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Paul Carrillo
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Paul Carrillo
George Washington University
pcarrill@gwu.edu

Dave Donaldson
Massachusetts Institute of Technology
ddonald@mit.edu

Dina Pomeranz
University of Zurich
dina.pomeranz@econ.uzh.ch

Monica Singhal
University of California Davis
msinghal@ucdavis.edu

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URPP Equality of Opportunity, University of Zurich, Schoenberggasse 1, 8001 Zurich, Switzerland
info@equality.uzh.ch, www.urpp-equality.uzh.ch

Ghosting the Tax Authority: Fake Firms and Tax Fraud in Ecuador*

Paul Carrillo[†]
Dave Donaldson[‡]
Dina Pomeranz[§]
Monica Singhal[¶]

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Abstract

An important but poorly understood form of firm tax evasion arises from “ghost firms”—fake firms that issue fraudulent receipts so that their clients can claim false deductions. We provide a unique window into this global phenomenon using transaction-level tax data from Ecuador. 5% of firms use ghost invoices annually and, among these firms, ghost transactions comprise 14% of purchases. Ghost transactions are particularly prevalent among large firms and firms with high-income owners, and exhibit suspicious patterns, such as bunching below financial system thresholds. An innovative enforcement intervention targeting ghost clients rather than ghosts themselves led to substantial tax recovery.

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[†]George Washington University, pcarrill@gwu.edu

[‡]Massachusetts Institute of Technology and NBER, ddonald@mit.edu

[§]University of Zurich and CEPR, dina.pomeranz@uzh.ch

[¶]University of California, Davis, and NBER, msinghal@ucdavis.edu

I Introduction

Developing countries rely disproportionately on taxes collected from firms as they strive to build state capacity, fund public goods, and enable redistributive programs in an efficient manner. A widespread scourge on these efforts throughout the world arises when fake firms—often known as “ghost firms,” “invoice mills,” or “missing traders”—issue fraudulent receipts that allow their supposed clients to claim additional tax deductions on value added and corporate income taxes.¹ Enforcement against ghosts has proven to be a challenging game of whack-a-mole since these ephemeral entities can disappear just as quickly as new ones can open up.

This paper provides a unique window into the ghost economy and the scope for interventions to recoup tax revenues that have been lost due to ghost deductions. Our empirical context is Ecuador, where we can identify ghost clients and transactions by combining firm-to-firm transaction-level tax data with a sample of over 800 ghost firms. The sample of ghost firms was identified after an exhaustive process by the tax authority, discussed further in Section III, but it nevertheless represents a lower bound on the universe of ghost firms. The transaction-level data allow us to investigate how ghost transactions—ones for which the seller is a detected ghost firm—facilitate evasion of both VAT and corporate income taxes. We supplement our analysis by drawing administrative data on the owners of Ecuadorian firms to quantify the extent to which evasion via ghost transactions, and the government’s ability to recoup evaded revenue, are regressive or progressive in nature. The phenomenon of ghost firms is not limited to Ecuador, but prevalent around the world. Appendix B describes their importance in other contexts.

Our first contribution is to document new facts about the ghost economy. We begin with the aggregate nature of this form of tax fraud, demonstrating that: evasion through ghost deductions is indeed widespread and quantitatively important; ghost clients are not limited to small, semi-formal firms; and ghost evasion benefits those at the top of the income distribution. In 2015, over 7,000 firms (4.7% of potential clients) took deductions from an identified ghost firm. Among these ghost clients, average annual ghost deductions were 14.1% of the value of their purchase deductions. Larger firms are more likely to engage in ghost transactions and have larger shares of such transactions in total input costs. Tax evasion via

¹See, e.g., OECD (2017) and Keen and Smith (2006). We use the term “ghost firms,” which is the name used by the Ecuadorian tax authority (“*empresa fantasma*”).

ghost firms has a regressive effect in the sense that ghost deductions are disproportionately used by firms owned by high-income individuals.

We next turn to opening the black box of ghost client behavior, exploiting firm-to-firm-transaction data to compare transactions that ghost clients make with ghosts to those they make with regular firms. The observed patterns indicate that ghost activity is a deliberate form of evasion on the part of many clients, with firms utilizing ghost transactions strategically and doing so in a way that avoids transacting through the formal financial sector. Ghost transactions are relatively concentrated at the end of the tax year, a time when firms can more easily determine the level of fake costs needed to offset annual revenues to reduce reported profits. They are more likely to bunch at round numbers, consistent with representing fake flows of non-existent goods. In addition, ghost transactions disproportionately bunch just below the \$5,000 threshold at which firms are required to make payments via the formal financial system. This avoids the need for ghost firms to have a (traceable) bank account and makes it possible for ghosts to issue receipts without the stated transaction amount actually changing hands.

From a policy perspective, information on the typical characteristics of ghost clients and transactions could be used to help identify ghost firms. However, this leaves open the question of how to recoup lost tax revenue even when ghost firms are successfully identified.

Our second contribution is therefore to provide the first evaluation—to the best of our knowledge—of an enforcement policy against the use of ghost firms. Enforcement efforts targeted directly at ghost firms face unique obstacles. Ghosts are often part of criminal enterprises; “owners” may be shell companies, deceased individuals, or victims of identity theft; and ghosts are often transient, disappearing and re-emerging as new entities (see [OECD, 2006](#); [de La Feria, 2020](#)). To deal with these challenges, the Ecuadorian Internal Revenue Service (SRI) began an innovative enforcement scheme in 2016 that targeted ghost *client* firms rather than chasing the ghosts themselves. Notifications were sent to over 1,500 unique firms, informing them that SRI had detected ghost transactions on previously filed tax returns and requiring that they submit revised returns removing these deductions. Notified firms were selected by SRI primarily on the basis of having made large deductions with ghost receipts in 2010–2015.

We use administrative records of firms’ amendments to their corporate income tax filings to evaluate this novel scheme for tackling ghost-enabled evasion. We analyze amendments

in the 90 days following the notification which involve a reduction in non-labor costs, and compare amended returns to firms' pre-notification returns. The identifying assumption is that, absent notification, firms would not have spontaneously filed amendments that removed deductions taken in prior years. Indeed, the probability that non-notified firms made such revisions is low.

The policy was highly effective and resulted in a total increase in reported firm income tax of \$20.6 million within three months, despite the fact that a large fraction of firms did not respond (consistent with Carrillo et al., 2017). Responding firms tend to be somewhat smaller than all notified firms, with 15.4% smaller median reported revenues and 30.1% smaller median reported tax liability. Among responding firms, the average tax increase was over \$44,000 (81% of their original filings) while the administrative cost of issuing notifications—conditional on having identified ghost firms—was close to zero. The tax increases stem mostly from firms owned by high-income individuals. The amount of additional tax reported as a share of owners' income is 170 times higher in the top 1% than in the bottom 80% of the income distribution. Despite the large additional tax filings, we do not find evidence of client firms going out of business or becoming informal. This is consistent with ghost clients being large, established firms.

This paper adds to the very sparse literature on tax evasion via ghost firms. Waseem (2020) exploits a VAT reduction in Pakistan and demonstrates that this reduced ghost firms identified by the tax authority. He further shows that most ghost deductions are claimed by exporters and used to over-claim refunds. Mittal et al. (2018) focus on the problem of identifying ghost firms, developing a machine learning algorithm to detect them and Mironov (2013) describes a related phenomenon of *spacemen* firms in Russia. As argued in Slemrod and Velayudhan (2022), more evidence is needed on the topic of ghost firms to answer key tax policy questions such as the overall effectiveness of the VAT.

We advance this literature in two ways. First, we provide the first detailed analysis of the characteristics of ghost client firms, their owners, and their patterns of reported transactions with ghost firms. Second, we provide the first analysis of an enforcement intervention aimed to close the tax gap arising from ghost firms.

II Institutional Background and Data

The fabrication and use of falsified invoices is commonly considered an intentional tax offence and regarded as a criminal activity. It is therefore more severe than other types of evasion such as simple revenue under-reporting (de La Feria, 2020; OECD, 2021).

Our data on these activities in Ecuador draws on SRI’s 2016 anti-ghost initiative.² While the details of these efforts are deliberately secret, they are known to involve four steps. First, candidate ghost firms were identified based on information from audits, whistle-blowers, and tax records. This included, in particular, firms that filed no returns or reported very little income, yet were listed as suppliers for large amounts of purchases by other firms. (The suspicious transaction patterns described in this paper were not known to the tax authority at the point of this intervention and were therefore not used in these efforts.) Second, SRI made attempts to contact candidate ghost firms. Firms that were neither found at their registered address nor responsive to emails were taken forward as potential ghosts. Third, the list of potential ghosts was posted on SRI’s website. Finally, firms that were wrongly on this list were given an opportunity to prove their existence and be removed. After these steps, a list of 811 identified ghost firms remained.³ This list forms the basis for the policy intervention we study in Section IV.

Our sample consists of all economically active firms that are required to file purchase annexes, which includes supplying valid invoice numbers. These annexes are needed to support the claiming of non-labor cost deductions from the VAT and from business income taxes. This sample includes all corporations and all larger sole proprietorships (i.e., annual sales above \$100,000, annual costs above \$80,000, or capital above \$60,000), as well as smaller sole proprietorships who wish to deduct production costs. Corporations make up 88% of total firm revenue in our sample, larger sole proprietorships 12%, and smaller sole proprietorships 0.2%. Robustness checks discussed below show that our results are qualitatively similar for corporations and sole proprietorships.

Smaller sole proprietorships can also choose to file using an abbreviated tax form. This form does not allow us to cleanly separate business and individual income and costs, and these firms are therefore not included in our sample. While it is theoretically possible for these firms to purchase receipts from ghost firms, they do not need to provide receipts in

²Appendix C provides details on data construction.

³Overall, about 7% of firms were dropped in the process from candidate firms to the final list.

order to justify the claiming of non-itemized deductions. Therefore, their only incentive to transact with ghosts is to have receipts ready in anticipation of a possible audit. We consider the implications of this sample selection after our discussion of the descriptive facts below.

We define firms as economically active for each year in which they file revenues or costs, appear as a seller or buyer in a purchase annex, or report payments to employees. We define firms as ghost clients for a given year if they report at least one purchase from an identified ghost. Our analysis focuses on the behavior of these client firms—their characteristics, transactions they make with ghost and non-ghost firms, and their response to SRI’s anti-ghost intervention.

Lastly, we link firms to administrative ownership records, which allows us to determine each firm’s owners and their ownership shares. We also observe individuals’ labor income from tax and social security data. This allows us to construct individuals’ income from the sum of their salaries, self-employment, and capital income from firm ownership (computed from the annual profit of each firm in which they have a stake, multiplied by their ownership share).

The firm size distribution in our sample is similar to that in other developing countries. Specifically, the firm size distributions in both our sample and other developing countries (see, e.g., Hsieh and Olken, 2014) are highly right-skewed: there are a large number of small firms accounting for a disproportionately small share of total firm revenue, and the firm distribution features a long, thin upper tail of very large firms.

III New Facts About Ghost Clients and Transactions

Ecuador’s transaction-level data allow us to shed new light on the nature of the ghost economy. Since these records form the tax authority’s basis for cross-checking cost deductions from both VAT and firm income tax filings, our findings expose evasion of both forms of taxation.

We establish six novel descriptive facts. The first three describe overall magnitudes of ghost transactions as well as the types of firms (and owners) involved as clients. All statistics in this Section refer to pooled 2010–2015 data unless stated otherwise.

Fact 1: Tax deductions based on fake receipts from ghost firms are widespread and large. 10.4% of unique firms file deductions based on receipts from at least one identified

ghost firm. Table 1 shows that, on average, 3.6% of purchases registered by these ghost clients are from ghosts, amounting to 10.4% of the value of their purchase deductions. At 4.6% and 14.1%, respectively, these shares are higher for 2015, the last year before the list of ghost firms was established.

This may result from earlier ghosts having disappeared by the time the list was established. In total, ghost clients reported ghost transactions amounting to \$2.1 billion in value. This represents a substantial share of taxes: 1.7% for corporations and 11.5% for sole proprietorships.

Fact 2: Evasion through ghost firms is more prevalent among larger firms.

Table 1 shows that ghost clients are much bigger than other firms, with higher revenues, costs, and tax liabilities. Consistent with Waseem (2020), their exporter share is also higher (7%) than among regular firms (2%).⁴ Looking at the full size distribution, Figure 1, Panel A shows that the probability of engaging in ghost transactions increases monotonically in firm revenue. While this may simply reflect the fact that larger firms have more transactions, Panel B shows that the share of ghost deductions out of total deductions also increases throughout much of the size distribution, except at the very top. The sharp drop at the top may result from very large corporations having stronger incentives to avoid illegal behavior or being able to use more sophisticated avenues of tax avoidance (as in, e.g., Bustos et al., 2022).

