analyzed replaced the ad hoc way of appointing CAs with a simple revenue-based rule: firms whose 2015 revenue was greater than sixty million pesos were automatically enrolled as CAs (Resolution 364/AGIP/2016). These firms could act as both *perceiving agent*, when selling goods or services, and *retaining agent*, when purchasing goods or services.

When a firm is enrolled as a CA, it must start using a separate tax collection software that incorporates withholding into its sales. This software has an updated register of all firms that are liable to be withheld and also determines the rate that should be applied. The withholding rate is applied to the amount before taxes. Firms must transfer the withheld funds every fifteen days along with an annex containing the details of every transaction: tax identifier of the withheld party, total transaction amount, and amount perceived or retained. Anecdotally, given that appointed firms are large and formal, they do not find

it very complicated to adapt to this new system.

Federal taxes. Firms are also subject to federal taxes. Depending on the firm's revenue, they have to file a monthly VAT return or be part of a simplified regime. The VAT base is total value added, which implies that firms can deduct purchases from their total revenue. On the other hand, firms in the simplified regime pay a fixed amount depending on the threshold determined by gross income, the same variable used to determine the tax rate and tax liability of the TT.

B Data Construction

As stated in Section 2.2, our main data source consists of *nearly* the entire universe of firms operating in the City of Buenos Aires in the period 2015-2020. Obtaining the universe of taxpayers was infeasible due to computing power limitations from the tax administration. In this Section, we describe the process undertaken for the construction of our data.

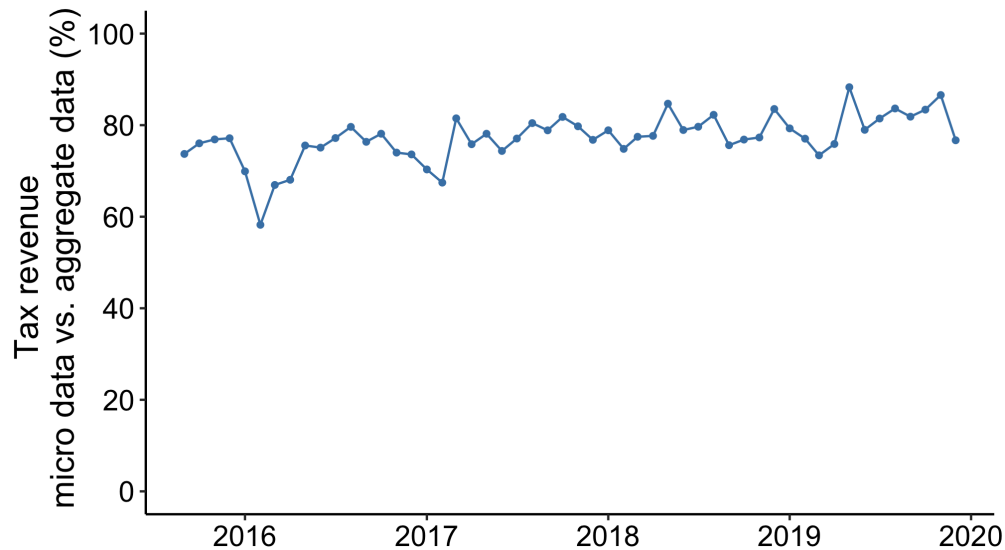
As one of the key components of our study was the use of commercial links between CAs and their commercial partners, we requested all transactions linked to CAs. However, the invoice data are defined at the CA-client-month level, and providing all line items proved to be too burdensome for the tax administration's servers. To circumvent this issue, we requested data from a random sample of CAs: out of the approximately 8,000 CAs, we obtained data for 3,000 CAs. So, in practice, our data consists of a sample of CAs and the universe of taxpayers linked to them.

The data construction process followed the steps outlined next. First, we defined the list of CAs on duty in 2017 and selected 3,000 CAs randomly—2,500 newly appointed in 2016 and 500 appointed prior to 2016. Second, for this subset of CAs, the tax authority pulled all their transaction-level declarations. Third, using these declarations we identified all the customers who had a transaction with the CAs and we built a list of their tax IDs. Finally, for all the IDs in our list plus all the IDs of our random sample of CAs, we obtained the monthly tax filings. These declarations contain the standard information about monthly sales, taxes owed and paid, amount withheld at source, etc.

How do our data compare to the universe of tax filings? [Figure B.1](#) shows that the total tax revenue collected from our sample is very close to the total revenue. Indeed, turnover tax revenue calculated from the microdata amounts to approximately 80% of the total tax revenue throughout the whole period of our study. Therefore, although we have access to a sample of taxpayers, in practice, they explain the majority of the commercial activity

captured by the tax. The taxpayers that we do not observe are likely small firms that do not have transactions with CAs.

Figure B.1



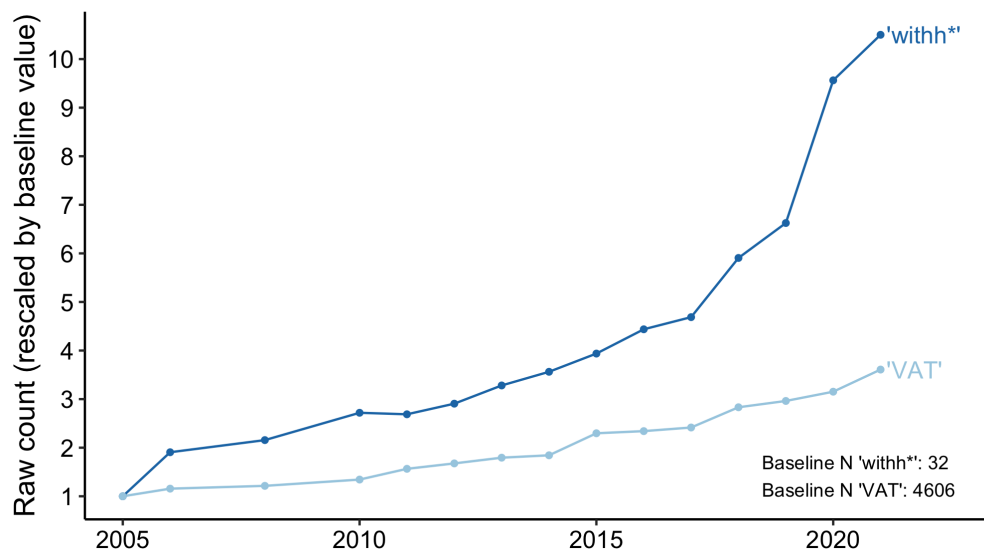
Note: This figure compares turnover tax receipts calculated using our randomly-selected sample from the microdata relative to the total tax revenue reported by the government in monthly reports. Source: Own elaboration based on aggregate data from “Dirección General de Estadística y Censos (Ministerio de Hacienda y Finanzas GCBA).”

C Text Analysis Using Ernst & Young’s Guide for Indirect Taxes

We explain in more detail the process followed to construct the database used in [Figure 1](#). We started by downloading Ernst & Young’s “Worldwide VAT, GST and Sales Tax Guide”. We split each of these guides into country chapters where possible (2013 onward). Then, we created a text-analysis program to scrape information from each chapter. For each country in the guide and every year available, the program searched for terms related to “tax withholding.” In particular, we searched for strings containing the term “withh*” (that is, “withholding,” “withheld,” “withhold,” “withholdings,” “withholder,” etc.). The program created a binary indicator equal to 1 if a country’s chapter contained any of these terms. As a benchmark, we repeated the text-analysis exercise by searching for terms related to the VAT, since this is also a widespread tax instrument.

Figure C.1 below shows the raw counts (scaled by the 2005 value) of the total number of matches per guide (that is, the sum across countries). The dark blue line corresponds to terms related to withholding and the light blue line to VAT. We observe a sharp increase in the number of matches over time. Moreover, the trend accelerates from 2018 onward. This suggests that withholding regimes are becoming more widespread. Moreover, from Figure 1, we can see that this is particularly pronounced in low- and middle-income countries, which usually have lower tax capacity. The results of our paper are encouraging and suggest that this might be a good development of tax systems.

Figure C.1: Number of matches per document:
 “withh*” vs. “VAT” (used as benchmark)



Note: This figure summarizes the results from our text-analysis exercise. It plots the time series of the number of times that our program detects terms related to withholding (dark blue) or VAT (light blue). Each series is rescaled by the level in 2005. Source: Own elaboration based on Ernst & Young. Our R code is available upon request.

D Documenting the Reforms with Raw Data

What do the withholding reforms look like in the raw administrative data? In this section we document the variation used in the paper in more detail and without imposing any sample restrictions. That is, we simply open the databases as they were shared with us, and in a couple of lines of code we compute summary statistics and time series that capture the nature of the identifying variation. The goal of this exercise is twofold. First,

it adds *transparency* to the paper and the research process. Second, it is a way of showing the *aggregate relevance* of the analyzed reforms. That is, we consider *all* the firms in the data instead of only those better suited for our empirical strategies (for example, those linked to new versus old CAs, those above and below the relevant cutoffs). Reassuringly, even without imposing any sample restrictions, we document sharp changes in several withholding measures right at the time of the reforms. The facts that we document also help alleviate concerns about the quality of the data and the speed of implementation or take-up of the reforms.

We provide graphical evidence to shed light on the variation used in the paper. Recall that we exploit two reforms: an increase in withholding for firms linked to newly appointed CAs (November 2016) and a decrease in withholding from banks (September 2018). There was a third reform in January 2020 that further expanded the net of withholding agents by updating the parameters from the first reform (Resolution 296/19 AGIP). We decided to ignore this third reform in the main analysis of the paper due to its closeness to the COVID-19 pandemic. Nevertheless, for completeness, we document its variation. In the next set of figures, we denote these three reforms with vertical red lines.

Figure D.1 shows descriptive evidence of the relationship between total tax withholdings and tax liability for the period September 2015 to December 2020. This graph includes the zeros and thus captures both extensive- and intensive-margin changes in withholding. Panel (a) plots the ratio of total tax withholdings to tax liability. The numerator includes withholding from three sources: (i) commercial partners and card companies, (ii) banks, and (iii) the customs office. We report the *median* of the ratio to get a better sense of the distribution of firms and to prevent some large outliers from spoiling the figure. Relatedly, Panel (b) plots the fraction of firms whose monthly withholdings exceed the tax liability.³ Both panels exhibit discrete jumps right at the time of the reforms. The share of tax withholdings to tax liability increases by about 20 p.p. in November 2016, decreases by more than 20 p.p. in September 2018, and increases again by about 20 p.p. in January 2020. Likewise, the share of overwithheld firms increases from 23% to 30% in November 2016, decreases to 24% in September 2018, and increases again to 31% in January 2020.

The patterns from Figure D.1 mask substantial heterogeneity. We next decompose these patterns into the extensive and the intensive margin. This is reported in Figures D.2

³In practice, firms can be overwithheld when (i) they are not registered in the withholding register of a province and the commercial partner thus must apply a withholding rate that can be twice as large as the tax rate, or (ii) a lag occurs between the sales of a good or service and the month in which the bank or credit card company reports the withholding. For instance, it is common for firms to have substantial sales in a month but the money is credited to the bank account in the following month, generating a time mismatch between the tax liability and the withheld amount.

and D.3, respectively. In addition to this, we unpack total withholding into its sources: (i) withholding by firms (for example, when trading with CAs or credit card companies) and (ii) withholding by banks (for example, when receiving deposits or making transfers).⁴ We also break the former into (i.a) withholding performed in the *sale of goods or services* and (i.b) reverse withholding made in the *purchase of inputs*. As explained below, we conclude that (i) the increase in withholding in Figure D.1 after the *first* reform is mostly explained by a combined extensive- and intensive-margin increase of reverse withholding in the purchase of inputs, and (ii) the sharp decrease in withholding after the *second* reform is entirely driven by an extensive-margin decrease in bank withholding.

Figure D.2 documents the extensive margin of withholding. We plot the share of firms whose taxes are withheld at source by type of withholding. Panel (a) suggests that although withholding is prevalent (blue dots), there is substantial variation across withholding types. Before the initial reform, about 60% of the firms were subject to withholding by firms (brown dots) and 50% by banks (green dots). Importantly, right after the first reform, the brown dots increase from 60% to 70% but the green dots do not change. This is reassuring, as the first reform only increased the number of firms operating as withholding agents—not banks. In contrast, after the second reform, which exempted a subgroup of firms from bank withholding, the green dots exhibit a sharp large decrease from 48% to 21% but the brown dots remain stable at 70%. When we further break down the withholding by firms (brown dots) in Panel (b), we observe a similar extensive-margin pattern for the withholding of sales (light blue) and purchases (light red) in the first reform.

Last, Figure D.3 documents the intensive margin of withholding over time. In this case, we plot the share of tax withholdings to tax liability for firms with positive withholding in each month separately. To capture responses at the upper end of the distribution, we compute the *average* rather than *median* and we exclude the largest outliers. Panel (a) focuses on the withholding by firms and Panel (b) on the withholding by banks. The top panel suggests that most of the response to the initial reform—the one that expanded the number of CAs—comes from withholding in purchases (light red dots) rather than in sales (light blue dots). Intuitively, when firms *purchase* intermediate inputs from upstream CAs, the invoice is *increased* by the amount of the withholding (it appears as an extra line in the receipt). When firms *sell* goods or services to downstream CAs, the invoice is *reduced* by the amount of the withholding (the seller receives a separate proof of payment for the withholding portion). With these two possibilities in mind, the figure might imply that the November 2016 reform likely appointed very large *upstream* CAs that were selling

⁴We omit withholdings by the customs office because they represent a tiny share of the total.

to downstream firms. This would explain the sharp increase of the light red dots and the relatively smooth pattern of the light blue dots. Finally, Panel (b) shows a smooth, flat evolution in the share of bank withholdings to tax liability. This is reassuring, as the September 2018 reform exempted a subgroup of firms *entirely* from bank withholdings. As a result, in this case, we would expect to only observe changes in the extensive margin, which is confirmed by the green markers in Figures [D.2a](#) and [D.3b](#).

Taken together, our facts suggest that the reforms we exploit in this paper operated as they ought to. The analysis also suggests that the reforms were substantially large, modified the way the turnover tax is collected, and, ultimately, provided sharp identifying variation to study the implications of withholding from firms in a credible way.

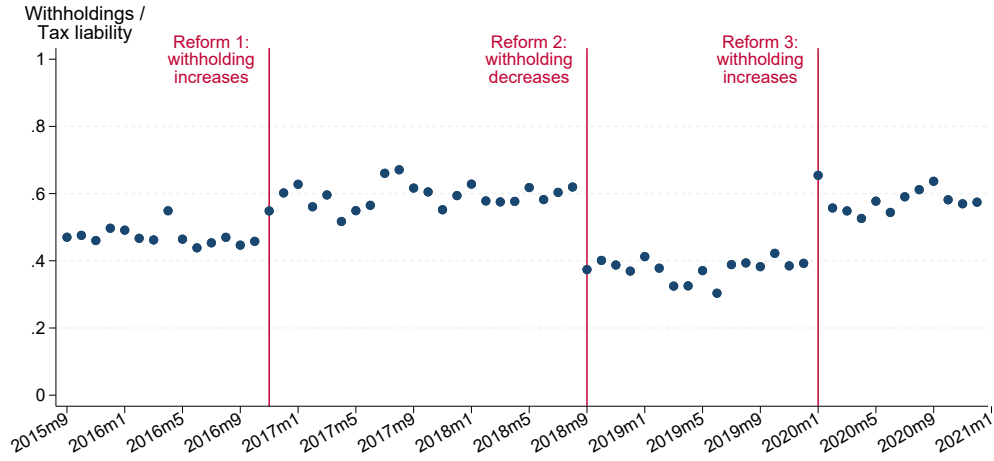
Table D.1: Statistics of withholding at baseline (September 2016)

	N Firms	Withheld firms	Withholdings / tax Liability				
		share	p5	p50	p75	p95	mean
Total withholding	132,897	0.806	0.029	0.434	0.969	2.643	0.770
<i>By type of withholding:</i>							
Sales to CAs	132,897	0.351	0	0	0.188	1.094	0.256
Purchases from CAs	132,897	0.514	0	0.002	0.116	0.923	0.214
Bank deposits	132,897	0.473	0	0	0.280	1.373	0.279

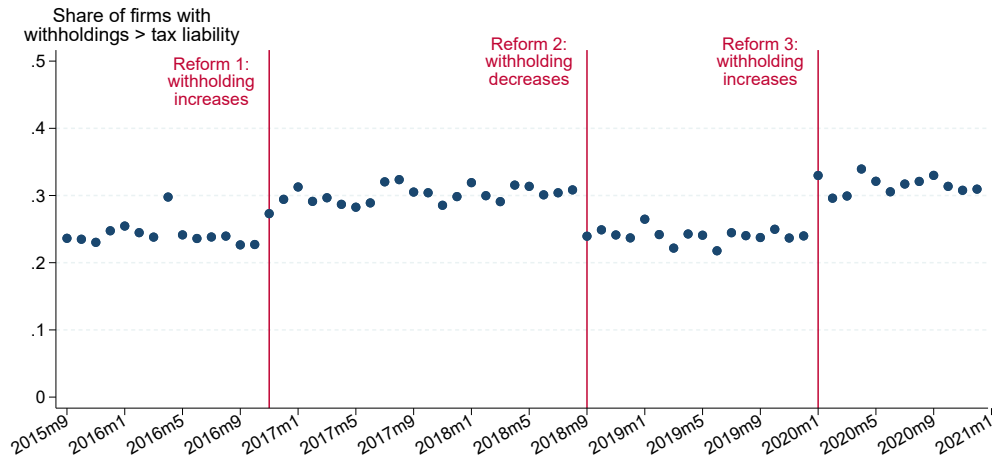
Note: This table reports summary statistics of withholding calculated in September 2016, right before the expansion of the withholding regime. The first row shows statistics for total withholding. The last three rows break total withholdings down by type: those generated when selling to collection agents (CAs), those generated when purchasing intermediate goods from CAs, and those generated when receiving payments in a bank account. The first column shows the number of firms in the data. The second column reports the share of these firms that have positive withholdings. The last five columns show different moments of the share of tax withholdings to tax liability. Importantly, this ratio includes the zeros and thus captures both extensive and intensive margins.

Figure D.1: Tax withholdings versus tax liability

(a) Share of tax withholdings to tax liability



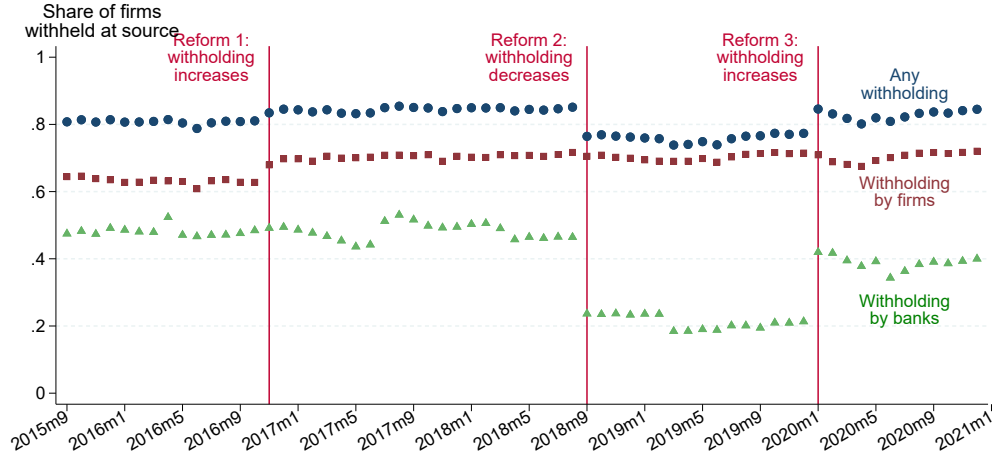
(b) Share of firms overwithheld



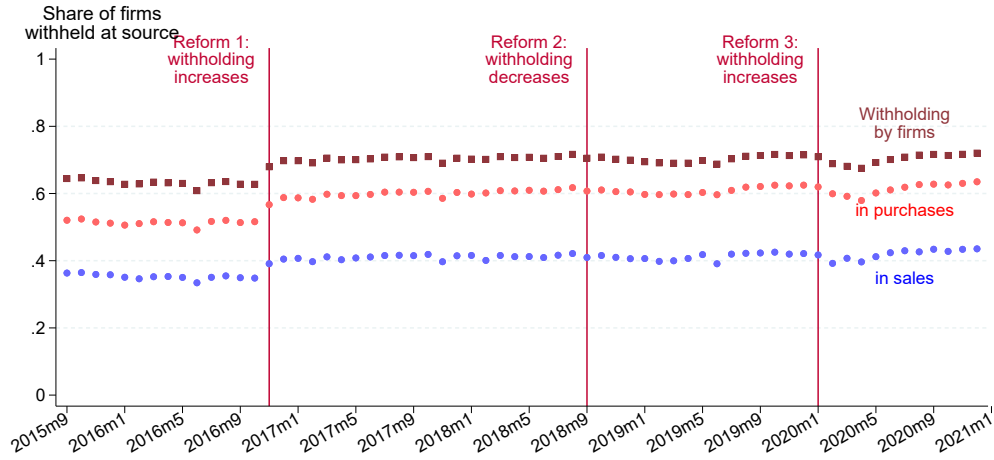
Note: This figure shows descriptive evidence of the relationship between total tax withholdings and tax liability for the period September 2015 to December 2020. Panel (a) plots the ratio of total tax withholdings to tax liability. The numerator includes withholding from three sources: (i) commercial partners and card companies, (ii) banks, and (iii) the customs office. We report the *median* of the ratio to get a better sense of the distribution of firms and to avoid the influence of large outliers. Panel (b) plots the fraction of firms whose monthly withholdings exceed the tax liability. See the text for further details.

Figure D.2: Tax withholdings: extensive margin

(a) Share of withheld firms per month



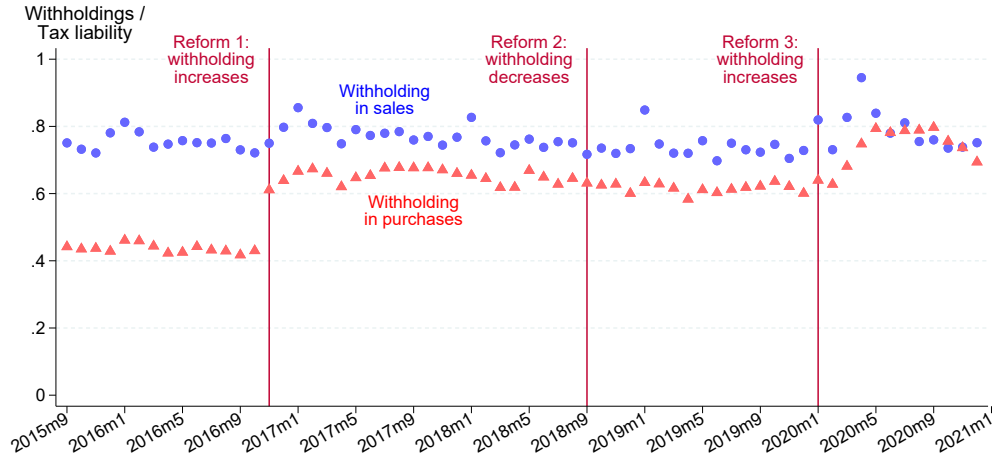
(b) Withholding in sales and purchases



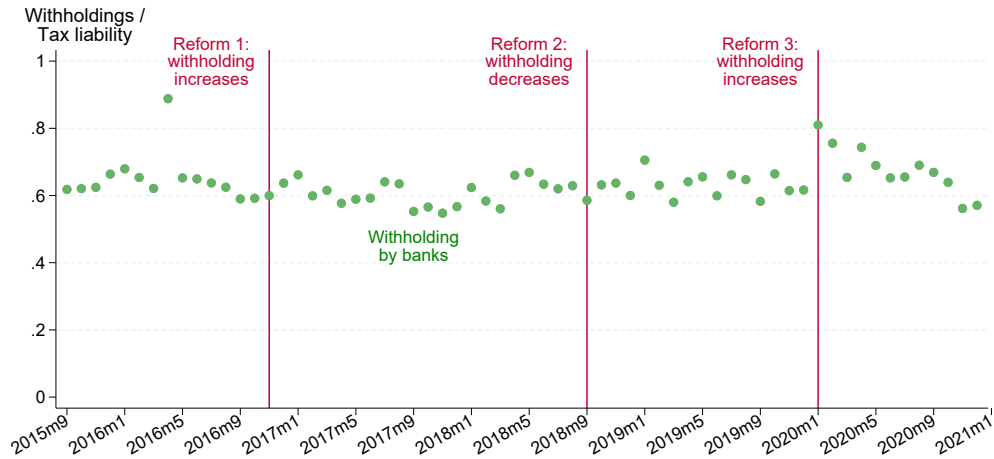
Note: This figure documents the extensive margin of withholding over time. It plots the share of firms withheld at source by type of withholding. The blue dots in the top panel correspond to firms with any withholding (that is, by collection agents, banks, or customs). The brown dots show withholding by collection agents. The green dots show withholding by banks. The bottom panel further breaks the withholding by firms (brown dots) from Panel (a) into withholding of sales (light blue) and withholding of purchases (light red). See the text for further details.