Fact 3: Ghost deductions are most prevalent in firms owned by high-income individuals. Involvement with ghost firms is increasing towards the top of the individual income distribution (Figure 1, Panels C–F). Not only does the probability of having ownership of a ghost client increase with individuals’ income, but so does the amount of ghost purchases attributed to individuals relative to their income.⁵ The ratio of ghost transactions over individuals’ income is about 17 times higher in the top 5% of the income distribution than in the bottom 80%, and almost 36 times higher in the top 1%. Zooming in on individuals who have capital income from firm ownership, we also see an increase throughout the income distribution.⁶ These findings imply that the type of evasion that ghost firms enable

⁴However, as Table A1 shows, while exporters are more likely to buy from ghost firms, the share of ghost purchases in exporters’ total purchases is smaller.

⁵We attribute ghost purchases to individuals by multiplying individuals’ ownership shares by the corresponding firms’ ghost purchases.

⁶These findings likely represent a lower bound on the true extent to which ghost deductions increase with income. Since individuals’ income includes reported profits of firms they own, their income mechanically

tends to reduce taxation of firms owned disproportionately by rich individuals.⁷

These results speak to a growing interest in distributional aspects of corporate tax evasion. While related studies have shown that *individuals'* tax avoidance and evasion are highly skewed towards the top of the distribution (Londoño-Vélez and Ávila-Mahecha, 2021; Brounstein, 2021; Alstadsæter et al., 2019; Guyton et al., 2021), there are few such studies for firms, as it has been difficult to map corporate evasion to individual owners.

Our next three facts draw on transaction-level data of ghost clients and show that transactions with ghost firms differ in striking ways from those that these same ghost clients make with regular firms.

Fact 4: Ghost transactions are clustered towards the end of the year. Figure 2, Panels A and B show that both the number and value of transactions with ghost firms increase strongly towards the end of Ecuador's tax year (which is also the calendar year), while those with other firms do not. In December, there are over twice as many monthly ghost transactions as in the first six months of the year on average, while the number of non-ghost transactions (by the same client firms) is only about 6% higher in December. This is consistent with firms assessing their annual revenues at the end of the year and then utilizing ghost transactions to achieve a target reported profit level or rate for tax purposes.⁸

Fact 5: Round number bunching is more prevalent among transactions with ghosts than with non-ghost firms. Figure 2, Panels C and D illustrate the distribution of ghost clients' purchase transaction values (net-of-VAT) from ghosts and non-ghost firms. 6.5% of net-of-VAT transaction values for purchases from ghosts are multiples of \$500, far more than for purchases from regular firms (0.7%).⁹ Such bunching is also observed in Kleven and Waseem (2013) for self-employed individuals' reported taxable income and is consistent

looks smaller when firms take more fake deductions. As Figure A1 shows, when we calculate individuals' incomes without counting deductions with ghost receipts, ghost deductions increase more monotonically and substantially more steeply with income.

⁷One might be concerned that the higher share of high-income owners is simply a result of the large firm size of ghost clients. However, Table A1 Panel A shows the use of ghost firms increases with owner income while controlling for firm size.

⁸This is similar to how US firms have been found to spend more on capital investments towards the end of the fiscal year to reduce tax obligations (Xu and Zwick, 2022) and public entities spend more at the end of the year to target their budget (Liebman and Mahoney, 2017).

⁹Bunching at values net-of-VAT is consistent with the fact that in Ecuador's tax forms costs are recorded net-of-VAT. The above bunching statistics are calculated for the full range of transaction amounts. When we exclude transactions below \$400 (which represent a sizeable number of transactions but by construction cannot bunch at multiples of \$500) round-number shares are somewhat higher for both ghost and non-ghost transactions: 8.1% and 2.9%, respectively.

with ghost transactions representing false activity (e.g., [Klimek et al., 2018](#); [Nigrini, 2018](#)).

Fact 6: Ghost transactions exhibit bunching below the financial system payments threshold. A common policy in many countries requires that transactions greater than a cutoff value (\$5,000 gross-of-VAT in Ecuador) be made through the formal financial sector (i.e., via electronic transfer, check, or credit card). Exceeding this threshold makes ghost transactions more costly, both because payments must be made to a valid—and traceable—bank account, and because real payments must actually take place, even if no goods or services are exchanged. While payments could be reimbursed by the ghost firm, doing so would require coordination and trust. Figure [2](#), Panel D shows strong bunching in ghost transactions just below the transaction value corresponding to \$5,000 gross-of-VAT, and very little density above.^{[10](#)} By contrast, the distribution of transactions with non-ghost firms (Panel C) is relatively smooth through the \$5,000 gross-of-VAT threshold, suggesting the requirement does not create large economic distortions.^{[11](#)}

Supplementary analysis in Appendix [A](#) shows how Facts 1-6 are robust across two key subgroups of firms. First, findings are qualitatively similar for incorporated firms and sole proprietorships (Figures [A2](#), [A3](#), [A4](#), [A5](#); Tables [A2](#), [A3](#)). Second, we analyze results by firms' filing behavior. Even though firms are required to file purchase annexes to claim deductions, some of this filing is incomplete. Figures [A6](#), [A7](#) and Table [A4](#) show that results look very similar among firms that file purchase annexes every month.^{[12](#)}

Taken together, these facts shed light on basic, unanswered questions about ghost-enabled tax evasion. The transaction patterns are strongly indicative of deliberate evasion by clients. One would not expect these patterns if apparent ghost transactions simply reflected misclassification of real firms as ghosts by SRI or genuine transactions between ghost clients and informal firms who in turn purchase fake receipts with supplier identification numbers from ghosts.

¹⁰In contrast to the round number bunching in Fact 5, which happens at net-of-VAT amounts (as this is the amount used for tax deductions), the \$5,000 requirement is gross-of-VAT. This value therefore does not coincide with round number bunching. For a small number of ghost clients (4%), we observe bunching of ghost transactions at \$1,000 gross-of-VAT starting in May 2013. We are not aware of any regulatory changes that could explain bunching at this threshold.

¹¹These results speak more generally to ways in which transacting through the formal financial system limits evasion ([Gordon and Li, 2009](#)) and to the question whether outlawing cash can foster tax compliance ([Rogoff, 2016](#); [Gadenne et al., 2022](#)).

¹²Filing behavior is very similar for corporations and sole proprietorships (Table [A5](#)).

These descriptive facts capture transactions with detected ghost firms, and it seems plausible that SRI’s targeting and detection process may have missed smaller ghosts. However, the production of fake receipts appears highly concentrated: just 10% of ghost firms account for over half of all ghost receipts in the sample (both in terms of number and amount) and 10 ghost firms alone issue 25% of ghost receipts (or 14% of total value). The detected sample of ghost firms is therefore likely to capture the majority of total ghost transactions. In addition, in Figure [A8](#) we recalculate the distributional analysis of Figure [1](#) while including only the smaller two terciles of ghost firms (which account for 15.5% of the total value of ghost deductions). The results look very similar to the full sample, suggesting limited heterogeneity of transactions by ghost firm size.¹³

A second potential form of selection is into the ghost client sample, since smaller sole proprietorships are not required to file purchase annexes. As discussed, these firms have weak incentives to purchase receipts from ghosts: receipts would only be required if they are audited, and they could always purchase fake receipts at that time. The fact that the empirical patterns we observe for corporations and larger sole proprietorships are similar is also reassuring. It is, however, possible that we are missing some ghost clients at the lower end of the full firm size and owner income distributions.

Finally, it is important to note that the sample of ghost firms and clients detected by SRI is the relevant sample for determining the implications of enforcement, since tax authorities can only target detected tax fraud. In this respect, Ecuador is unlikely to be unique: tax authorities would generally be more likely to detect larger or more egregious ghost firms, and size-based thresholds for requiring tax documentation to support deductions are a feature of most tax systems.

IV Enforcement Against Ghost Clients

What can tax authorities do about the sort of widespread evasion via ghost firms we have documented above? Ensuring in real time that all deductions taken by one firm are declared as income by another is extremely challenging in practice, and not even countries with highly developed administrative capacity manage to do so. Many countries – including Ecuador –

¹³If there is positive assortative matching (larger ghost firms transacting with larger clients) and SRI is more likely to detect larger ghosts, this could overstate the use of ghosts by larger firms. However, we observe on the contrary that larger ghosts are more likely to transact with smaller clients, but this relationship between ghost size and client size is sensitive to specification.

have made CEOs and accountants personally liable for tax fraud such as the use of ghost falsified receipts. However, the bar to prove such felonies in court is high. Finally, substantial obstacles arise when agencies pursue ghost firms via direct enforcement since, by their nature, these firms and their true owners are difficult to locate, and any success may only be fleeting because new ghost entities can easily reappear.

To address these challenges, in 2016 SRI began an innovative enforcement alternative based on targeting *clients* of ghost firms rather than ghosts themselves. A potential advantage of targeting clients is that, unlike ghost firms, client firms have a genuine economic presence that makes them less able to disappear and re-emerge, potentially allowing for recovery of evaded taxes. In this section, we evaluate the effectiveness of this approach. SRI sent notification emails to ghost clients, retroactively challenging their deductions from ghost firms on tax returns filed for 2010–2015. The relevant portion of these notifications (with financial details provided as an example) translates as follows:¹⁴

Dear taxpayer,

Upon reviewing the information available in its registries, the Tax Authority detected that you registered transactions with firms that have been classified, for tax purposes, as non-existent, ghosts, or individuals and firms that undertake fictitious activities or transactions. [...]

Therefore, you are given a deadline of 10 business days to submit your amended corporate income tax and VAT tax forms, in which you must modify the corresponding differences and pay resulting taxes as well as interests and fines:”

Fiscal year	Line item	Costs reported by taxpayer	Costs calculated by tax administration	Difference
20XX	799 - Total costs and expenditures	\$ 1,023,686	\$ 947,166	\$ 76,520

We focus on notifications sent to incorporated firms regarding their corporate income tax filings because this is the sample for which we have data on firms’ amendments (discussed below). 2,382 notifications were sent to 1,589 such ghost clients—10.8% of all incorporated firms with detected ghost deductions in 2010–2015.¹⁵ SRI selected notified clients primarily based on having made large deductions with ghost receipts in 2010–2015. While SRI’s methodology is deliberately confidential, the notification sample presumably represents the type of firms tax authorities desire to target.

¹⁴Appendix D shows the full notification (Spanish and translated).

¹⁵SRI also sent 1,288 notifications to sole proprietorships and 329 to incorporated firms about the VAT.

Notified firms were larger than typical incorporated ghost clients, with 2.4 times higher median tax liability (Table [A6](#), Panel A). This is consistent with SRI targeting firms with higher potential tax recovery. The median amount of ghost deductions indicated in notifications was around \$181,000 (mean \$338,000) and the median share of ghost deductions out of total purchases was 26% (mean 38%) among notified firms.

Unsurprisingly, many firms did not respond to the notifications. Within 90 days, 25.4% of notifications resulted in the filing of an amendment with a reduction in non-labor costs. Some firms may not have responded because of failure of the email to reach the firm or the right person within the firm. In addition, as discussed in [Carrillo et al. \(2017\)](#), firms may choose not to amend, knowing that the tax authority has limited capacity for follow-up enforcement. Adjusting firms tend to be somewhat smaller than all notified firms, with 15.4% lower median reported revenues and 30.1% lower median tax liability (Table [A6](#), Panel B).

To estimate the causal effect of these notifications, we compare each firm’s own post-notification filings—after potential amendments—with its original filings for that same tax year. This identification strategy is similar to that used in [Carrillo et al. \(2017\)](#) and is feasible because we observe the original returns as well as amended returns. We focus on firms that file an amendment within 90 days of receiving a notification which involves a reduction in at least one cost category that could potentially stem from a ghost transaction (i.e. any non-labor costs). We call this the “adjusting firms” sample. In this sense, firms’ own pre-notification filings serve as the counterfactual. This is a different approach from comparing various interventions to each other, as is the case in papers comparing different types of letter messages. The identifying assumption is that, absent the notification, firms would not spontaneously file amendments at the time of the notification to lower their cost deductions on filings from previous years.

Two sets of findings in Figure [3](#) provide support for this assumption. The first relates to the *timing* of amendments. As seen in Panel A, there is a stark increase in amendments involving a reduction in cost deductions after notification.^{[16](#)} Further, Panel B shows amendments in calendar time, with zero indicating the start of the campaign in July 2016.^{[17](#)} Before

¹⁶The slight increase prior to notification stems from amendments made after the intervention started, but before the notification was sent to the specific firm. This likely results from anticipatory spillover effects, as some firms learned that one of their suppliers was detected as a ghost.

¹⁷See Table [A7](#) for notifications sent by month.

the campaign, such amendments were rare. After the first notifications were sent, amendments began to increase. This accelerated each time after a large batch was sent—indicated by blue dotted lines. By contrast, there is no increase in amendment rates by non-ghost client firms (Figure [A9](#)).

Second, the pattern of amendment *content*—Panel C of Figure [3](#)—provides additional support for the identifying assumption. This figure compares the amount of ghost deductions mentioned in a firm’s notification (on the x-axis) to the reduction in reported costs in the amended filing within 90 days of notification (on the y-axis). The line of best fit shows that, on average, adjusting firms made reductions to their claimed non-labor costs of 98 cents per dollar in the notification. This seems unlikely to have occurred without the intervention. While firms reduced their cost deductions overall, some firms also increased claimed deductions in some cost categories. Such increases appear designed to leave firms with less of an increase in tax liability. Consistent with this notion, the cost categories that were increased are labor, inventory, and financial costs while the cost categories that were reduced most strongly are domestic purchases, other production costs, and imports. Overall, total costs still decreased on average by 72 cents for every dollar contested in the notification (Panel D).