Figure D.3: Tax withholdings: intensive margin

(a) Withholding by commercial partners and credit card companies



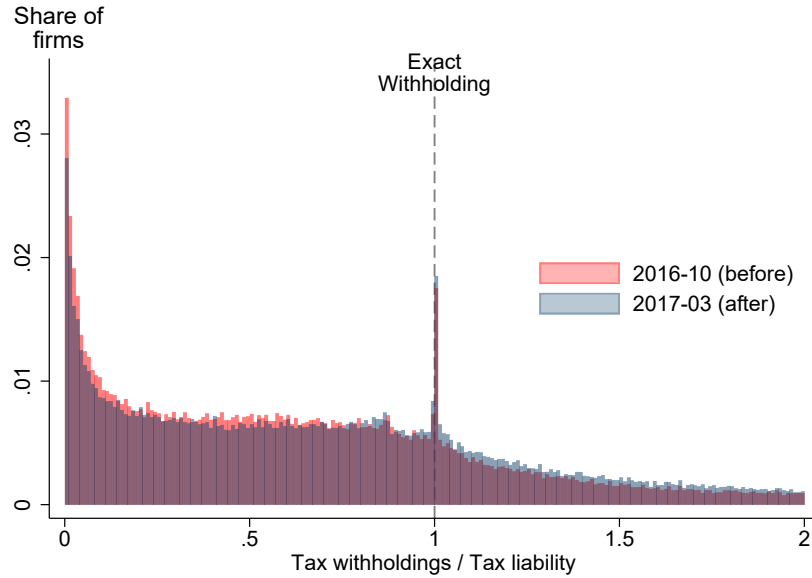
(b) Withholding from banks



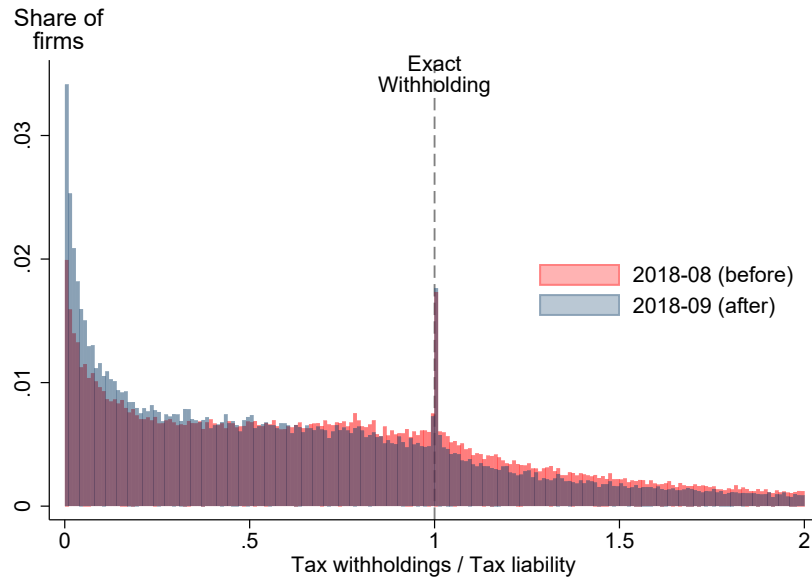
Note: This figure documents the intensive margin of withholding over time. Panel (a) shows withholdings by firms and Panel (b) withholdings by banks. Each panel plots the share of tax withholdings to tax liability for firms with positive withholding in each month separately. To capture responses at the upper end of the distribution, we compute the *average* rather than *median* and we exclude the largest outliers. See the text for further details.

Figure D.4: Distribution of tax withholding to tax liability

(a) Before and after the increase in withholding by collection agents



(b) Before and after the decrease in withholding by banks



Note: This figure shows the distribution of the ratio of total tax withholdings to tax liability. We use two hundred bins of 0.01 width. Panel (a) shows the density right before (pink) and after (blue) the increase in withholding by collection agents. Panel (b) shows the density right before (pink) and after (blue) the decrease in withholding by banks. In Panel (a) the density shifts to the right and in Panel (b) it shifts to the left. Both panels exhibit bunching at the point at which withholding exactly matches the tax owed.

E Firm-to-Firm Linkages and Treatment Assignment

A limitation of our data and DD approach is that we do not observe whether newly appointed CAs and linked firms were indeed trading before November 2016. Hence, the assignment of treated units is based on post-reform data, which might introduce some misclassification bias. In this section, we discuss the nature of this potential bias and conduct various robustness exercises that alleviate some of these concerns.

Potential misclassification bias. On the one hand, firms that would have been treated but in response to the reform change from CA to non-CA commercial partners in November 2016 (i.e., trading-partner effect), ended up in our control group. Our difference-in-differences effect may thus underestimate the true treatment effect if such switching behavior is more prominent among firms with higher evasion rates (i.e., those that have more to lose from an increase in withholding at source). In other words, the compliant treated firms would comprise those for whom withholding or information reporting generates a smaller effect on reported sales and tax liability. Although possible, we believe this source of bias is unlikely or small. First, it would imply that firms are perfectly informed and switch over to non-CA suppliers or clients exactly in the month of the reform. Second, such a response would mechanically imply a decrease in sales for newly appointed CAs as their suppliers or clients are cast aside. However, our evidence from Section 4.2 suggests this was not the case.

On the other hand, the treatment group may contain firms that added additional trading links exactly in the month of the reform (i.e., have grown at the reform, for unrelated reasons), whereas the control group is restricted to firms that have not created such new links (i.e., have potentially grown less). This means that the increase in self-reported sales could confound the response to the reform and the faster post-reform growth trend in the treatment group, which may be unrelated to the reform. Although possible, the parallel pre-trends displayed in Figure 9 are reassuring as they suggest that treatment and control were behaving similarly in terms of sales growth.

Documenting the stability of firm-to-firm linkages. While acknowledging that the 2016 reform could, in principle, influence the choice of CA and non-CA trading partners, we present two empirical tests indicating that commercial linkages do not seem to break either immediately on impact or over time.⁵

Without loss of generality, we start by revisiting Figure 6 focusing on a slightly smaller sample of firms. Specifically, we exclude 42 CAs (6 old and 36 new) with activity code

⁵We thank an anonymous referee for guiding us in this direction.

801090 (security and investigation services) which generate the lumpy pre-trend observed in the linkages for old CAs in Figure 6. Upon excluding these 42 CAs from the analysis, the number of monthly linkages for old CAs becomes very stable, as depicted in Figure E.1. Building upon the stable trends for both old and new CAs, we conduct the following two exercises.

First, focusing on old CAs only, we estimated a regression with the number of commercial partners as the dependent variable on time and firm fixed effects. We omit December 2016 (instead of November) to account for any reporting delay in the first month of the reform. The top panel of Figure E.2 shows that the coefficients of the time dummies oscillate around zero. This implies that the number of linkages for old CAs remained pretty stable over the entire period.

Second, leveraging the stable pattern for old CAs, we proceed to compare the number of linkages between new and old CAs over time, as depicted in the bottom panel of Figure E.2. The blue line corresponds to a simple difference-in-differences specification without fixed effects. This is equivalent to comparing the blue and red lines in Figure E.1 relative to December 2016. The estimated coefficients oscillate around zero, meaning that the number of linkages for new and old CAs remained unchanged for three years. Moreover, when we add firm fixed effects to the diff-in-diffs, it suggests a slight increase for new CAs, albeit not statistically significant.

These results strike us as remarkable and may suggest that the flat pre-trend for old CAs displayed in Figure E.1 could serve as a counterfactual for the new CAs. In other words, our exercise suggests that, if we were able to observe in our data the pre-existing linkages for new CAs, they might coincide with those reported after November 2016. The only remaining possibility is that linkages were broken exactly when the reform was passed and remained constant thereafter, which seems unlikely or odd given the underlying adjustment frictions documented in the literature (e.g., Kleven and Waseem, 2013).

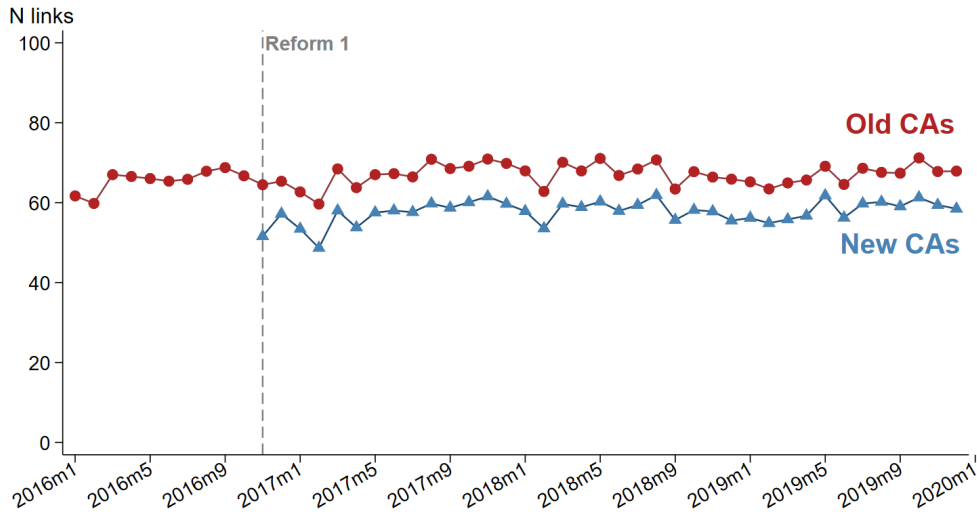
One caveat of the regression analysis presented in Figure E.2 is the somewhat wide confidence intervals, which prevents us from completely dismissing the possibility of changes in firm linkages (although we frankly think the stability of the point estimates is convincing enough).

Robustness to treatment assignment. To further mitigate some of these concerns, we evaluate the robustness of our results to alternative definitions of treatment and control. Recall that, to assign firms into T, we considered trade links with newly appointed CAs that remained stable six months after the reform. We assumed that any transaction ob-

served between November 2016 and April 2017 would reflect pre-existing commercial linkages between firms and newly appointed CAs.

Table E.1 investigates the robustness of the regression in Table 3 Panel A with respect to the number of months used to estimate baseline trade linkages. The first column replicates Panel A of Table 3, while the remaining columns repeat the specification changing only the number of months used to estimate these linkages: from one month—where trade links are constructed based on transactions observed right at the time of the reform—to twelve months—where we use one year of transaction data to construct trade links. Reassuringly, the estimates remain stable across specifications, suggesting that the results do not depend on the months chosen to construct the trade linkages.