The policy intervention had large effects on reported taxes of adjusting firms. Their corporate income tax liabilities increased by about \$40,000 per notification for filings from 2015 and around \$34,000 for the pooled sample across all years (Table [2](#)).¹⁸ Since some firms received notifications for multiple years, the tax increase per firm was over \$44,000. The total amount of additional taxes filed was \$20.6 million. This represents an 81% increase on the \$25.4 million filed by adjusting firms in their pre-amendment returns. (13.7% of the \$189 million among all notified firms.)

These increases in tax liabilities result from the large reductions in reported costs (Figure [3](#)). On average, reported costs were reduced by \$229,000 for 2015 and \$182,000 in the pooled sample (2010-2015) (Table [2](#)). A number of recent studies have found that enforcement strategies aimed at pushing firms to more truthfully report their revenues led many firms to make large offsetting adjustments by increasing reported costs ([Asatryan and Peichl, 2017](#); [Carrillo et al., 2017](#); [Slemrod et al., 2017](#); [Almunia and Lopez-Rodriguez, 2018](#); [Mascagni et al., 2018](#); [Naritomi, 2019](#); [Li and Wang, 2020](#)). In contrast, we find that this intervention,

¹⁸Table [A8](#) presents results for each year separately and Table [A9](#) for the full notification sample.

which pushes firms to reduce reported costs, did not lead to systematic offsetting reductions in reported revenues (Table 2 and Figure A10). This points to an important advantage of enforcement focused on cost over-reporting. The third-party reporting system means that, in principle, a firm’s sales to other firms can be cross-checked with their clients’ purchase records. It is plausible that the fear of such actions constrains notified firms’ willingness to reduce reported revenues as a way of offsetting cost reductions.

Looking at distributional considerations, the tax increases resulting from this intervention are even more highly concentrated among firms owned by high-income individuals than the overall use of ghost deductions (Figure A11). The amount of additional taxes as a share of owners’ income is over 56 times higher in the top 5% than in the bottom 80% of the income distribution, and almost 170 times higher in the top 1%.¹⁹

Our estimates likely represent a lower bound on true revenue gains. First, firms may also have filed amended VAT returns with reductions in ghost deductions that we do not observe. Second, the intervention may have disincentivized both targeted and non-targeted firms from using ghost firms in the future. Finally, our definition of adjusting firms, whose amendments we count as resulting from the intervention, is conservative.²⁰

In terms of real impacts, we find no evidence that the intervention was followed by firms going out of business or de-formalizing. Figure A12 shows these results. There is natural decay over time, as some firms go out of business. However, at 13.1% between 2015 and 2017, this rate was very similar for notified and non-notified ghost clients.²¹ These findings are consistent with client firms being large and established. However, it is of course possible that the intervention affected firm development in the longer run. An interesting future research avenue would be to investigate post-treatment impacts over a longer duration and for additional outcomes, such as for investments and employment, as well as potential renewed use of fraudulent deductions from new ghost firms.

In terms of external validity, it is likely that sending similar notifications to a larger number of firms, including smaller ghost clients, would lead to lower returns per notification

¹⁹Again, the concentration at the top of the income distribution is even stronger when computing individuals’ capital incomes without deducting their firms’ ghost deductions (Figure A11, Panels E and F).

²⁰52 additional amendments (filed within 90 days of the notification) reported a change in taxes without updating underlying line items, so these are not included in our adjusting sample. Doing so would raise the total impact of the intervention by \$2.2 million.

²¹Given the different pre-treatment evolution, this is of course merely suggestive and not necessarily indicative of the effect of the intervention.

sent.

V Conclusion

The phenomenon of tax evasion through ghost firms highlights several broader challenges with building state capacity in the developing world. Third-party reporting is considered central to the ability of modern governments to raise revenue. Ghost firms exploit logistical limits in the ability to cross check information completely and in real time, thereby undermining the legitimacy of apparently third-party reported firm deductions. While retroactively using information cross-checks can reveal discrepancies, which allows tax authorities to identify potential ghost firms, recovering tax revenue from these firms is often difficult, if not impossible.

Relatively little is known about the underlying mechanics of firm misreporting of costs. Our paper helps to fill this gap by exploring how ghost firms facilitate cost misreporting, and which types of firms engage in this form of evasion. Cost misreporting also has important implications for policy design. It can undermine self-enforcement in VAT systems and may force governments to rely on inefficient tax instruments (Best et al., 2015). For example, high prevalence of cost under-reporting would favor retail sales taxes over value added taxes and turnover taxes (or generally, broad taxes with limited deductions) over profit taxes.

Our results also highlight the promise of targeting enforcement on ghost clients. One benefit of this type of intervention is that it is quite resistant against attempts at gaming. Traces of the illicit behavior are directly observable by the government (firms issuing a large share of receipts that they do not report as income in their own tax filings), and the generally large, well-established client firms cannot easily disappear. Nevertheless it is of course possible that firms become more sophisticated if this type of intervention is repeated, for example by retiring ghost firms more frequently in order to change more rapidly who the ghost firms are.

A final important consideration in tax enforcement is its distributional implications. Ghost clients—specifically those likely to be detected and targeted by the tax authority—have ownership that is concentrated at the top of the income distribution. To the extent that the economic incidence of reduced corporate profits falls on firm owners, tax enforcement against ghost clients is therefore likely to be quite progressive.

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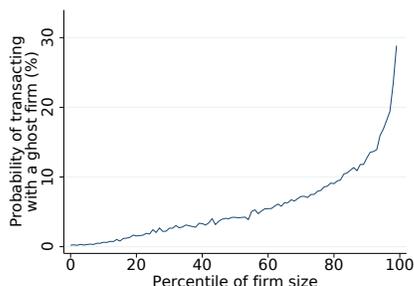
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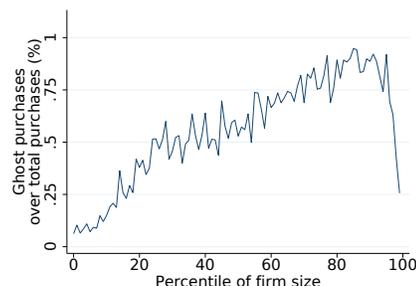
FIGURES

Figure 1: Distributional Results

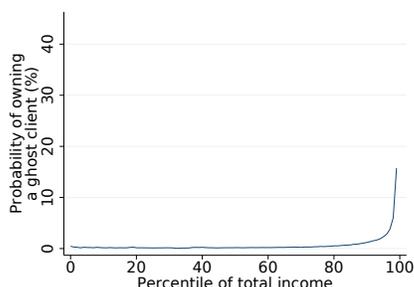
A) Probability of Being a Ghost Client, by Firm Size



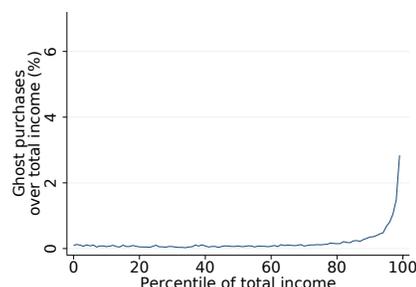
B) Value of Reported Ghost Purchases Over Firm Total Purchases, by Firm Size



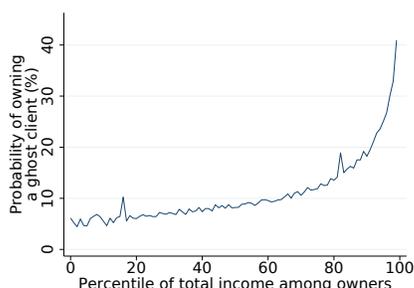
C) Probability of Owning a Ghost Client, by Individual Total Income



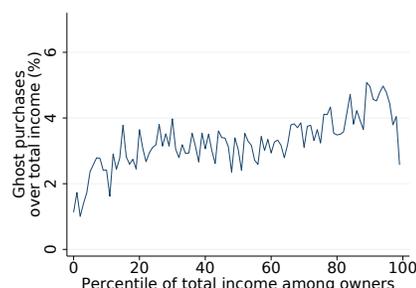
D) Value of Reported Ghost Purchases Over Total Individual Income, by Individual Total Income



E) Probability of Owning a Ghost Client, by Owner Total Income – Owners Only

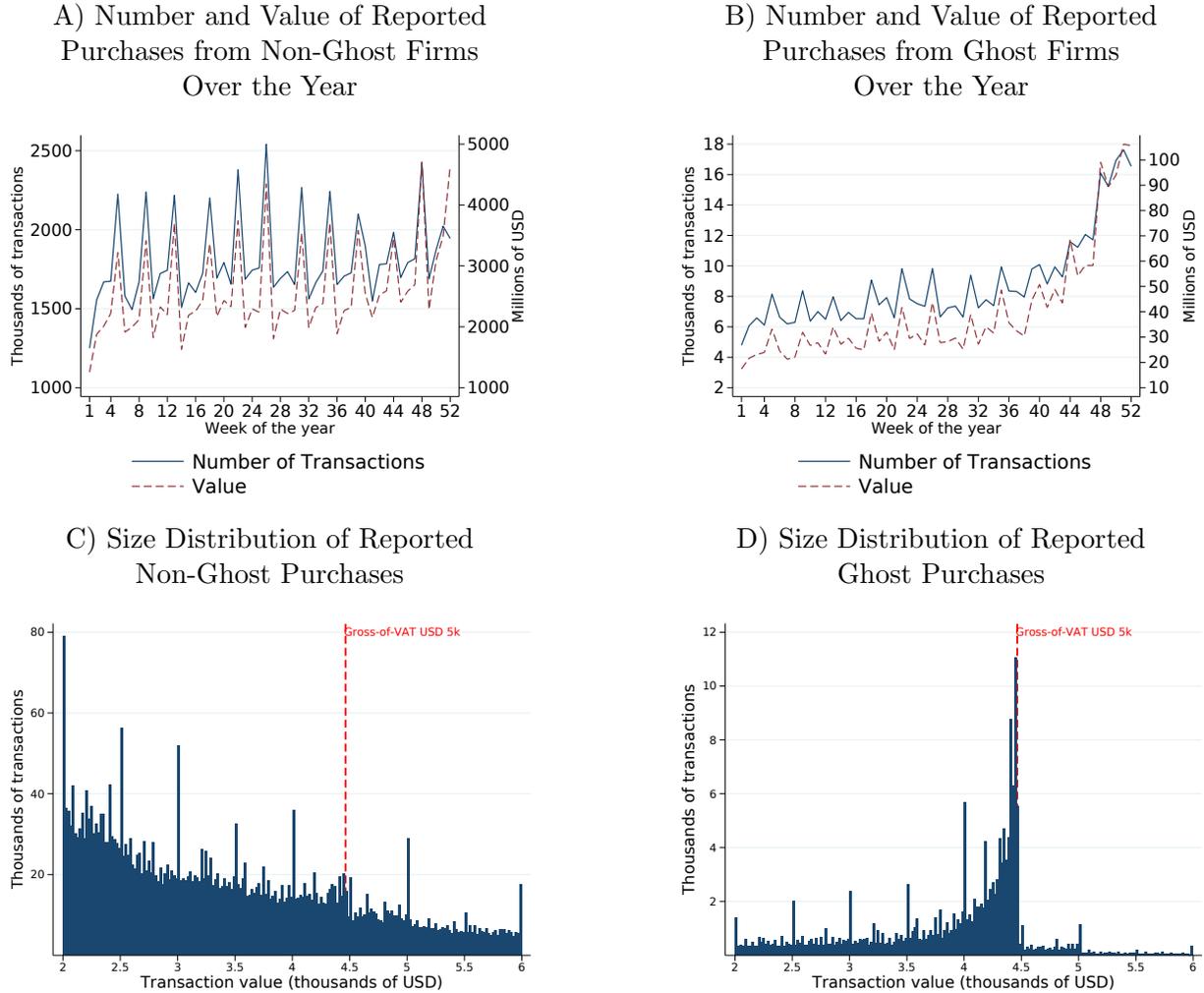


F) Value of Reported Ghost Purchases Over Total Owner Income, by Owner Total Income – Owners Only



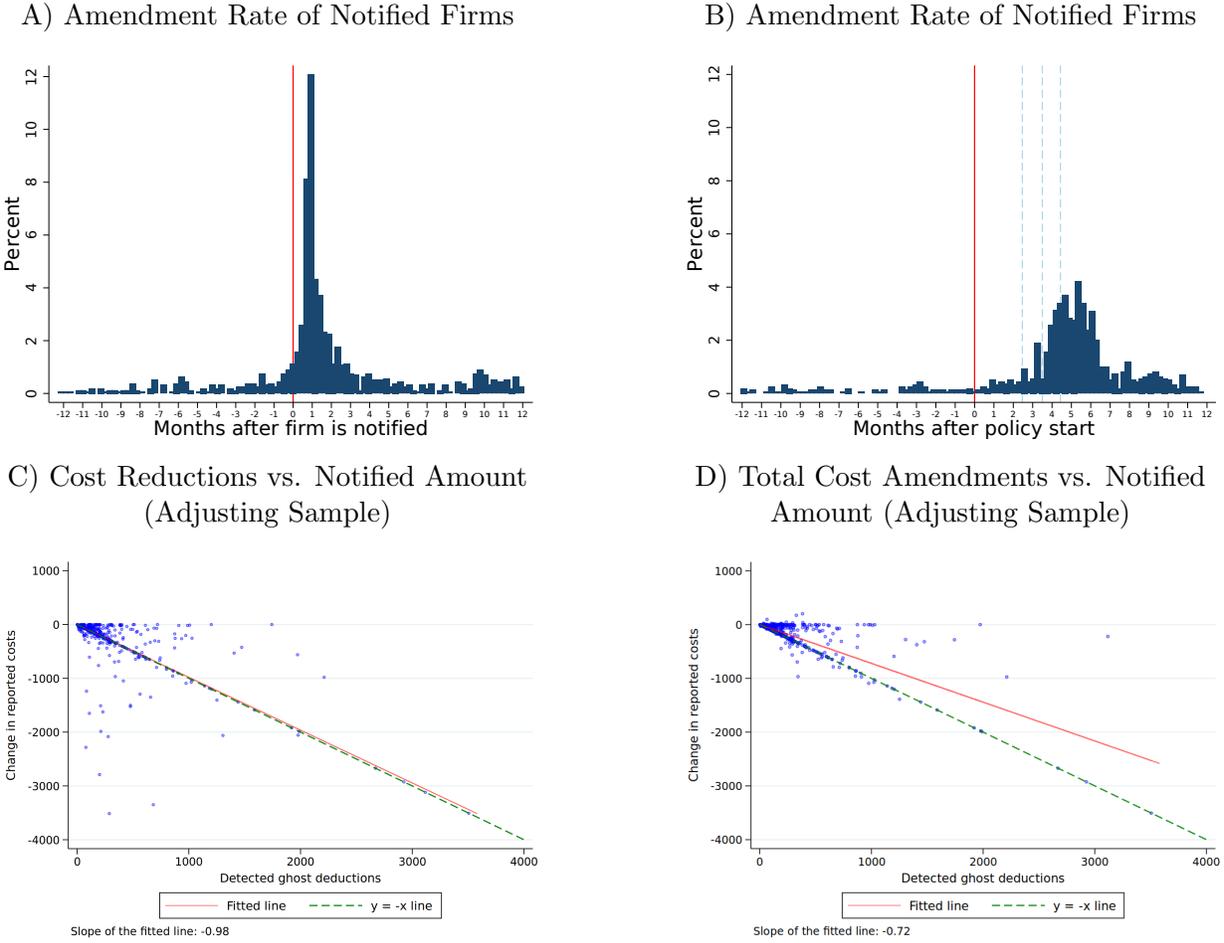
Note: This figure provides descriptive results on the use of receipts from ghost firms across the distribution of firm size and individuals' incomes (pooled 2010–2015). Panels A and B show the probability of being a ghost client and the share of firms' reported purchases that are based on receipts from ghost firms, by percentile of firm revenue (for firms that are required to file a purchase annex and have positive revenues). Panels C and D look at individuals and their ownership in ghost client firms, by percentile of individuals' income (for individuals who earn at least \$1 a day and firms with up to 3,000 owners). Panel C shows the probability of having an ownership share in a ghost client. Panel D displays ghost purchases attributed to owners (i.e., individuals' ownership shares multiplied by the corresponding firms' ghost purchases) divided by individuals' total income. Panels E and F show the same as C and D, focusing only on firm owners (i.e., individuals with capital income from a firm in our sample). Outcome variables trimmed at the top 1% of positive values. This figure uses firms' reported profits to calculate their owners' incomes, which can make owners' income appear artificially lower the more ghost deductions a firm takes. Figure [A1](#) shows results when using the profits firms would have without deducting the ghost transactions. Figures [A4](#) and [A5](#) show results separately for ghost purchases by incorporated firms and sole proprietorships, respectively. Figure [A7](#) shows Panels A and B for firms that file a purchase annex every month. Figure [A8](#) shows results restricting the sample to the lower two terciles of ghost firms in terms of their size.

Figure 2: Patterns of Reported Purchases by Ghost Clients from Regular Firms versus Reported Purchases from Ghost Firms



Note: Panels A and B show the weekly number and total value of reported purchases over the year, and Panels C and D the frequency of values, for reported purchases from non-ghost firms and ghost firms, respectively (for all years during 2010–2015) among economically active ghost clients that file a purchase annex. Transaction values are net-of-VAT. The red dashed lines in Panels C and D refer to the corresponding gross-of-VAT amount above which firms are required to make payments via the formal financial system. For ease of visibility, Panels C and D include only transactions that are fully subject to VAT. Figure [A13](#) shows the same also including VAT-exempt transactions. Figures [A2](#) and [A3](#) show results separately for corporations and sole proprietorships. Figure [A6](#) shows results for firm-year pairs that filed a purchase annex in all months of that year.

Figure 3: Amendment Patterns in Response to the Notifications



Note: This figure shows amendment patterns following the notifications for tax filings from 2010–2015. Panels A and B show amendment rates for the universe of notified firms that include reductions to any non-labor costs. In Panel A zero indicates the date on which a given firm was sent its first notification, while in Panel B zero indicates the start of the notification intervention by SRI (July 18th, 2016). The blue dashed lines in Panel B plot the dates on which SRI sent additional sizeable batches of notifications (see Table [A7](#) for the number of notifications sent per month). Panels C and D show a firm’s cost amendments compared to the amount of ghost deductions mentioned in the notification. Panel C only includes amendments of non-labor cost categories that involve a reduction in reported costs, while Panel D includes all amendments to any cost categories. The red solid line in Panels C and D plots the fitted line of a regression of the change in reported costs on the amount of detected ghost transactions mentioned in the notifications. The green dashed line plots the $y = -x$ line. All monetary figures in thousands of USD.

TABLES

Table 1: Descriptive Statistics

	2015		2010-2015	
	(1) Ghost clients	(2) Non-Ghost clients	(3) Ghost clients	(4) Non-Ghost clients
<i>Panel A: Ghost Clients vs. Non-Ghost Clients</i>				
Revenue (\$000)	4,060 (24,098) [568]	1,023 (28,538) [111]	6,058 (120,767) [568]	952 (30,955) [107]
Cost (\$000)	3,827 (21,928) [538]	967 (26,227) [107]	5,364 (81,360) [536]	875 (22,792) [102]
Tax liability (\$000)	50.68 (395) [3.68]	15.44 (637) [0.01]	153 (10,202) [3.91]	17.20 (2,033) [0.01]
Share exporting firms	0.071	0.023	0.068	0.022
<i>Panel B: Use of Ghost Firms by Ghost Clients</i>				
Number of unique ghost suppliers	2 (2) [1]		2 (2) [1]	
Number of identified ghost purchases/ total number of purchases	0.046		0.036	
Value of identified ghost purchases/ value of total purchases	0.141		0.104	
Number of firms	7,118	136,086	22,630	204,186
Number of observations	7,118	136,086	39,982	736,413

Note: This table shows descriptive statistics by ghost-client status for the universe of economically active firms that are required to file a purchase annex for 2015 (Columns 1 and 2) and pooled for 2010–2015 (Columns 3 and 4). Ghost client status is defined at the firm-year level. Panel A compares ghost client firms to non-ghost client firms. Panel B shows how ghost clients transact with ghost firms. All amounts are from filings prior to the start of the policy intervention. Means are reported along with standard deviations in parentheses and medians in brackets. All monetary figures in thousands of USD. Table [A10](#) shows the statistics by year for 2010-2015. Tables [A2](#) and [A3](#) show robustness for incorporated firms and sole proprietorships only. Table [A4](#) includes only firm-year pairs that filed purchase annexes in every month of that year.

Table 2: Impacts of Notifications on Reported Revenue, Cost, and Tax Liability of Adjusting Firms

	(1)	(2)
	2015	2010-2015
Revenue	-17,733 (21,534)	-10,079 (6,872)
Cost	-228,583 (51,238)	-181,626 (28,680)
Tax liability	40,165 (7,529)	34,003 (5,114)
Number of firms	172	460
Number of firm-year pairs	172	605

Note: This table shows changes to reported revenue, cost, and tax within 90 days after mailing of the notification from SRI, among the adjusting firms. Each coefficient stems from a separate regression showing the average difference in the reported outcome variable across notifications between the original filing from before the notification and the amendment filing after the notification. In Column (1) we regress the pre- and post-notification values for filings concerning the tax year 2015 on a post-notification dummy including firm fixed effects. In Column (2) we create a pooled sample of all filings (including amendments) for the 2010-2015 tax years. We then regress the reported values (separately for each outcome in question) on a firm-tax year fixed effect and a dummy variable indicating whether the filing was submitted in the 90 days following the firm was sent a notification about the filing from SRI. The coefficient reported here is that on the post-notification dummy variable. Each firm-tax year pair corresponds to a separate notification. Table [A8](#) shows these results for each year separately. Table [A9](#) shows results including all notified firms. Standard errors clustered at the firm level. All outcomes in USD.

Ghosting the Tax Authority:
Fake Firms and Tax Fraud in Ecuador

Paul Carrillo
Dave Donaldson
Dina Pomeranz
Monica Singhal

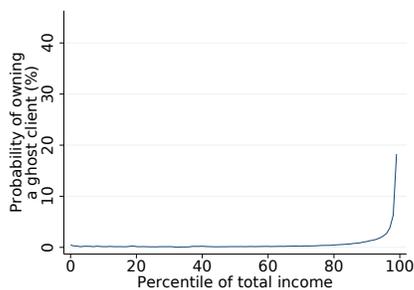
Online Appendix

A Supplementary Results

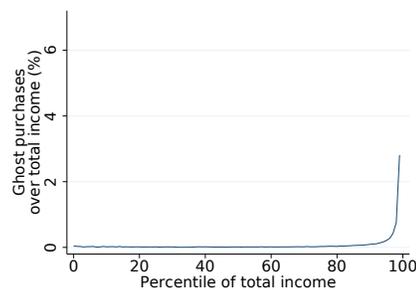
Figure A1: Distributional Results

(Adjusted by Not Deducting Ghost Transactions from Firm Owners' Capital Income)

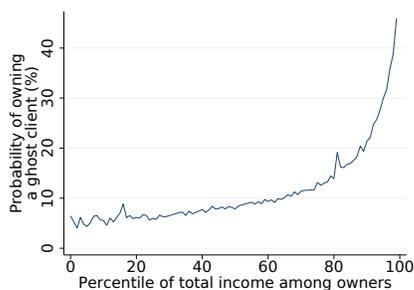
A) Probability of Owning a Ghost Client, by Individual Total Income



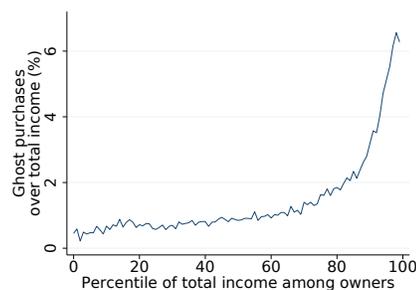
B) Value of Reported Ghost Purchases Over Total Individual Income, by Individual Total Income



C) Probability of Owning a Ghost Client, by Owner Total Income – Owners Only



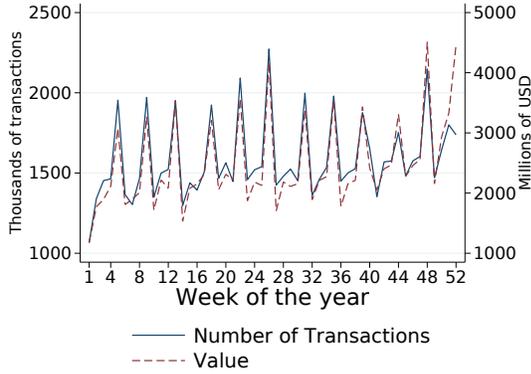
D) Value of Reported Ghost Purchases Over Total Owner Income, by Owner Total Income – Owners Only



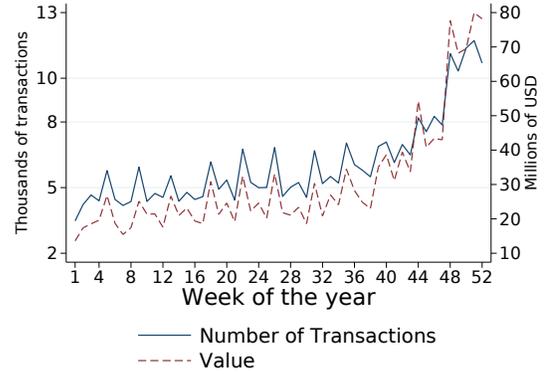
Note: This figure provides descriptive results on the use of receipts from ghost firms across the distribution of individuals' income (pooled 2010–2015), similar to Figure 1. Panels C–F. To calculate individuals' capital income, Figure 1 attributes firms' reported profits to their individual owners. This can make individuals' income look falsely lower the more fake ghost deductions the firms take. By contrast, this Figure calculates individuals' capital income based on the profits their firms would have without deducting the ghost transactions. Panels A and B look at individuals and their ownership in ghost client firms, by percentile of individuals' income (for individuals who earn at least \$1 a day and firms with up to 3,000 owners). Panel A shows the probability of having an ownership share in a ghost client. Panel B displays ghost purchases attributed to owners (i.e., individuals' ownership shares multiplied by the corresponding firms' ghost purchases) divided by individuals' total income. Panels C and D show the same as A and B, focusing only on firm owners (i.e., individuals with capital income from a firm in our sample). Outcome variables trimmed at the top 1% of positive values.