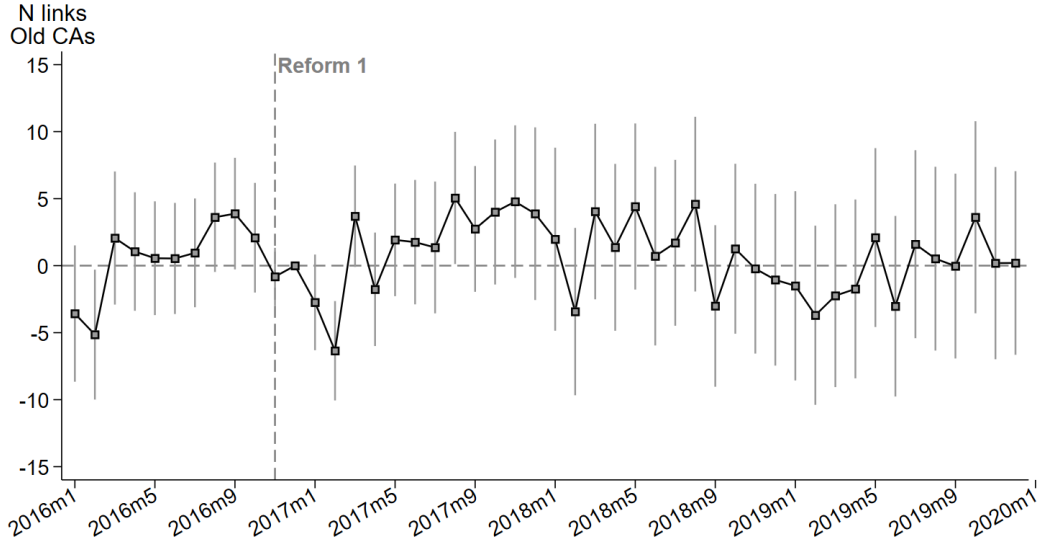
Figure E.1: Number of monthly linkages for old and new CAs



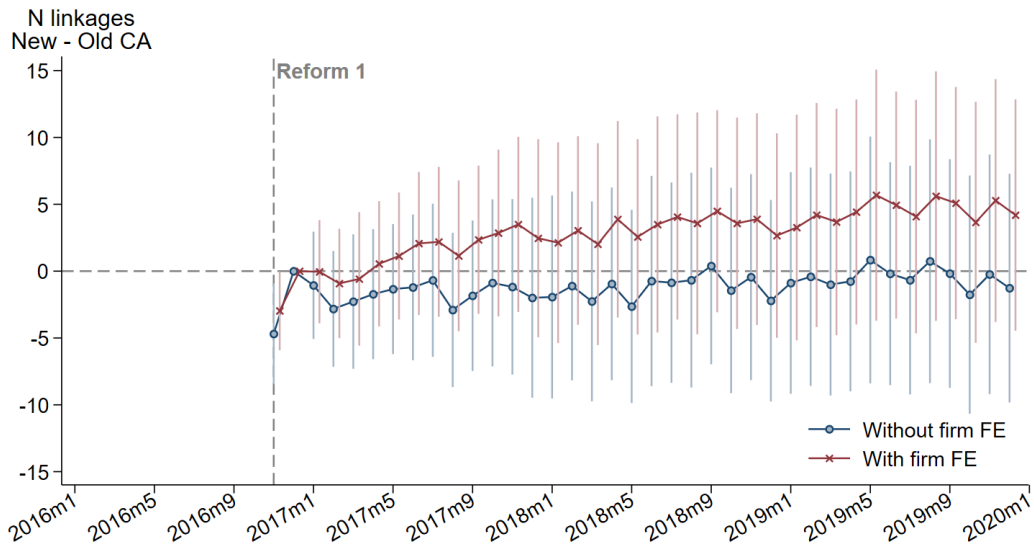
Note: This figure shows the average number of firms that get withheld each month from new and old collection agents (CAs) appointed in November 2016 and 2012, respectively. The gray vertical line corresponds to November 2016, the date at which the expansion of the withholding scheme entered into effect and, therefore, the first month of activity for new CAs. We exclude 42 CAs (6 old and 36 new) with activity code 801090 (security and investigation services) due to the uneven evolution in their linkage depicted in Figure 6b. While these firms account for 9% of all the firm-to-firm links throughout the period of analysis, the total value of transactions involved amounts to only 1%.

Figure E.2: Change in commercial linkages over time

(a) Old CAs: Number of linkages relative to Dec'16



(b) New vs Old CAs: Number of linkages relative to Dec'16



Note: This figure shows how the number of linkages changes over time for old collection agents (CAs) (panel a) and between old and new CAs (panel b). Panel (a) plots the coefficients from a regression of the number of monthly linkages on time and firm fixed effects. Panel (b) compares the number of monthly linkages between new and old CAs relative to December 2016. The blue circles correspond to a specification without firm fixed effects and the red crosses include firm fixed effects. In both regressions, we omit December instead of November 2016 to account for any reporting delay in the first month of the reform. The evidence indicates that commercial linkages do not seem to break both immediately on impact ($t = 0$) and over time.

Table E.1: Robustness to changing the length of baseline trade linkages to construct treatment and control groups

	Months used to estimate baseline trade linkages				
	6-months (1)	1-month (2)	3-months (3)	9-months (4)	12-months (5)
First stage					
Treat · Post	0.139*** (0.004)	0.153*** (0.004)	0.144*** (0.004)	0.139*** (0.004)	0.139*** (0.004)
Reported sales					
Treat · Post	5.808*** (0.542)	4.404*** (0.489)	5.471*** (0.514)	5.938*** (0.560)	6.476*** (0.576)
Tax revenue					
Treat · Post	5.507*** (0.596)	3.994*** (0.527)	5.408*** (0.558)	5.504*** (0.621)	5.884*** (0.640)
Observations	1223156	903935	1103822	1301080	1356128
Number of firms	75846	55770	68339	80751	84181

Note: This table investigates the robustness of our main regressions reported in Table 3 Panel A with respect to the number of months used to estimate baseline trade linkages. Column 1 replicates Panel A of Table 3, columns 2 to 5 repeat the specification changing only the number of months used to estimate these linkages. The last row shows the number of observations and firms in each specification. Standard errors clustered at the firm level are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels.

F Symmetry in the Responses to Increased and Decreased Withholdings

The results from the quasi-experiments in Sections 5 and 6 indicate symmetry in the effects of a decrease and increase in withholding on firms' reported sales and the amount of tax revenue collected. In this section, we explore whether these responses are in fact symmetric. Theoretically, if firms follow a simple heuristic where they use the amount withheld by third parties as a lower bound of their reported sales, then it could be possible that the responses to decreases and increases in withholding are similar in magnitude. However, there may be reasons to suspect that this is not the case. If part of the increase effect is because firms now "appear" on the radar of the tax authority in new ways, there may be a sustained compliance effect even as the extent of transactions covered by withholding decreases—firms will continue reporting the same as their enforcement perceptions have changed.

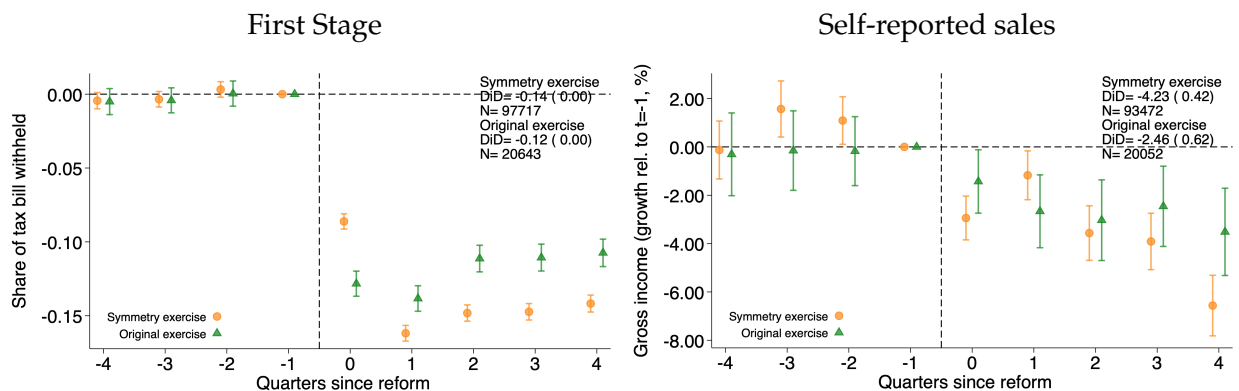
To evaluate these alternatives, we rely on a similar research design as the one used in Sections 5 and 6 and implement it on a sub-sample of firms that experience an increase and a subsequent decrease in withholding. We define firms as treated if they were part of the treatment group in the first reform (they were connected to newly appointed CAs) and they were also part of the treatment group in the second reform (their sales in 2017 were below the AR\$10 million cutoff and therefore waived from being withheld by banks). We run two separate regressions comparing the outcomes of this treatment group relative to the two original control groups.

We made a series of adaptations to the regression specifications to improve this exercise. First, since keeping the subset of firms treated in both reforms implied sacrificing power in our estimations, we increased the size of the treatment and control groups in the second reform. The treatment group in the "symmetry exercise" ("original exercise") consists of firms with 2017 sales between AR\$500 thousand (AR\$5 million) and AR\$10 million while firms with 2017 sales between AR\$10 million and AR\$50 million (AR\$20 million) are part of the control group. [Figure F.1](#) compares the two definitions: there are only small differences in the estimates and it is clear that a larger sample size in the current definition increases precision. Second, we homogenized the definition of the time variable in both specifications. In the original exercises, quarters were defined relative to the timing of each reform, in the current setting quarters are all defined relative to the first reform (making the first quarter of a given year run from February through April). This is also visible in [Figure F.1](#), the quarter of the reform under the current definition in-

cludes non-treated periods, which slightly decreases the absolute magnitude of the point estimate.

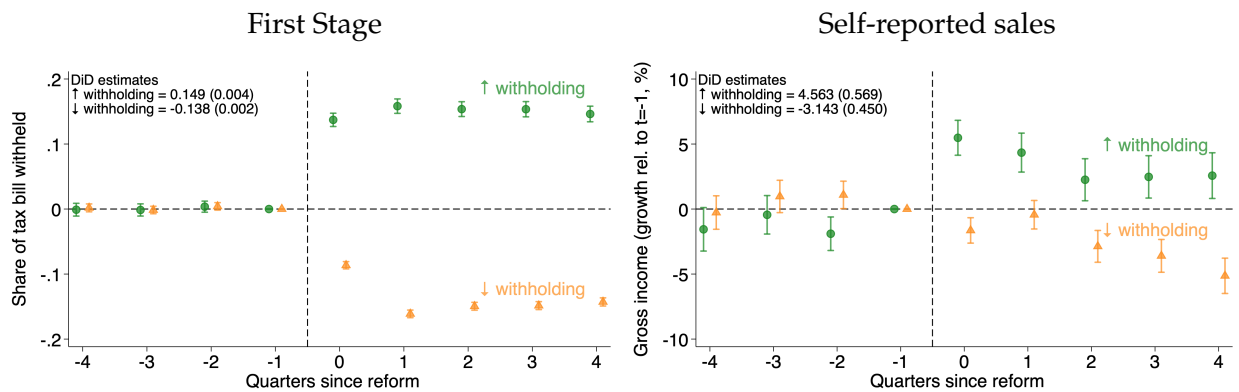
Figure F.2 (and Table F.1) shows the estimation results; the responses to both reforms are overlaid in a single figure to enhance the clarity of the exercise. The absolute magnitudes of the first-stage effects are similar, with the DD point estimates equal to 0.15 and -0.14 for the increase and decrease, respectively. Meanwhile, the absolute magnitude of the effect on self-reported sales is approximately 45 percent larger for the increase (4.56) than for the decrease (-3.14).

Figure F.1: Alternative definitions of the treatment status in Reform 2



Note: The figure compares two ways of defining the treatment and control groups under the second reform (that implied a decrease in withholdings). In the “original exercise” firms were classified as treated if their 2017 sales were between AR\$5 million and AR\$10 million, while those in the control group had sales between AR\$10 million and AR\$50 million. In the “symmetry exercise” firms are treated if their sales are in the AR\$500 thousand to AR\$10 million range, and control if they are in the AR\$10 million to AR\$20 million range.

Figure F.2: Symmetry in the responses to increased and decreased withholdings



Note: The figure shows the estimates for the dynamic differences-in-differences regressions performed on a sub-sample of firms that were treated both when withholdings increased (first reform) and when withholdings decreased (second reform). The plot on the left corresponds to the regression estimates for the first stage. The outcome of interest is the share of tax withheld by CAs (for the increase in withholding) and the share of tax withheld by banks (for the decrease in withholding). The plot on the right corresponds to the regression estimates on self-reported sales. In all cases, each coefficient represents the difference between the treatment and control groups in a given quarter relative to the pre-reform quarter. The vertical spikes indicate the 95% confidence interval. The DD estimates are displayed at the top of each figure. All regression specifications contain a balanced panel of firms that filed taxes in at least six months every year. The dashed vertical line indicates the timing of the reform.