Figure A2: Patterns of Reported Purchases by Ghost Clients from Regular Firms versus from Ghost Firms (Incorporated Firms Only)

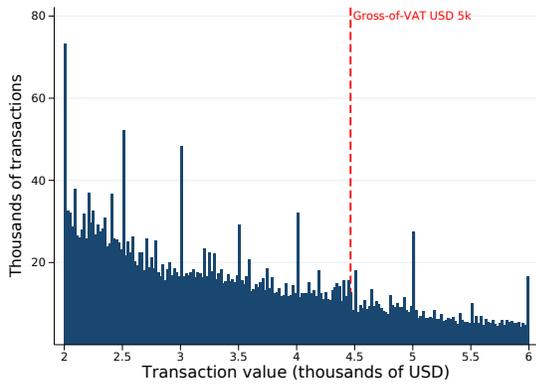
A) Number and Value of Reported Purchases from Non-Ghost Firms Over the Year



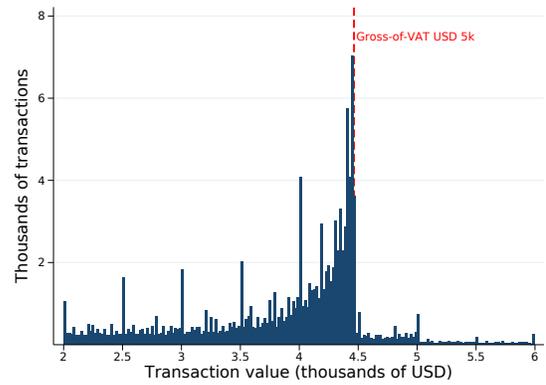
B) Number and Value of Reported Purchases from Ghost Firms Over the Year



C) Size Distribution of Reported Non-Ghost Purchases



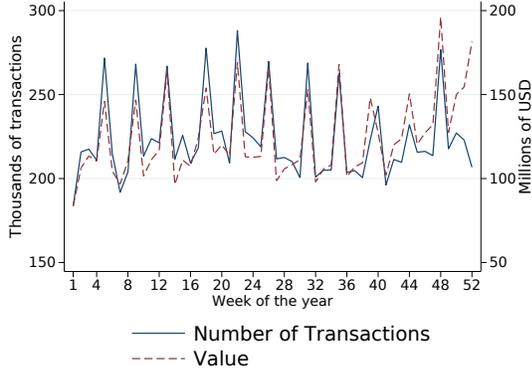
D) Size Distribution of Reported Ghost Purchases



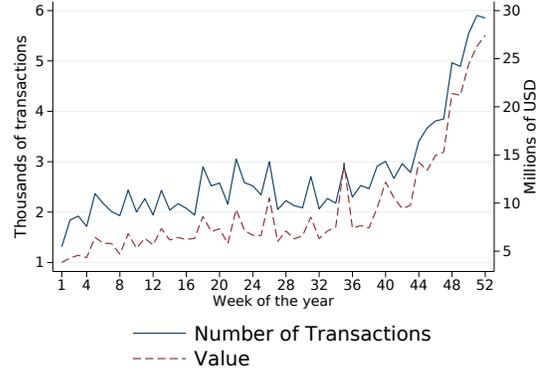
Note: Panels A and B show the weekly number and total value of reported purchases over the year, and Panels C and D the frequency of values for reported purchases, from non-ghost firms and ghost firms, respectively (for all years during 2010–2015) among economically active incorporated ghost clients that file a purchase annex. Transaction values are net-of-VAT. The red dashed lines in Panels C and D show the corresponding gross-of-VAT amount above which firms are required to make payments via the formal financial system. For ease of visibility, Panels C and D include only transactions that are fully subject to VAT. Figure 2 shows the same graphs for all economically active firms that file a purchase annex.

Figure A3: Patterns of Reported Purchases by Ghost Clients from Regular Firms versus from Ghost Firms (Sole Proprietorships Only)

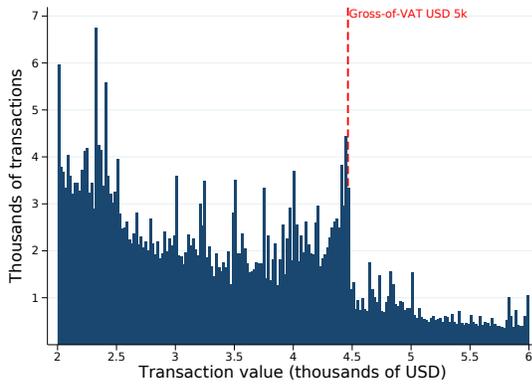
A) Number and Value of Reported Purchases from Non-Ghost Firms Over the Year



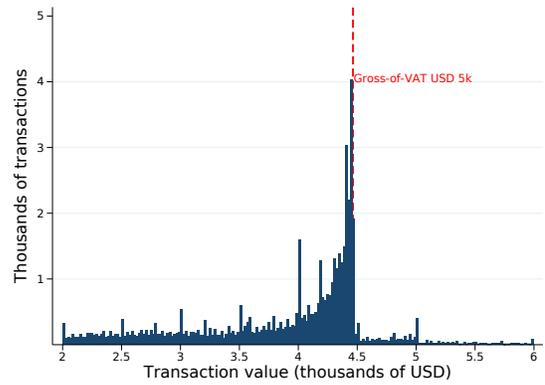
B) Number and Value of Reported Purchases from Ghost Firms Over the Year



C) Size Distribution of Reported Non-Ghost Purchases



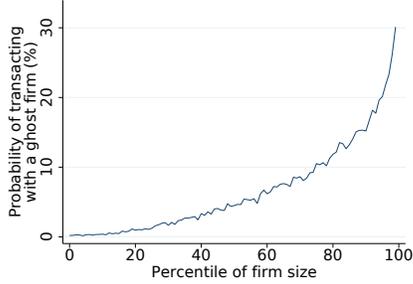
D) Size Distribution of Reported Ghost Purchases



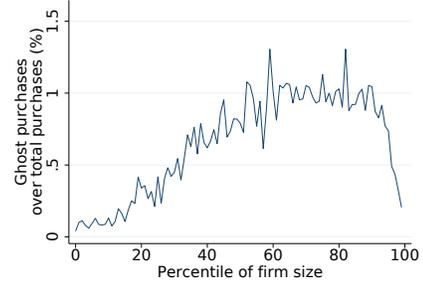
Note: Panels A and B show the weekly number and total value of reported purchases over the year, and Panels C and D the frequency of values for reported purchases, from non-ghost firms and ghost firms, respectively (for all years during 2010–2015) among economically active sole proprietorships that are ghost clients and file a purchase annex. Transaction values are net-of-VAT. The red dashed lines in Panels C and D show the corresponding gross-of-VAT amount above which firms are required to make payments via the formal financial system. For ease of visibility, Panels C and D include only transactions that are fully subject to VAT. Figure 2 shows the same graphs for all economically active firms that file a purchase annex.

Figure A4: Distributional Results
(Incorporated Firms Only)

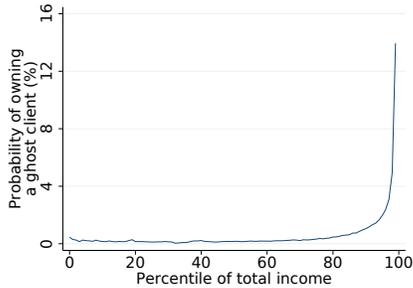
A) Probability of Being a Ghost Client,
by Firm Size



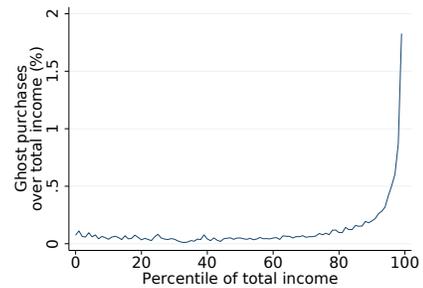
B) Value of Reported Ghost Purchases
Over Firm Total Purchases, by Firm Size



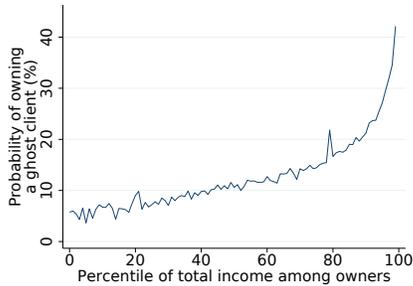
C) Probability of Owning a Ghost Client,
by Individual Total Income



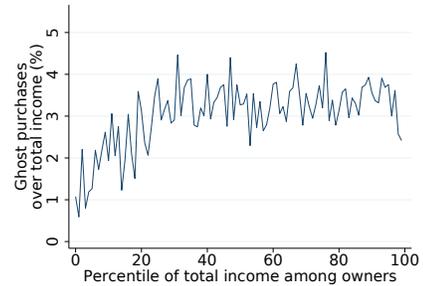
D) Value of Reported Ghost Purchases
Over Total Individual Income,
by Individual Total Income



E) Probability of Owning a Ghost Client,
by Owner Total Income
– Corporate Owners Only



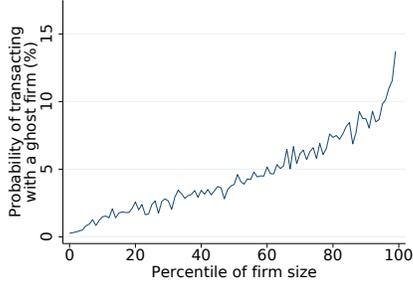
F) Value of Reported Ghost Purchases Over
Total Owner Income, by Owner Total
Income – Corporate Owners Only



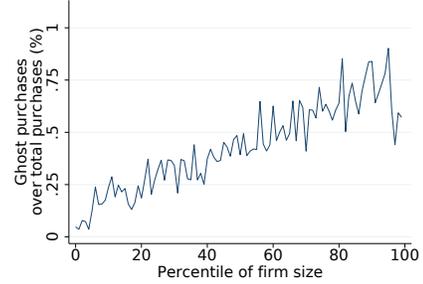
Note: This figure provides descriptive results on the use of receipts from ghost firms across the distribution of firm size and individuals' incomes (pooled 2010–2015) for incorporated firms. Panels A and B show the probability of being a ghost client and the share of firms' reported purchases that are based on receipts from ghost firms, by percentile of firm revenue (for incorporated firms that have positive revenues). Panels C and D look at individuals and their ownership in ghost client firms, by percentile of individuals' income (for individuals who earn at least \$1 a day and incorporated firms with up to 3,000 owners). Panel C shows the probability of having an ownership share in an incorporated ghost client. Panel D displays ghost purchases from incorporated firms attributed to owners (i.e., individuals' ownership shares multiplied by the corresponding firms' ghost purchases) divided by individuals' total income. Panels E and F show the same as C and D, focusing only on corporate owners (i.e., individuals who earn at least \$1 a day in capital income from an incorporated firm). Outcome variables trimmed at the top 1% of positive values. Figure [A4](#) shows the same graphs including ghost purchases from all economically active firms that are required to file a purchase annex.

Figure A5: Distributional Results
(Sole Proprietorships Only)

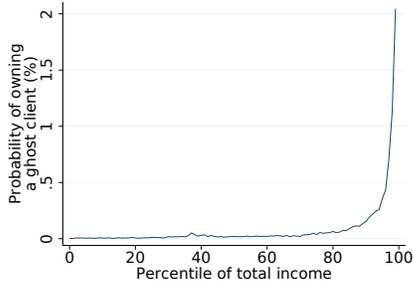
A) Probability of Being a Ghost Client,
by Firm Size



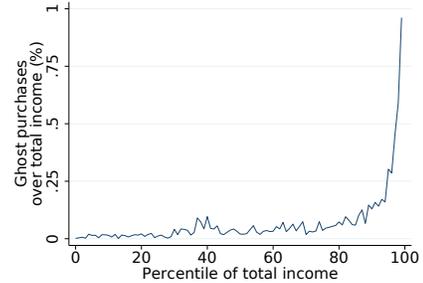
B) Value of Reported Ghost Purchases
Over Firm Total Purchases, by Firm Size



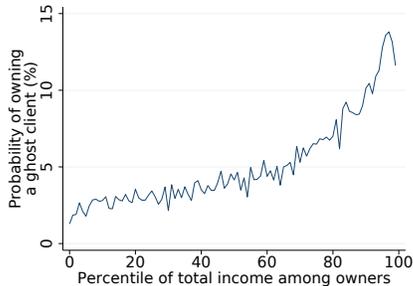
C) Probability of Owning a Ghost Client,
by Individual Total Income



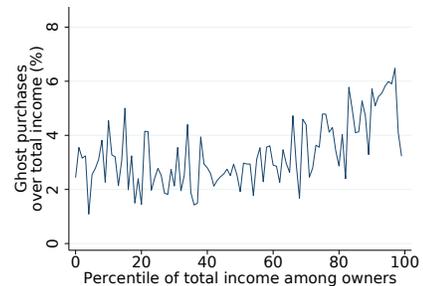
D) Value of Reported Ghost Purchases
Over Total Individual Income,
by Individual Total Income



E) Probability of Owning a Ghost Client,
by Owner Total Income
– Sole Proprietorship Owners Only

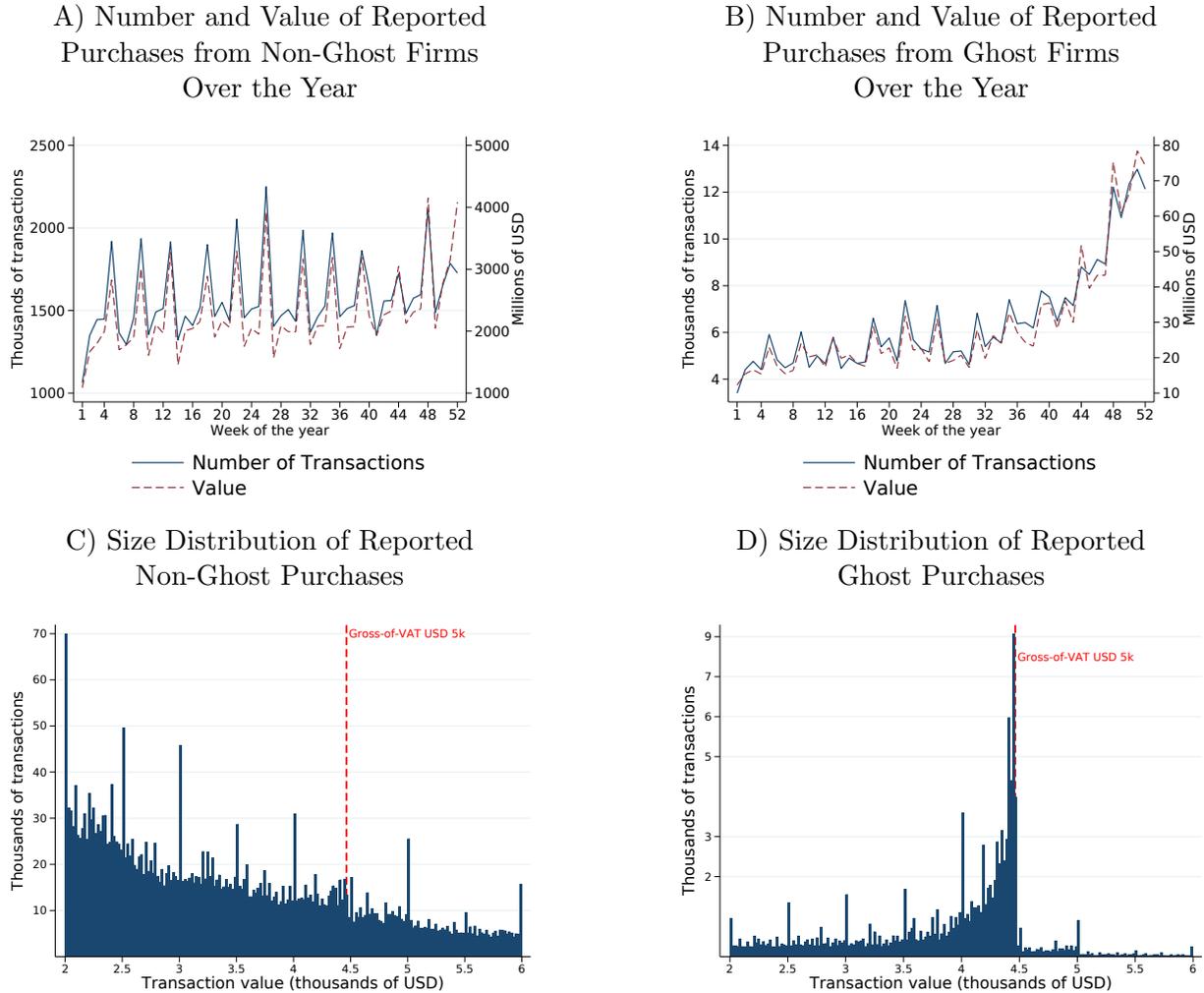


F) Value of Reported Ghost Purchases Over
Total Owner Income, by Owner Total
Income – Sole Proprietorship Owners Only



Note: This figure provides descriptive results on the use of receipts from ghost firms across the distribution of firm size and individuals' incomes (pooled 2010–2015) for sole proprietorships. Panels A and B show the probability of being a ghost client and the share of firms' reported purchases that are based on receipts from ghost firms, by percentile of firm revenue (for sole proprietorships that have positive revenues). Panels C and D look at individuals and their ownership in ghost client firms, by percentile of individuals' income (for individuals who earn at least \$1 a day and sole proprietorships). Panel C shows the probability of having a sole proprietorship that is a ghost client. Panel D displays ghost purchases attributed to owners (i.e., the corresponding sole proprietorships' ghost purchases) divided by individuals' total income. Panels E and F show the same as C and D, focusing only on individuals who earn at least \$1 a day in capital income from a sole proprietorship. Outcome variables trimmed at the top 1% of positive values. Figure [1](#) shows the same graphs including ghost purchases from all economically active firms that are required to file a purchase annex.

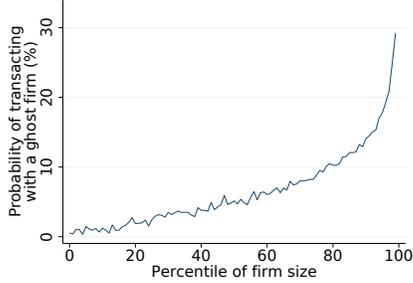
Figure A6: Patterns of Reported Purchases by Ghost Clients
 from Regular Firms versus from Ghost Firms
 (Robustness to Purchase Annex Filing Behavior)



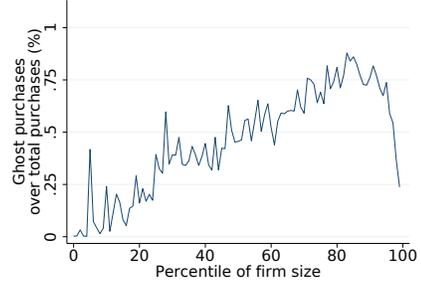
Note: Panels A and B show the weekly number and total value of reported purchases over the year, and Panels C and D the frequency of values for reported purchases, from non-ghost firms and ghost firms, respectively (for all years during 2010–2015) among economically active ghost clients that file a purchase annex. Transaction values are net-of-VAT. The red dashed lines in Panels C and D refer to the corresponding gross-of-VAT amount above which firms are required to make payments via the formal financial system. For ease of visibility, Panels C and D include only transactions that are fully subject to VAT. The sample is limited to firm-year pairs with purchase annex filings in every month in that year. Figure 2 shows the same graphs for all economically active firms that file a purchase annex independent of the firms’ filing frequency. Table A5 provides descriptive statistics on firms’ purchase annex filing behavior.

Figure A7: Distributional Results
(Robustness to Purchase Annex Filing Behavior)

A) Probability of Being a Ghost Client,
by Firm Size — Firm-Year Pairs that Filed
a PA Every Month



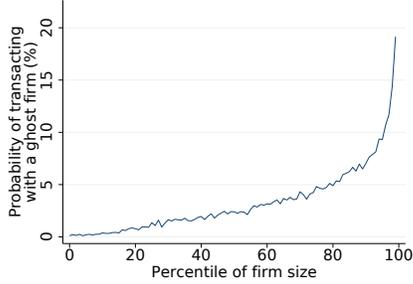
B) Value of Reported Ghost Purchases
Over Firm Total Purchases, by Firm Size
— Firm-Year Pairs that Filed a PA Every
Month



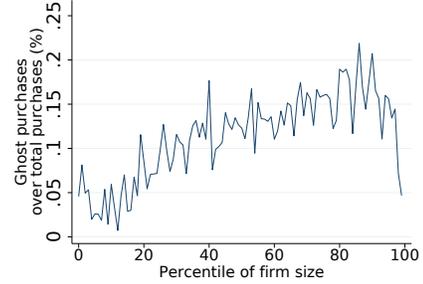
Note: This figure provides descriptive results on the use of receipts from ghost firms across the distribution of firm size (pooled 2010–2015). Compared to Figure [1](#), the sample is restricted to firm-year pairs with purchase annex filings in every month. Panel A shows the probability of being a ghost client. Panel B displays the share of firms’ reported purchases that are based on receipts from ghost firms. Table [A5](#) provides descriptive statistics on firms’ purchase annex filing behavior.

Figure A8: Distributional Results
(Small Ghost Firms Only)

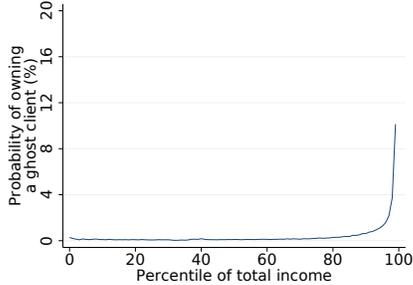
A) Probability of Being a Ghost Client,
by Firm Size



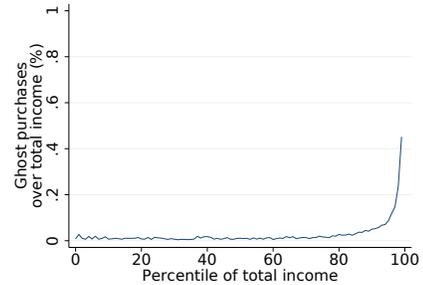
B) Value of Reported Ghost Purchases
Over Firm Total Purchases, by Firm Size



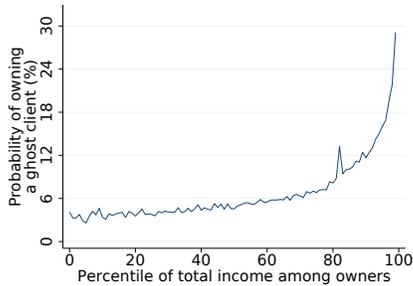
C) Probability of Owning a Ghost Client,
by Individual Total Income



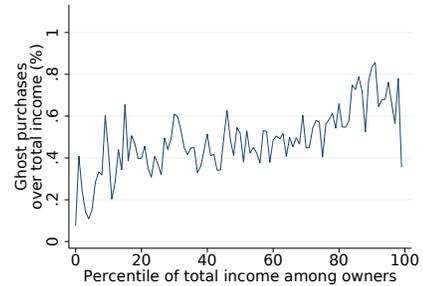
D) Value of Reported Ghost Purchases
Over Total Individual Income,
by Individual Total Income



E) Probability of Owning a Ghost Client,
by Owner Total Income
– Owners Only

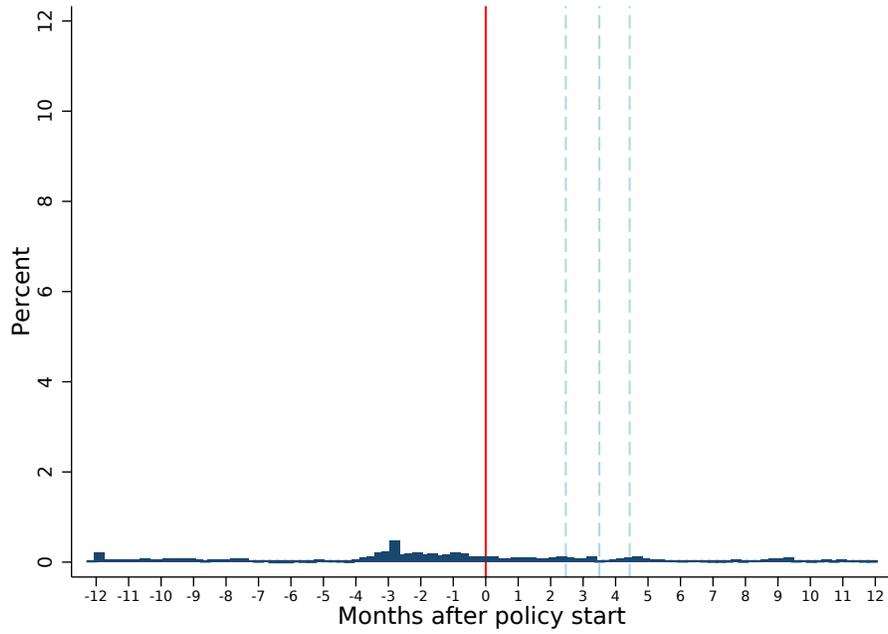


F) Value of Reported Ghost Purchases Over
Total Owner Income, by Owner Total
Income – Owners Only