Table F.1: Symmetry in the responses to increased and decreased withholdings

	First Stage (1)	Reported sales (2)	Tax revenue (3)
<i>Panel A: Increase in withholding</i>			
<i>Treat · Post</i>	0.149*** (0.004)	4.563*** (0.569)	4.144*** (0.613)
Observations	503076	494348	473081
N firms	58377	56387	53953
Mean	0.404	13.641	13.473
<i>Panel B: Decrease in withholding</i>			
<i>Treat · Post</i>	-0.138*** (0.002)	-3.143*** (0.450)	-3.184*** (0.481)
Observations	554213	546484	529581
N firms	63488	62559	60638
Mean	0.236	19.625	19.413

Note: This table investigates the symmetry in the responses to increased and decreased withholdings on a sub-sample of firms that experience both the initial increase and the subsequent decrease in withholding. Column 1 shows the first-stage results. For Panel A, this corresponds to the share of taxes withheld by CAs, while for Panel B it corresponds to the share of taxes withheld by banks. Columns 2 and 3 correspond to the gross income and the tax revenue growth relative to the baseline period (third quarter of 2016 and third quarter of 2018, respectively). The last row of each panel shows the average value of the dependent variable at baseline. Standard errors clustered at the firm level are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels.

G Heterogeneous Effects

In this section, we perform a series of exercises that extend our analysis of the indirect effect of withholding on linked taxpayers. We evaluate how the taxpayers' responses differ across three dimensions: their size, their economic activity, and their position in the supply chain. In all cases, we follow a similar procedure to estimate these responses: we split our baseline sample based on the firm's observable characteristics and then apply the same regression specifications used in the paper.

Firm size. For the first reform, we classify firms into three groups based on their gross revenue in 2015: (i) small firms, with revenues between AR\$15,000 and up to AR\$1 million (percentiles 1 through 42); (ii) medium-sized firms, with revenues between AR\$1 million and up to AR\$4 million (percentiles 43 through 70); and (iii) large firms, with revenues between AR\$4 million and up to AR\$172 million (percentiles 71 through 99). [Figure G.1](#) illustrates the distribution of firm sizes by industry along with these thresholds. For the second reform, we adopt a different strategy. Given that its assignment rule already leverages size differences (firms with sales in 2017 below AR\$10 million are treated), we partition the treatment group into two equal-sized sub-groups while maintaining the control group's definition. Small firms are defined as those between AR\$500 thousand and AR\$2 million (the median value) and medium-sized firms are those between AR\$2 million and AR\$10 million.

We repeat the regression specifications outlined in the paper on the subset of firms falling under each of these categories. Results are shown in [Figure G.2](#). The most notable pattern is observed for large firms connected to newly appointed CAs, displaying a substantial increase in the share of tax withheld by CAs (first stage) compared to similarly sized firms linked to old CAs: the initial increase is around 60% larger than that observed by medium and small firms but then tapers off to the same level as the other groups. The opposite pattern is observed for self-reported sales: the responses are initially similar across groups but large firms diverge to a larger effect.

The observed results initially seem counterintuitive, as conventional wisdom suggests that larger firms, typically more compliant, would exhibit a more muted response in self-reported sales following the reform. However, the tax compliance literature offers mixed results on firm size heterogeneity (Pomeranz, 2015; Brockmeyer and Hernandez, 2019; Waseem, 2023). One reason larger firms might react more is their greater perceived risk of evasion penalties, as they face higher audit rates (Kumler et al., 2020; Kleven et al., 2016;

Holz et al., 2023). For example, Holz et al. (2023) found that in the Dominican Republic, the increased likelihood of audits for larger firms significantly influences their responsiveness to tax enforcement, highlighting the impact of perceived audit risk on compliance.

Nevertheless, as we show next, the same pattern emerges for firms in the primary sector (agriculture, mining, manufacturing, and construction) which tend to be the largest in this setting (see the top row of [Figure G.1](#)), and are usually presumed to underreport sales to a greater extent.

Industry. Most of the firms in our sample report their primary industrial activity, which can be mapped to the ISIC Rev. 4 classification. We aggregate industries into five economic activities or sectors: primary (contains industry codes corresponding to agriculture, mining, manufacturing, and construction), commerce (wholesale, retail), high-skilled services (professionals, financial services, real estate), low-skilled services (transportation, hotel, food, recreation, and other), and utilities (we exclude it from our calculations as there are few, very large, firms in this category).

We then re-estimate the regression specifications for the first and second reforms on these groups. Results are shown in [Figure G.3](#). As noted above, the primary sector displays a more pronounced response to the first reform while the rest of the sectors behave similarly.

Position in the supply chain. We classify firms with respect to the CA's position in the supply chain by examining the type of withholding they report: firms can either report being withheld by a CA that sells to them (i.e., downstream withholding, where the supplier withholds by adding the withheld tax to the total sale) or being withheld by a CA that buys from them (i.e., upstream withholding, where the buyer subtracts the withheld amount from the total sale).⁶ In practice, however, firms usually have a mix of both types of withholding, then, we proceed in the following way to isolate these groups. We classify firms into the "CA seller only" group if they only registered downstream withholding throughout our study (that is, we completely shut off the possibility of being withheld upstream). Conversely, for firms to be classified into the group "CA buyer only" it must be the case that they only registered upstream withholding throughout our study (we shut off downstream withholding in this case).

To keep the exercise simple, we focus on the expansion of the withholding scheme for

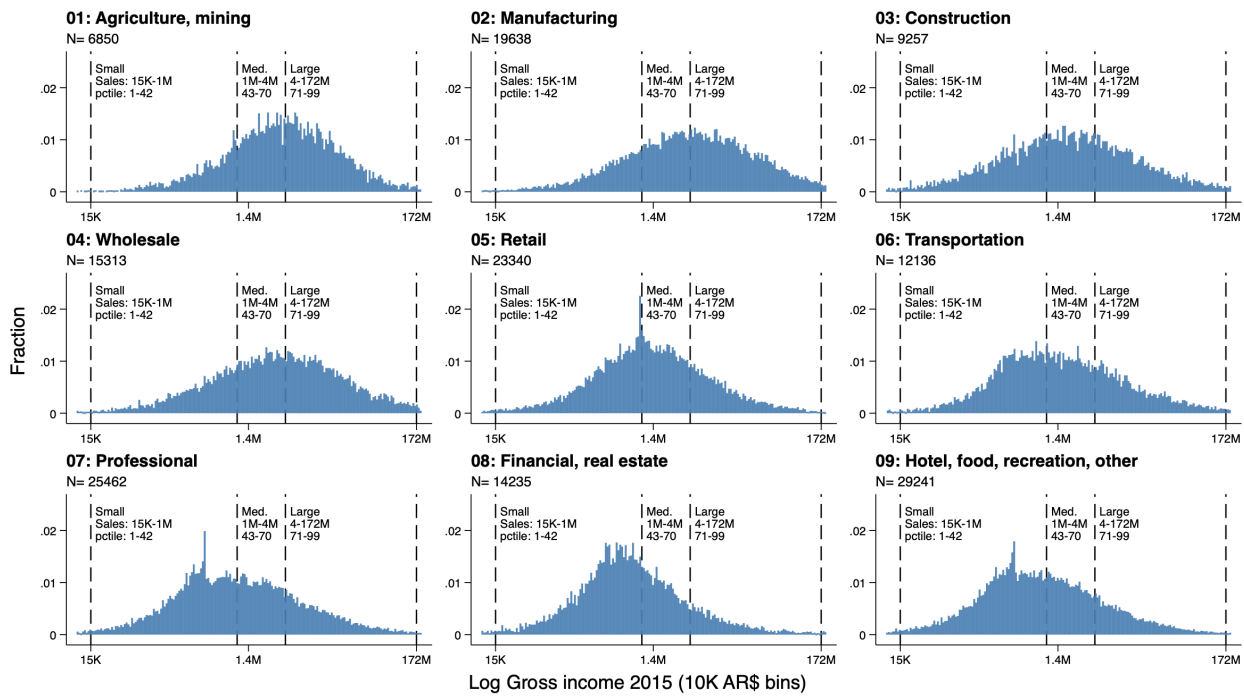
⁶See [Figure 4](#) and [Appendix A](#) for more details on the different tax collection mechanisms.

which the nature of the first stage is more clear. This first reform allows us to analyze more cleanly the effect of an increase in withholding on firms located downstream (withheld by CAs acting as sellers) vis-a-vis firms located upstream (withheld by CAs acting as buyers). In contrast, in the second reform, although we can flag downstream and upstream firms, the nature of the change in withholding is less clear. In this case, there is a decrease in bank withholding and, thus, it is not fully evident ex-ante whether downstream and upstream firms would respond more.

To illustrate the construction of our treatment groups consider the firms originally classified as treated in the first reform, that is, firms linked to new CAs which experienced an increase in the amount of tax collected through withholding. As mentioned above, most firms face a mix of CAs located upstream and downstream. Our strategy relies on isolating subsets of treated taxpayers that have linkages to only one type of CA. [Figure G.4](#) showcases the aforementioned classification, the left panel for firms in the “CA seller only” group, and the right panel for those in the “CA buyer only” group—for brevity, we discuss the former case next but the latter is analogous. The left panel displays the share of tax withheld by CA sellers and CA buyers over time for the treated firms that are only withheld by CAs acting as sellers. As the upstream channel has been shut off, the only source of withholding by CAs is downstream from CAs that act as sellers. In this case, all the variation in the treatment group’s share of tax withheld originates from CAs that sell goods or services to them.

Using these two treatment group definitions, we quantify their responses (relative to the control group, which remains unchanged) following the first reform to the withholding scheme. Results are displayed in [Figure G.5](#). The group of firms that face CAs that are sellers has a larger increase in self-reported sales after an increase in withholding. This aligns with findings in the existing literature: firms located at the end of the supply chain are more prone to evading taxes (Pomeranz, 2015; Naritomi, 2019; Waseem, 2023).

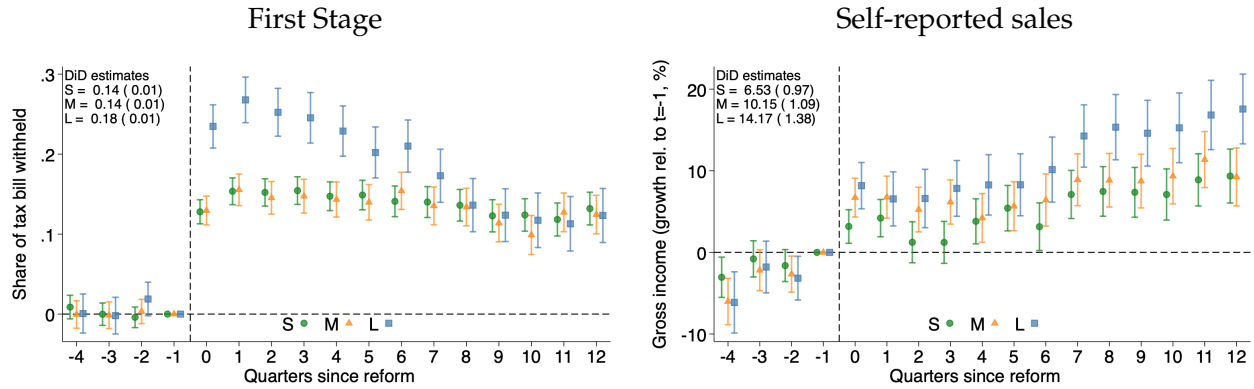
Figure G.1: Firm size distribution in 2015 (annual sales)



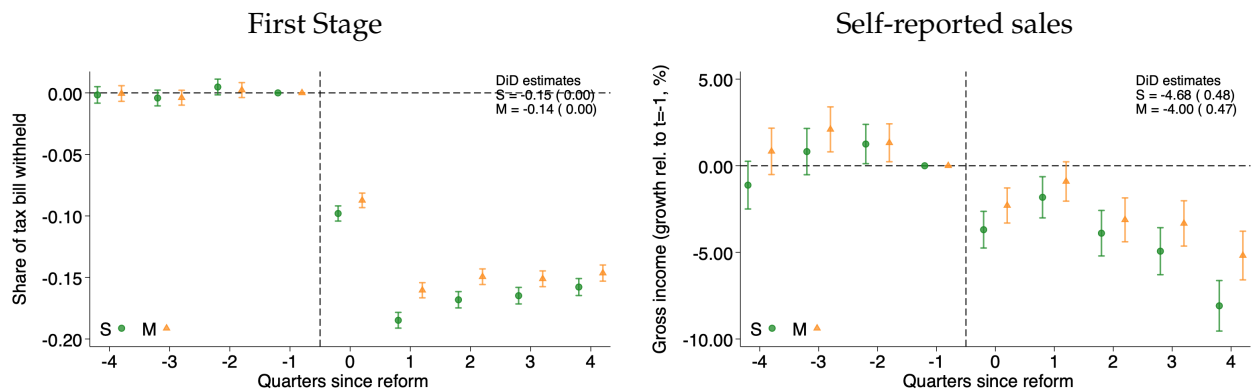
Note: This figure shows the firm size distribution according to the firm's gross income in 2015 (in logs). The support takes values between AR\$10 thousand and AR\$200 million; there are 190 equally spaced bins of width AR\$10 thousand. The bunching observed in professional services, retail, and other services aligns with the VAT registration threshold in 2015.

Figure G.2: Heterogeneity by Firm Size

(a) Withholding increase



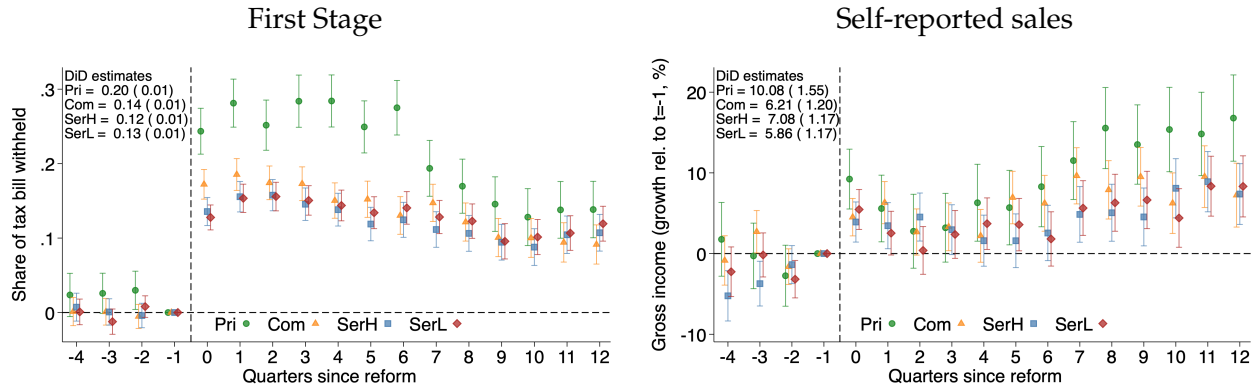
(b) Withholding decrease



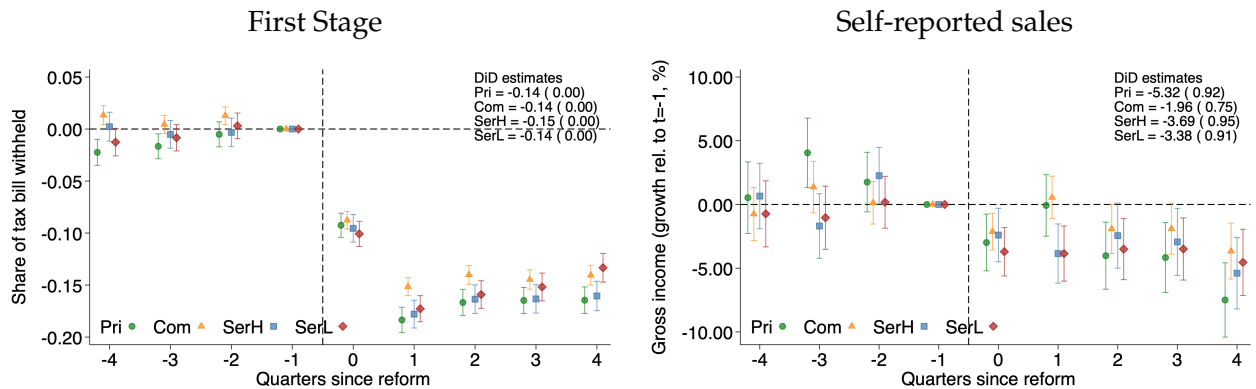
Note: The two panels in this figure show the dynamic difference-in-differences estimates by firm size. The top panel shows the results for the first reform (increase in withholding), while the bottom panel shows the results for the second reform (decrease in withholding). For the first reform, we classify firms into three groups based on their gross revenue in 2015: (i) small firms: AR\$15,000–AR\$1 million (percentiles 1–42); (ii) medium-sized firms: AR\$1 million–AR\$4 million (percentiles 43–70); and (iii) large firms: AR\$4 million–AR\$172 million (percentiles 71–99). For the second reform, we split the treatment group into two equal-sized sub-groups based on median sales in 2017: (i) small firms: AR\$500 thousand–AR\$2 million (the median value); and (ii) medium-sized firms: AR\$2 million–AR\$10 million. The plots on the left correspond to the regression estimates for the first stage. The outcome of interest is the share of tax withheld by CAs (for the increase in withholding) and the share of tax withheld by banks (for the decrease in withholding). The plots on the right correspond to the regression estimates on self-reported sales. In all cases, each coefficient represents the difference between the treatment and control groups in a given quarter relative to the pre-reform quarter. The vertical spikes indicate the 95% confidence interval. The DD estimates are displayed at the top of each figure. All regression specifications contain a balanced panel of firms that filed taxes in at least six months every year. The dashed vertical line indicates the timing of the reform.

Figure G.3: Heterogeneity by Industry

(a) Withholding increase



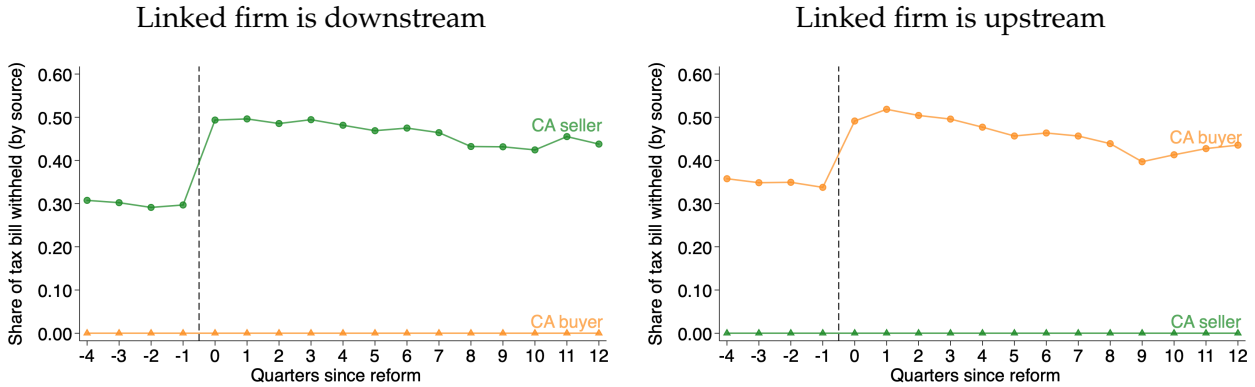
(b) Withholding decrease



Note: The two panels in this figure show the dynamic difference in difference estimates for heterogeneous effects by industry. We classify firms into four sectors: primary (contains industry codes corresponding to agriculture, mining, manufacturing, and construction), commerce (wholesale, retail), high-skilled services (professionals, financial services, real estate), and low-skilled services (transportation, hotel, food, recreation, and other). The top panel shows the results for the first reform (increase in withholding), while the bottom panel shows the results for the second reform (decrease in withholding). The plots on the left correspond to the regression estimates for the first stage. The outcome of interest is the share of tax withheld by CAs (for the increase in withholding) and the share of tax withheld by banks (for the decrease in withholding). The plots on the right correspond to the regression estimates on self-reported sales. In all cases, each coefficient represents the difference between the treatment and control groups in a given quarter relative to the pre-reform quarter. The vertical spikes indicate the 95% confidence interval. The DD estimates are displayed at the top of each figure. All regression specifications contain a balanced panel of firms that filed taxes in at least six months every year. The dashed vertical line indicates the timing of the reform.

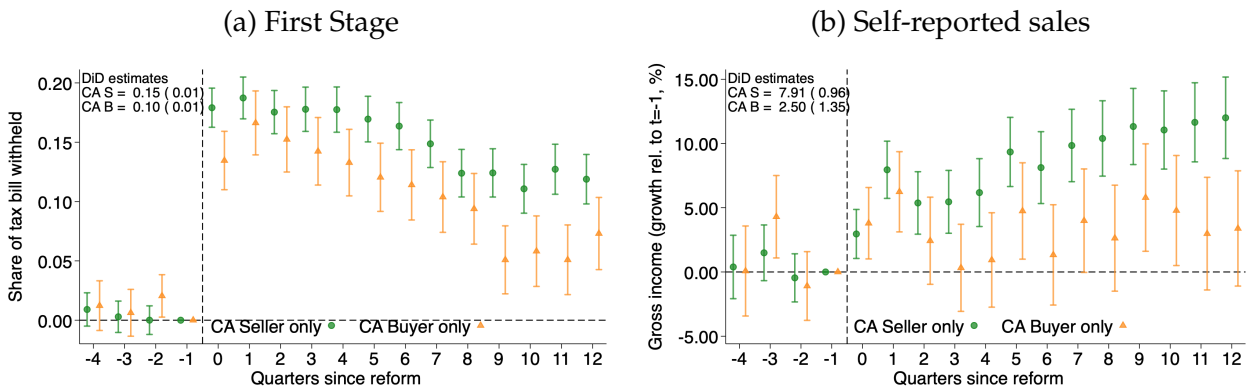
Figure G.4: Position of linked firms in the supply chain (variation)

(a) Increase in withholding by upstream CAs (b) Increase in withholding by downstream CAs



Note: This figure shows the change in tax withholdings for firms linked to CAs that sell goods or services to them (left panel) and firms linked to CAs that buy goods or services from them (right panel). These firms comprise a subset of the original treatment group. We refer to firms in panel (a) as ‘downstream firms’. As the upstream channel has been shut off (orange line), the only source of withholding in this case is downstream from CAs that act as sellers. Likewise, we refer to firms in panel (b) as ‘upstream firms’. In this case, the downstream channel has been shut off (green line). We leverage this variation and compare each group to the original control group in [Figure G.5](#).

Figure G.5: Position of linked firms in the supply chain

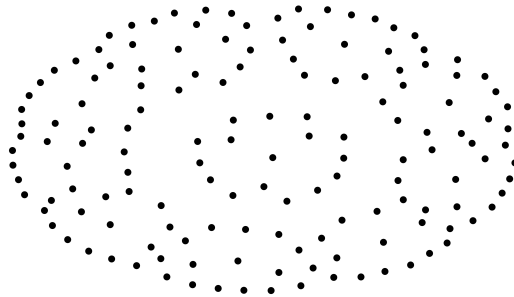


Note: This figure explores heterogeneous effects along the supply chain. It shows the effect of an increase in withholding on (i) firms located downstream, withheld by CAs selling to them (green circles), and (ii) firms located upstream, withheld by CAs buying from them (orange triangles). The plot on the left displays the first stage change in the share of tax withheld by CAs. The coefficients represent the difference between each treatment and the original control groups in a given quarter relative to the pre-reform quarter. The plot on the right corresponds to the regression estimates on self-reported sales. The vertical spikes indicate the 95% confidence interval. The DD estimates are displayed at the top of each figure. All regression specifications contain a balanced panel of firms that filed taxes in at least six months every year. The dashed vertical line denotes the moment of the reform.