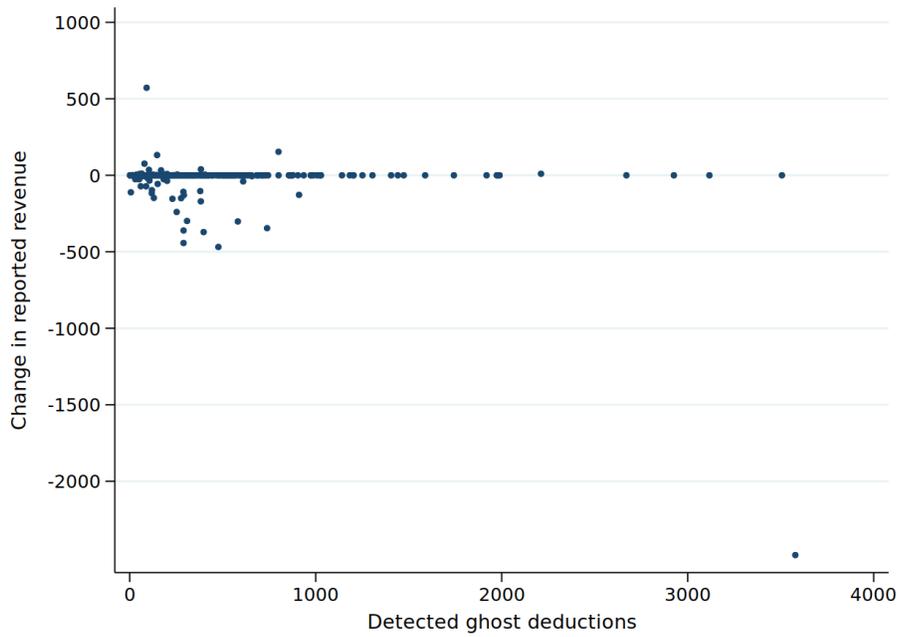
Note: This figure provides descriptive results on the use of receipts from ghost firms across the distribution of firm size and individuals' incomes (pooled 2010–2015) as in Figure 1, but restricting the sample to the lower two terciles ghost firms in terms of their size. Panels A and B show the probability of being a ghost client and the share of firms' reported purchases that are based on receipts from ghost firms, by percentile of firm revenue (for firms that are required to file a purchase annex and have positive revenues). Panels C and D look at individuals and their ownership in ghost client firms, by percentile of individuals' income (for individuals who earn at least \$1 a day and firms with up to 3,000 owners). Panel C shows the probability of having an ownership share in a ghost client. Panel D displays ghost purchases attributed to owners (i.e., individuals' ownership shares multiplied by the corresponding firms' ghost purchases) divided by individuals' total income. Panels E and F show the same as C and D, focusing only on firm owners (i.e., individuals with capital income from a firm in our sample). Outcome variables trimmed at the top 1% of positive values. This figure uses firms' reported profits to calculate their owners' incomes, which can make owners' income appear artificially lower the more ghost deductions a firm takes.

Figure A9: Amendment Rates of Non-Ghost Clients



Note: This figure shows amendment rates for non-ghost clients for tax filings from 2010–2015. Zero indicates the start of the notification intervention by SRI (July 18th 2016). For comparison, Figure 3 Panel B shows the same for the sample of notified ghost clients. Blue dashed lines plot the dates in which SRI sent additional sizeable batches of notifications. We observe seasonal small amendment rates around the Ecuadorian tax day on April 15th, which are unrelated to the intervention.

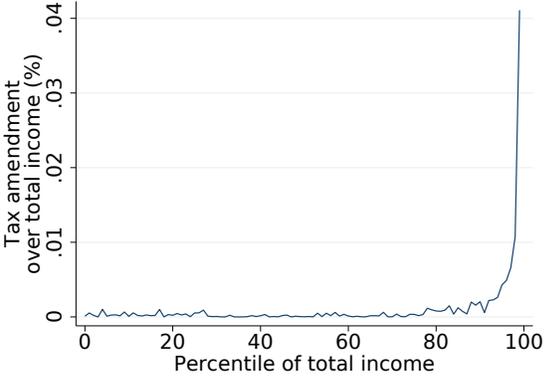
Figure A10: Revenue Adjustments Versus Notified Amounts
(Adjusting Sample)



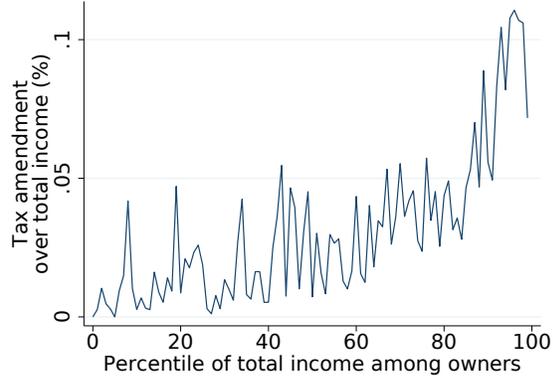
Note: This figure shows how a firm's revenue amendments compare to the amounts of ghost deductions mentioned in the notification for a given firm-year among the adjusting firms (2010–2015). Figure 3, Panels C and D show this relationship for cost amendments. All monetary figures in thousands of USD.

Figure A11: Distributional Effects – Response to Policy Intervention

A) Value of Tax Amendments Over Total Income, by Individual Total Income

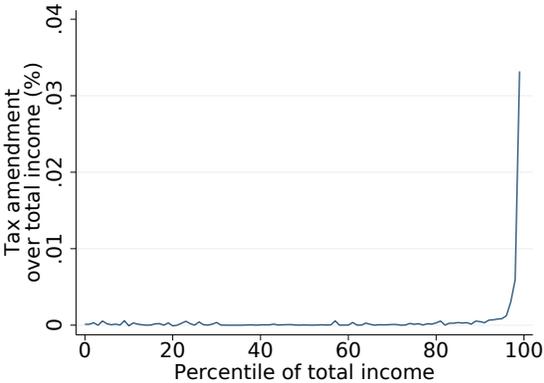


B) Value of Tax Amendments Over Total Income, by Owner Total Income - Corporate Owners Only

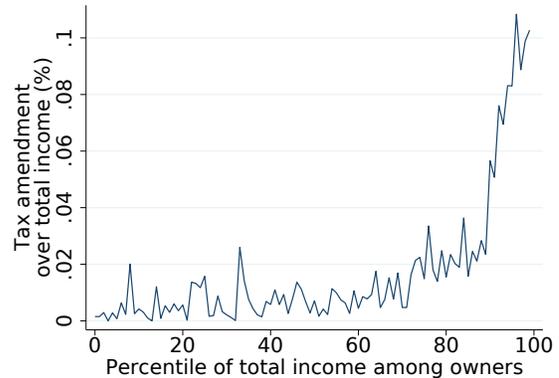


Adjusted by Not Deducting Ghost Transactions from Firm Owners' Capital Income

C) Value of Tax Amendments Over Total Income, by Individual Total Income



D) Value of Tax Amendments Over Total Income, by Owner Total Income - Corporate Owners Only



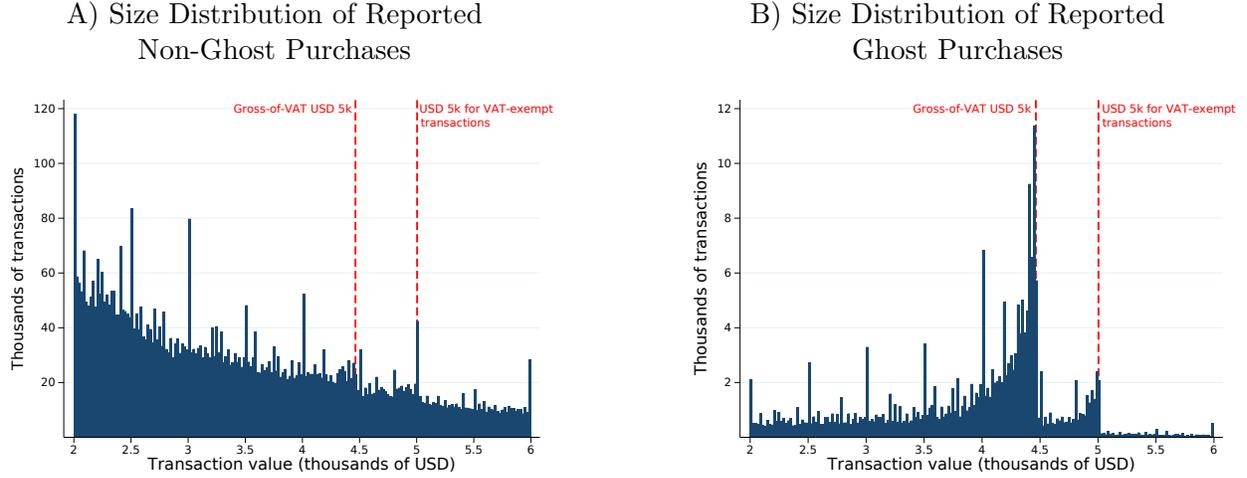
Note: This figure provides descriptive results on the value of tax amendments in response to the notifications across the distribution of individuals' incomes (pooled 2010–2015). Panel A shows results for all individuals, Panel B for corporate owners only (including firms with up to 3,000 owners). Panels A and B use firms' reported profits to calculate their owners' income, which can make owners' income look falsely lower the more ghost deductions a firm takes. Panels C and D show results when using the profits firms would have without deducting the ghost transactions. The value of tax amendments attributed to owners is their ownership share in a firm multiplied by the firm's change in reported tax, summed across firms. Panels A and C include individuals who receive a salary from an incorporated or non-incorporated firm or have an ownership stake in a firm, and earn at least \$1 a day. In Panels B and D, corporate owners are individuals holding stakes in incorporated firms with positive profits and who earn at least \$1 a day in capital income from incorporated firms. Outcome variables trimmed at the top 1% of positive values.

Figure A12: Probability of Filing Corporate Income Tax



Note: This figure plots the share of firms that file corporate income tax in 2014–2017 among the sample of incorporated firms that have been economically active at least once in our study period (2010–2015). Since corporate income taxes are filed in April of the following year, the filing for 2016 is the first one affected by the notification intervention.

Figure A13: Patterns of Reported Purchases by Ghost Clients from Regular Firms versus from Ghost Firms



Note: Panels A and B show the frequency of values for reported purchases, from non-ghost firms and ghost firms, respectively (for all years during 2010–2015) among economically active ghost clients that file a purchase annex. Includes transactions subject to VAT as well as those exempt from the tax. Transaction values of transactions subject to VAT are net-of-VAT. The legal requirement to make payments through the formal financial sector applies to transactions greater or equal than \$5,000 gross-of-VAT, indicated by the red dashed lines for transactions subject to and exempt from the VAT, respectively. Figure [2](#). Panels C and D show the same graphs excluding transactions that are not subject to VAT.

Table A1: Firm Size, Owner Income and Exporting

	Firm is a Ghost Client (Linear Probability)		Value of Reported Ghost Purchases Over Total Purchases	
	(1)	(2)	(3)	(4)
<i>Panel A: Firm Size and Owner Income</i>				
Percentile of Firm Size	0.1324*** (0.0013)	0.1105*** (0.0013)	0.0090*** (0.0003)	0.0062*** (0.0004)
Percentile of Owner Income		0.0457*** (0.0012)		0.0058*** (0.0004)
Observations	182,459	182,459	182,459	182,459
Adjusted-R2	0.063	0.069	0.004	0.005
<i>Panel B: Firm Size and Exporting</i>				
Percentile of Firm Size	0.1287*** (0.0013)	0.1077*** (0.0013)	0.0093*** (0.0003)	0.0065*** (0.0004)
Percentile of Owner Income		0.0445*** (0.0012)		0.0059*** (0.0004)
Exporter (1=Yes)	3.7190*** (0.2787)	3.4059*** (0.2780)	-0.2625*** (0.0550)	-0.3039*** (0.0556)
Observations	182,459	182,459	182,459	182,459
Adjusted-R2	0.065	0.070	0.004	0.005

Notes: This table shows the relationship between the use of ghost purchases and firm size, owner income, and whether the firm is an exporter (pooled 2010–2015). Columns 1 and 2 show regressions on a dummy variable indicating whether the firm is a ghost client, Columns 3 and 4 on the share of firms' reported purchases that are based on receipts from ghost firms. Percentiles of firm size are based on firms' mean annual revenue. Percentiles of owner income are based on ownership-share weighted total income of a firm's owners. Exporters are firms that reports exports in at least one year. Robust standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.1.