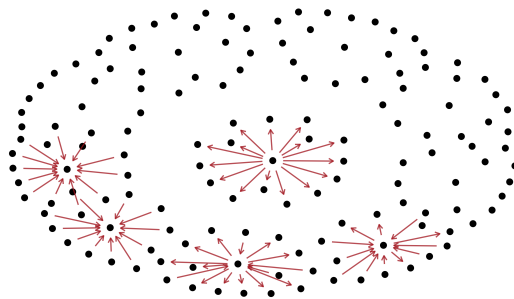
H Additional Figures and Tables

Figure H.1: Networks

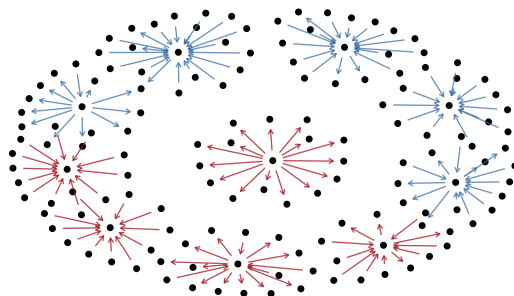
(a) No CA data



(b) Only old CA data



(c) Both old and new CA data



Note: These figures illustrate the construction of the business-to-business linkages in our data set. Each node represents a real firm, and the connecting edges represent real linkages. The central nodes, from which the edges radiate, correspond to firms acting as collection agents (CAs) while the direction of the edges signifies whether the CA is a seller (outgoing) or a buyer (incoming) in the transaction. Notice that the same CA can simultaneously withhold sales and purchases and thus have arrows pointing in both directions.

Figure H.2: Relevance of the reform

ambito.com

Modificaciones en régimen de retenciones en CABA

EDICIÓN IMPRESA 11 Octubre 2016

Los agentes de retención en el régimen de recaudación reformulado serán designados de oficio cuando superen ciertas cifras de ingresos del año calendario anterior sin advertirse un mecanismo de reclamo.



Por Jorge A. Carmona y Héctor A. Duguine

El régimen recaudatorio vigente en la actualidad se haya dispuesto por Resolución N° 939/AGIP 2013, con las modificaciones introducidas por la Resolución N° 364/AGIP 2016 y la Resolución N° 421/AGIP 2016. **Las modificaciones introducidas, crean un típico régimen general de recaudación de retenciones y percepciones basado en gestión de alícuotas por Padrón de Contribuyentes, intentando emular el vigente en la provincia de Buenos Aires administrado por ARBA con retenciones y percepciones cruzadas, perdiendo los Agentes de Recaudación el beneficio de no ser retenidos y percibidos.** Hasta la modificación efectuada por la Resolución N° 364/AGIP 2016, en la CABA los agentes de recaudación eran en todos los casos designados taxativamente por el Fisco, a partir de ahora coexistirá ese régimen con el de padrones de alícuotas para el régimen general de retenciones y percepciones. Además de los nominados, deberán actuar en ese carácter los sujetos que desarrollen actividades en la Ciudad Autónoma de Buenos Aires queobtenido en el año calendario inmediato anterior ingresos por un montoa los \$60.000.000. **A diferencia de la provincia de Buenos Aires en donde el potencial agente debe inscribirse, en la CABA será designado de oficio cuando supere esa cifra. No advertimos un mecanismo exprés de reclamo.**

Con ese objeto deberánlos ingresos gravados, exentos y no gravados correspondientes a todasjurisdicciones, netos de impuestos. Se considera que desarrollan actividades en laAutónoma de Buenos Aires aquellos sujetos que posean en esta jurisdicciónagencias, representaciones, oficinas, locales y todo otro tipo deexplotación, edificio, obra, depósito o similar y quienes se valgan paraejercicio de su actividad en territorio de la Ciudad Autónoma de Buenos Aires, de losde comisionistas, corredores, consignatarios o martilleros. Existen una serie de sujetos excluidos de actuar como agentes de recaudación.

Note: This figure shows an article from the *Ambito* newspaper that discusses the major expansion of the withholding scheme analyzed in this paper. The title is “Changes in the Withholding Regime in CABA (City of Buenos Aires),” and the text below reads “Withholding agents in the reformulated collection regime will be appointed ex officio when they exceed an income threshold from the previous calendar year and have no right to appeal the appointment.” Related newspapers also published articles with FAQs clarifying the details of the reform. For example, see [iProfesional](#). Source: [Ambito.com](#).

Figure H.3: Example of the register of withholding agents published monthly by the tax administration

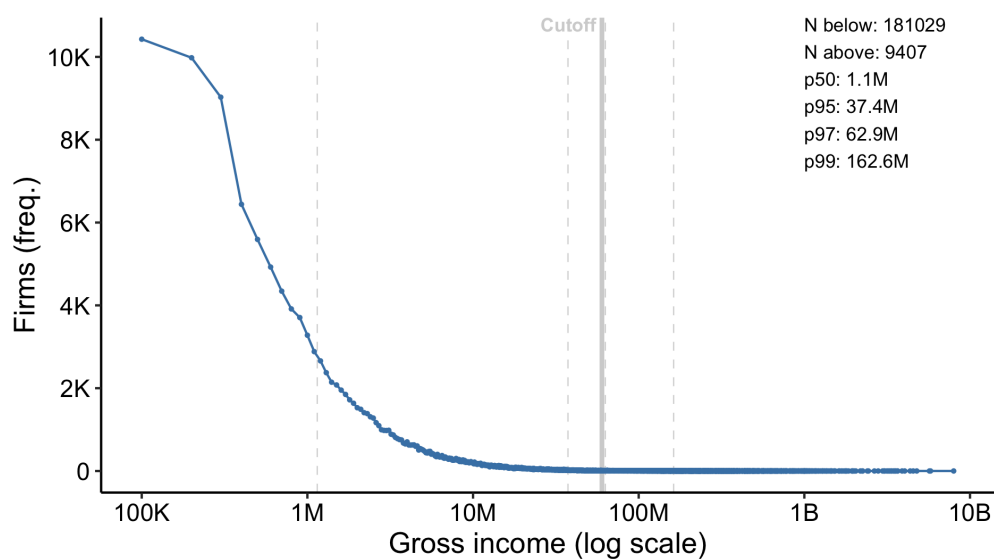


NOMINA AGENTES DE RECAUDACION
MAYO 2017

ORDEN	AG	DI	CUIT	RAZON SOCIAL	NORMA	VEGENCIA
1248	15404	0	30711230188	CABLETECH ARGENTINA SA	RES. 364-AGIP-2016	01/11/2016
1249	8410	9	30579652084	CABLEVISION SA	RES. 1080-MHGC-07	02/05/2007
1250	9454	2	30500506992	CABOSCH S.A.	RES. 607-AGIP-2009	01/10/2009
1251	15875	0	33504113049	CABOT ARGENTINA SAIC	RES. 364-AGIP-2016	01/11/2016
1252	1543	7	30537745742	CABRALES SOCIEDAD ANONIMA	Res. 1465-SHYF/01	01/09/2001
1253	9506	6	30708969245	CACHAY S.A.	RES. 50-AGIP-2010	01/03/2010
1254	11537	0	30507400228	CACHI YACO SA	RES. 364-AGIP-2016	01/11/2016
1255	13811	0	30700584131	CACHO SUSPENSION S.A.	RES. 364-AGIP-2016	01/11/2016
1256	15356	0	30710983107	CACIC SPORTS VISION SRL	RES. 364-AGIP-2016	01/11/2016
1257	9519	5	30544013544	CADENACI SA	RES. 50-AGIP-2010	01/03/2010
1258	9760	8	30578890002	CAFE OYAMBRE SRL	RES. 371-AGIP-2010	01/08/2010
1259	9761	1	30707732055	CAFE ROCAMORA S.R.L.	RES. 371-AGIP-2010	01/08/2010
1260	1507	9	30501077131	CAFES LA VIRGINIA S.A	Res. 430-SHYF/01	01/05/2001
1261	1544	0	30523456144	CAFES MUÑOZ SRL	RES. 371-AGIP-2010	01/08/2010
1262	9479	7	30504312212	CAGNOLI S.A.	RES. 675-AGIP-2009	01/12/2009
1263	14471	0	30708284250	CAIF COMPANIA ARGENTINA DE INVESTIGACIONES FARMACEUTICAS S.A.	RES. 364-AGIP-2016	01/11/2016
1264	15870	0	33500730639	CAIMARI	RES. 364-AGIP-2016	01/11/2016
1265	3749	6	30863205621	CAJA DE SEGUROS SA	Res. 430-SHYF/01	01/05/2001
1266	4749	2	30554475910	CAJA DE VALORES S.A.	Res. 1465-SHYF/01	01/09/2001
1267	3563	6	30701951251	CAJA NOTARIAL COMPLEMENTARIA DE SEGURIDAD SOCIAL	Res. 1465-SHYF/01	01/09/2001
1268	12739	0	30644296675	CALDENES SA	RES. 364-AGIP-2016	01/11/2016
1269	11340	0	30500039678	CALEDONIA ARGENTINA COMPANIA DE SEGUROS S.A.	RES. 364-AGIP-2016	01/11/2016
1270	13303	0	30683338121	CALENDER SA	RES. 364-AGIP-2016	01/11/2016
1271	9271	3	30555460526	CALERA BUENOS AIRES S.A.	RES. 568-AGIP-2008	01/02/2009
1272	9280	8	30709076902	CALERA CONGRESO SH D E JUAN M SELVA MARIANO F SELVA Y JUAN I SELVA	RES. 568-AGIP-2008	01/02/2009
1273	14607	0	30708553886	CALERA DE SAENZ P.E.A. S.A.	RES. 364-AGIP-2016	01/11/2016
1274	14152	0	30707587845	CALERA EL OMBU S.A	RES. 364-AGIP-2016	01/11/2016
1275	16050	0	33683963289	CALERA SAN JUSTO SA	RES. 364-AGIP-2016	01/11/2016
1276	12253	0	30596774640	CALFOR S.R.L.	RES. 364-AGIP-2016	01/11/2016
1277	10998	4	30710371527	CALFRAC WELL SERVICES (ARGENTINA) SA	RES. 353-AGIP-2014	01/07/2014
1278	15949	0	3359683679	CALICO S.A.	RES. 364-AGIP-2016	01/11/2016
1279	14658	0	30708687568	CALLMED SA	RES. 364-AGIP-2016	01/11/2016
1280	16136	0	33707528449	CALOREX S.A.	RES. 364-AGIP-2016	01/11/2016
1281	9089	6	30706046093	CALZADO LOPEZ TAIBO SRL	RES. 313-AGIP-2008	01/10/2008
1282	11908	0	30551587300	CALZADOS FERLI S.A.	RES. 364-AGIP-2016	01/11/2016
1283	9091	5	30680631721	CALZARTE SRL	RES. 313-AGIP-2008	01/10/2008
1284	12150	0	30585357657	CALZETTA NEUMATICOS SOCIEDAD ANONIMA	RES. 364-AGIP-2016	01/11/2016
1285	10800	4	33690589619	CALZIFICIO ALDAMA SA	RES. 592-AGIP-2012	01/10/2012
1286	9641	8	30700955008	CAMARA DE EMPRESAS DE CONTROL Y ADM. DE INFRACCIONES DE TRANS DE LA REP. ARG. ASOCIACION CIVIL	RES. 144-AGIP-2010	01/05/2010
1287	10323	5	30643748823	CAMARAS Y LUCES SA	RES. 259-AGIP-2012	01/06/2012
1288	15308	0	30710776063	CAMARIQAS SA	RES. 364-AGIP-2016	01/11/2016
1289	12621	0	30632829732	CAMASA SA	RES. 364-AGIP-2016	01/11/2016
1290	11392	0	30501948981	CAMBRE INDUSTRIAL COMERCIAL Y FINANCIERA SA	RES. 364-AGIP-2016	01/11/2016

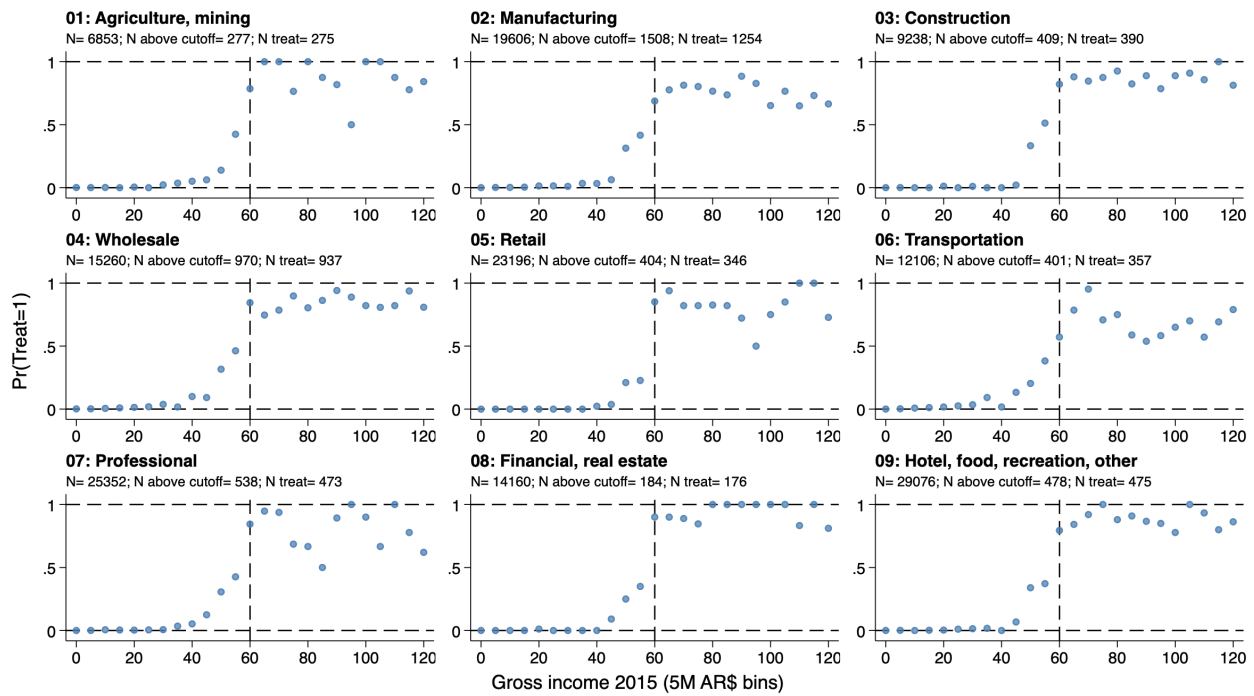
Note: This figure shows a page from the register of withholding agents published monthly by the tax administration. The full list, in particular, includes all the active withholding agents as of May 2017. This information is publicly available on the [AGIP website](#). Each row corresponds to a different firm. The fourth column shows the tax identifier, the fifth column shows the name of the company, the sixth column shows the resolution that appoints the firm to act as a collection agent, and the last column shows the starting date. Not surprisingly, the majority of the dates correspond to November 1, 2016, the date at which the major reform we analyze was implemented. We downloaded all these monthly registers, digitized them, and constructed a database that we merged with our main administrative data. We also used this database to construct [Figure 2](#). It is interesting to observe the mix of firms appointed to act as collection agents. In this list, one can see coffee producers, pharmaceutical firms, insurance companies, footwear manufacturers, and construction-materials wholesalers, among others.

Figure H.4: Firm size distribution in 2015 (annual sales)



Note: This figure shows the firm size distribution according to the firm’s gross income (sales) in 2015. This is the same variable that was used to determine the appointment of firms into the collection agent regime in 2016. The figure includes firms that reported sales equal to or greater than size AR\$100,000, using bins of size AR\$100,000 (~US\$8,000). The solid gray line labeled “Cutoff” indicates the location of the sales threshold used to determine appointment; the dashed lines indicate the 50th, 95th, 97th, and 99th percentiles.

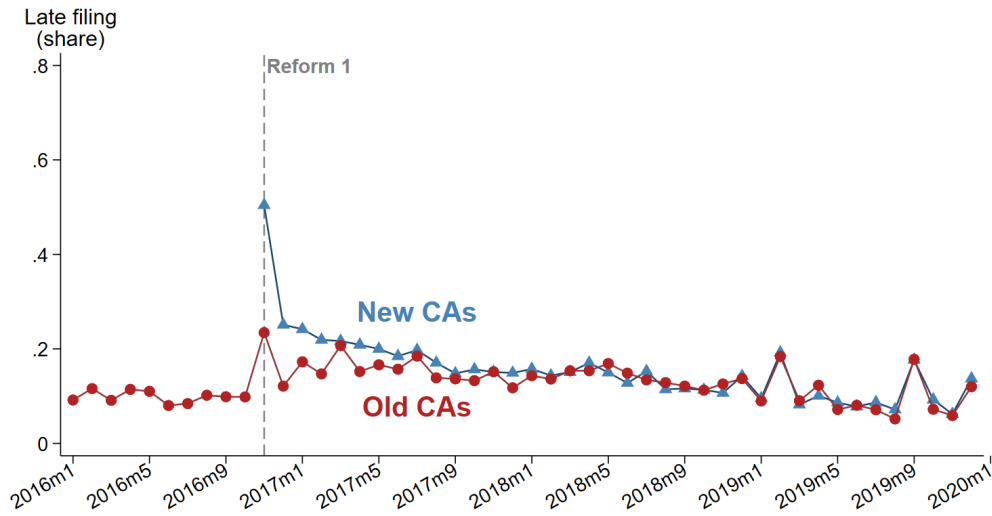
Figure H.5: Probability of appointment as collection agent, by industry group



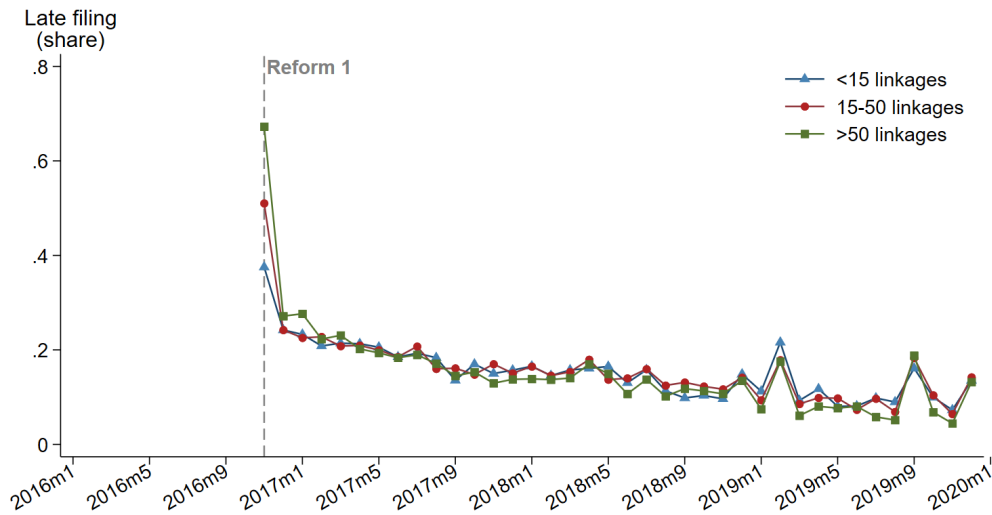
Note: This figure groups firms by industry group and shows the probability of appointment as CA by 2015 gross income bin, where each bin is of size AR\$5 million. At the top of each plot, we indicate: the total number of firms in the industry group, the number of firms above the AR\$ 60 million threshold used to determine appointment, and the number of firms effectively appointed as CAs. Industry groups are defined following ISIC Rev. 4 sections.

Figure H.6: Delay in remitting tax withholdings

(a) New vs Old CAs: Share of transactions filed past the due date



(b) New CAs: heterogeneity by number of linkages



Note: This figure plots the share of transactions filed past the due date. Panel (a) compares old and new CAs and Panel (b) explores the heterogeneity by the number of commercial linkages for new CAs. A potential cost of becoming a CA is that firms must file a monthly tax return containing all the transactions with their commercial partners, and must subsequently remit the amount withheld on their behalf. If this cost was meaningful, one would expect new CAs to encounter delays in filing their tax returns; especially compared to old CAs, with more experience in this task. The results from this exercise add further evidence countering the notion of a direct impact on CAs. The figure reveals that new and old CAs exhibit remarkably similar delays in remittances.

Table H.1: Summary statistics for old and new Collection Agents (CAs)

	Full Sample			Excluding industry 801090		
	New CAs (1)	Old CAs (2)	Diff.: (2)-(1) (3)	New CAs (4)	Old CAs (5)	Diff.: (5)-(4) (6)
<i>Panel A: CAs</i>						
Primary sector	0.396 [0.489]	0.218 [0.414]	-0.177*** (0.021)	0.402 [0.490]	0.221 [0.415]	-0.181*** (0.022)
Wholesale/Retail sector	0.260 [0.439]	0.374 [0.484]	0.114*** (0.024)	0.264 [0.441]	0.379 [0.486]	0.115*** (0.024)
Services sector	0.344 [0.475]	0.407 [0.492]	0.063*** (0.024)	0.334 [0.472]	0.400 [0.490]	0.066*** (0.025)
Total sales 2016 (log)	18.772 [1.007]	18.681 [1.596]	-0.091 (0.074)	18.768 [1.010]	18.667 [1.599]	-0.100 (0.075)
Number of linked firms	52.090 [153.974]	82.311 [471.580]	30.221 (21.170)	51.620 [151.611]	62.406 [133.810]	10.786 (6.715)
Withholding as seller	0.618 [0.348]	0.546 [0.338]	-0.073*** (0.017)	0.615 [0.348]	0.542 [0.338]	-0.073*** (0.017)
Remittances delayed	0.148 [0.193]	0.124 [0.170]	-0.024*** (0.008)	0.147 [0.192]	0.124 [0.170]	-0.023*** (0.009)
Days delayed	58.196 [103.451]	68.102 [107.005]	9.906* (5.531)	58.486 [103.897]	68.464 [107.273]	9.978* (5.569)
Withholding/Sales	0.009 [0.033]	0.009 [0.018]	-0.000 (0.001)	0.009 [0.033]	0.009 [0.018]	-0.000 (0.001)
<i>Panel B: Linked Firms</i>						
Primary sector	0.284 [0.182]	0.227 [0.154]	-0.057*** (0.008)	0.285 [0.183]	0.227 [0.154]	-0.058*** (0.008)
Wholesale/Retail sector	0.312 [0.155]	0.331 [0.182]	0.019** (0.009)	0.312 [0.156]	0.332 [0.182]	0.020** (0.009)
Services sector	0.404 [0.209]	0.441 [0.217]	0.037*** (0.011)	0.403 [0.210]	0.441 [0.218]	0.038*** (0.011)
Total sales 2016 (log)	17.078 [1.025]	16.748 [1.093]	-0.330*** (0.053)	17.073 [1.027]	16.741 [1.089]	-0.332*** (0.053)
N firms	2498	507	3005	2462	501	2963

Note: The table reports the mean of a series of characteristics (standard deviation in brackets) for the sample of newly-appointed CAs and pre-existing CAs in Columns 1 and 2, as well as the difference in means t-test coefficient (standard error in parenthesis) in Column 3. Columns 4-6 exclude activity code 801090 from the sample. Panel A shows variables describing the CAs: “Primary sector”, “Wholesale/Retail sector” and “Services sector” are binary variables indicating whether the firm is in the sector; “Total sales 2016 (log)” is the firm’s total sales in 2016, in logs; “Number of linked firms” is the average number of linked firms withheld in a month; “Withholding as seller” is the share of transactions where the CA acted as seller; “Remittances delayed” is the share of transactions for which the withheld tax was remitted after the submission deadline was due; “Days delayed” is the average delayed days, conditional on being delayed; and “Withholding/Sales” is the ratio of total withheld funds relative to total sales in 2017 (the first full year where both old and new CAs withhold taxes); Panel B shows variables describing the average characteristics of linked firms: “Primary sector”, “Wholesale/Retail sector” and “Services sector” are the shares of trade partners in the corresponding sectors; “Total sales 2016 (log)” is the average sale amount of trade partners in 2016, in logs. *, **, and *** denote statistical significance at the 10%, 5% and 1% levels.