Table A2: Descriptive Statistics
(Incorporated Firms Only)

	2015		2010-2015	
	(1) Ghost clients	(2) Non-Ghost clients	(3) Ghost clients	(4) Non-Ghost clients
<i>Panel A: Ghost Clients vs. Non-Ghost Clients</i>				
Revenue (\$000)	5,499 (28,741) [750]	1,354 (35,368) [42]	8,556 (146,377) [803]	1,249 (38,335) [41]
Cost (\$000)	5,183 (26,143) [716]	1,275 (32,503) [45]	7,555 (98,579) [765]	1,138 (28,222) [43]
Tax liability (\$000)	69.11 (472) [5.30]	22.04 (790) [0.01]	220 (12,370) [5.97]	24.69 (2,518) [0.00]
Share exporting firms	0.097	0.032	0.096	0.030
<i>Panel B: Use of Ghost Firms by Ghost Clients</i>				
Number of unique ghost suppliers	2 (2) [1]		2 (2) [1]	
Number of identified ghost purchases/ total number of purchases	0.051		0.040	
Value of identified ghost purchases/ value of total purchases	0.140		0.104	
Number of firms	4,959	88,552	14,742	132,252
Number of observations	4,959	88,552	27,190	479,993

Note: This table shows descriptive statistics by ghost-client status for the universe of economically active, incorporated firms for 2015 (Columns 1 and 2) and pooled for 2010–2015 (Columns 3 and 4). Ghost client status is defined at the firm-year level. All amounts are from filings prior to the start of the policy intervention. Means are reported along with standard deviations in parentheses and medians in brackets. All monetary figures in thousands of USD. Table [1](#) shows the same statistics for the universe of economically active firms that are required to file a purchase annex. Table [A3](#) shows the same statistics for sole proprietorships that are required to file a purchase annex.

Table A3: Descriptive Statistics
(Sole Proprietorships Only)

	2015		2010-2015	
	(1) Ghost clients	(2) Non-Ghost clients	(3) Ghost clients	(4) Non-Ghost clients
<i>Panel A: Ghost Clients vs. Non-Ghost Clients</i>				
Revenue (\$000)	755 (1,290) [390]	406 (810) [199]	748 (1,438) [362]	396 (771) [191]
Cost (\$000)	712 (1,255) [358]	393 (788) [190]	707 (1,381) [331]	381 (752) [181]
Tax liability (\$000)	8.32 (28.45) [1.46]	3.14 (20.66) [0.01]	8.61 (39.92) [1.61]	3.19 (24.74) [0.07]
Share exporting firms	0.011	0.008	0.008	0.008
<i>Panel B: Use of Ghost Firms by Ghost Clients</i>				
Number of unique ghost suppliers	2 (2) [1]		2 (2) [1]	
Number of identified ghost purchases/ total number of purchases	0.034		0.027	
Value of identified ghost purchases/ value of total purchases	0.144		0.103	
Number of firms	2,159	47,534	7,894	72,626
Number of observations	2,159	47,534	12,792	256,420

Note: This table shows descriptive statistics by ghost-client status for the universe of economically active sole proprietorships that are required to file a purchase annex in 2015 (Columns 1 and 2) and pooled for 2010–2015 (Columns 3 and 4). Ghost client status is defined at the firm-year level. All amounts are from filings prior to the start of the policy intervention. Means are reported along with standard deviations in parentheses and medians in brackets. All monetary figures in thousands of USD. Table [1](#) shows these statistics for economically active firms that are required to file a purchase annex. Table [A2](#) shows these statistics for economically active, incorporated firms.

Table A4: Descriptive Statistics
(Firm-Year Pairs that Filed a Purchase Annex Every Month)

	2015		2010-2015	
	(1) Ghost clients	(2) Non-Ghost clients	(3) Ghost clients	(4) Non-Ghost clients
<i>Panel A: Ghost Clients vs. Non-Ghost Clients</i>				
Revenue (\$000)	4,951 (27,470) [728]	1,788 (40,042) [230]	7,446 (135,028) [766]	1,715 (22,891) [246]
Cost (\$000)	4,657 (24,955) [695]	1,687 (36,843) [222]	6,524 (84,882) [726]	1,595 (20,764) [236]
Tax liability (\$000)	62.77 (449) [4.82]	28.40 (901) [0.30]	205 (12,219) [5.48]	28.06 (677) [0.49]
Share exporting firms	0.084	0.036	0.083	0.037
<i>Panel B: Use of Ghost Firms by Ghost Clients</i>				
Number of unique ghost suppliers	2 (2) [1]		2 (2) [1]	
Number of identified ghost purchases/ total number of purchases	0.023		0.017	
Value of identified ghost purchases/ value of total purchases	0.102		0.071	
Number of firms	5,318	65,303	16,585	108,919
Number of observations	5,318	65,303	27,786	307,132

Note: This table shows descriptive statistics by ghost-client status for the universe of economically active firms filed a purchase annex in every month of 2015 (Columns 1 and 2) and pooled for 2010–2015 (Columns 3 and 4). Ghost client status is defined at the firm-year level. All amounts are from filings prior to the start of the policy intervention. Means are reported along with standard deviations in parentheses and medians in brackets. All monetary figures in thousands of USD. Table [1](#) shows these statistics for all economically active firms that are required to file a purchase annex.

Table A5: Purchase Annex Filing Intensity — Firm-Year Level

	Pooled	F101	Long Form F102
<i>Panel A: All firm-year pairs</i>			
Average number of months in which the firm filed a PA in that year	7.4	6.9	8.5
Filed PA 1 month or more in that year	0.78	0.76	0.82
Filed PA 3 months or more in that year	0.72	0.68	0.79
Filed PA 6 months or more in that year	0.64	0.59	0.74
Filed PA 9 months or more in that year	0.56	0.50	0.67
Filed PA 12 months or more in that year	0.42	0.37	0.51
Number of unique firm-year pairs	796,109	507,183	288,926
<i>Panel B: Only firm-year pairs with positive revenues</i>			
Average number of months in which the firm filed a PA in that year	8.2	8.0	8.5
Filed PA 1 month or more in that year	0.84	0.84	0.82
Filed PA 3 months or more in that year	0.78	0.78	0.79
Filed PA 6 months or more in that year	0.71	0.69	0.74
Filed PA 9 months or more in that year	0.63	0.60	0.67
Filed PA 12 months or more in that year	0.47	0.45	0.51
Number of unique firm-year pairs	693,685	407,955	285,730

Note: This table shows descriptive results of purchase annex filing behavior for different levels of filing intensity on the firm-year level over 2010–2015. All numbers correspond to shares, except for Row 1. Panel A includes all firms that are required to file purchase annexes, while Panel B restricts the sample to firm-year pairs with positive revenues.

Table A6: Yearly Descriptive Statistics for Notified and Adjusting Firms

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	2010	2011	2012	2013	2014	2015	2010-2015
<i>Panel A: Notified firms</i>							
Revenue (\$000)	7,061 (35,012) [1,323]	9,950 (31,144) [2,060]	4,986 (22,966) [1,330]	4,982 (21,029) [1,191]	4,838 (12,004) [1,317]	5,589 (15,120) [1,305]	5,605 (20,696) [1,326]
Cost (\$000)	6,675 (33,033) [1,286]	9,341 (29,004) [1,992]	4,733 (21,736) [1,236]	4,478 (17,413) [1,091]	4,554 (11,456) [1,233]	5,305 (14,629) [1,236]	5,248 (19,075) [1,258]
Tax liability (\$000)	90.83 (489) [18.00]	142 (707) [23.33]	59.49 (298) [12.77]	97.10 (810) [13.73]	64.42 (167) [14.52]	69.39 (189) [12.94]	79.37 (475) [14.27]
Detected ghost transactions (\$000)	261 (447) [145]	356 (388) [210]	291 (373) [168]	316 (518) [165]	384 (634) [204]	362 (578) [191]	338 (529) [181]
Observations	153	182	416	513	556	562	2,382
<i>Panel B: Adjusting firms</i>							
Revenue (\$000)	2,757 (4,774) [1,259]	4,217 (4,453) [2,604]	2,959 (9,508) [906]	2,925 (7,596) [887]	4,047 (9,371) [1,235]	3,706 (8,130) [1,189]	3,486 (8,360) [1,121]
Cost (\$000)	2,707 (4,743) [1,180]	4,202 (4,920) [2,416]	2,878 (9,342) [849]	2,755 (7,182) [811]	3,862 (8,938) [1,220]	3,510 (7,679) [1,100]	3,328 (8,004) [1,053]
Tax liability (\$000)	20.34 (17.97) [20.37]	64.15 (85.85) [25.20]	26.35 (66.87) [6.79]	37.99 (115) [10.76]	44.16 (111) [11.69]	52.05 (141) [8.69]	41.99 (114) [10.01]
Detected ghost transactions (\$000)	216 (407) [113]	350 (462) [201]	205 (230) [118]	214 (307) [121]	297 (405) [178]	316 (508) [151]	268 (402) [145]
Observations	27	20	89	136	161	172	605

Note: This table shows descriptive statistics for notified ghost clients in Panel A and for adjusting firms in Panel B by year (Columns 1 to 6) and pooled for 2010–2015 (Column 7). Amounts from filings prior to the start of the policy intervention. Means are reported along with standard deviations in parentheses and medians in brackets. All monetary figures in thousands of USD.

Table A7: Notification Dates by Month

Date	Number of notifications sent	Percent
January 2016	1	0.04
March 2016	1	0.04
July 2016	4	0.17
September 2016	78	3.27
October 2016	276	11.59
November 2016	567	23.80
December 2016	1,046	43.91
January 2017	111	4.66
February 2017	16	0.67
March 2017	84	3.53
April 2017	37	1.55
May 2017	56	2.35
June 2017	12	0.50
July 2017	9	0.38
August 2017	36	1.51
September 2017	18	0.76
October 2017	28	1.18
November 2017	1	0.04
December 2017	1	0.04
Total	2,382	100

Note: This table shows the number of notifications sent to economically active, incorporated ghost clients by SRI per month.

Table A8: Impacts of Notifications on Reported Revenue, Cost, and Tax Liability of Adjusting Firms – Yearly

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	2010	2011	2012	2013	2014	2015	2010-2015
Revenue	-13,738 (19,618)	-5,223 (8,457)	-8,397 (7,983)	-10,441 (6,186)	-2,515 (3,595)	-17,733 (21,534)	-10,079 (6,872)
Cost	-200,276 (114,633)	-160,760 (60,790)	-130,318 (23,761)	-155,134 (37,215)	-181,664 (41,057)	-228,583 (51,238)	-181,626 (28,680)
Tax liability	40,599 (24,481)	26,236 (11,308)	21,135 (4,228)	29,192 (6,823)	38,457 (7,861)	40,165 (7,529)	34,003 (5,114)
Number of firms	27	20	89	136	161	172	460
Number of firm-year pairs	27	20	89	136	161	172	605

Note: This table shows changes to reported revenue, cost and tax within 90 days after mailing of the notification from SRI, among the adjusting firms. Each coefficient stems from a separate regression showing the average difference in the reported outcome variable across notifications between the original filing from before the notification and the amendment filing after the notification. Separate for each tax year from 2010–2015, in Columns (1) to (6), we regress the pre- and post-notification values for filings concerning the respective tax year on a post-notification dummy including firm fixed effects. In Column (7) we create a pooled sample of all filings (including amendments) for the 2010–2015 tax years. We then regress the reported values (separately for each outcome in question) on a firm-tax year fixed effect and a dummy variable indicating whether the filing was submitted in the 90 days following the firm was sent a notification about the filing from SRI. The coefficient reported here is that on the post-notification dummy variable. Each firm-tax year pair corresponds to a separate notification. Table 2 shows these results for 2015 and from 2010–2015. Standard errors clustered at the firm level. All outcomes in USD.

Table A9: Impact of Notifications on Reported Revenue, Cost, and Tax Liability of All Notified Firms

	(1)	(2)
	2015	2010-2015
Revenue	-4,338 (7,106)	-2,667 (1,898)
Cost	-66,421 (16,971)	-44,748 (8,060)
Tax liability	16,834 (2,844)	10,909 (1,564)
Number of firms	562	1,589
Number of firm-year pairs	562	2,382

Note: This table shows changes to reported revenue, cost and tax within 90 days after mailing of the notification from SRI, among the notified firms. Each coefficient stems from a separate regression showing the average difference in the reported outcome variable across notifications between the original filing from before the notification and the amendment filing after the notification. If the notified firm did not file an amendment within 90 days following the notification, the post-notification value is the same as its reported pre-notification value. In Column (1) we regress the pre- and post-notification values for filings concerning the tax year 2015 on a post-notification dummy including firm fixed effects. In Column (2) we create a pooled sample of all filings (including amendments) for the 2010–2015 tax years. We then regress the reported values (separately for each outcome in question) on a firm-tax year fixed effect and a dummy variable indicating whether the filing was submitted in the 90 days following the firm was sent a notification about the filing from SRI. The coefficient reported here is that on the post-notification dummy variable. Each firm-tax year pair corresponds to a separate notification. Table 2 shows these results for adjusting firms. Standard errors clustered at the firm level. All outcomes in USD.

Table A10: Yearly Descriptive Statistics

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	2010	2011	2012	2013	2014	2015	2010-2015
<i>Panel A: Ghost clients</i>							
Revenue (\$000)	6,674 (120,126) [494]	9,508 (219,424) [696]	7,481 (180,708) [544]	5,173 (34,998) [563]	4,731 (32,879) [592]	4,060 (24,098) [568]	6,058 (120,767) [568]
Cost (\$000)	6,207 (110,077) [466]	7,719 (128,782) [670]	6,304 (115,816) [517]	4,778 (29,601) [529]	4,338 (27,659) [548]	3,827 (21,928) [538]	5,364 (81,360) [536]
Tax liability (\$000)	91.99 (1,635) [3.35]	405 (21,989) [4.09]	262 (15,226) [3.47]	88.09 (1,740) [4.44]	82.22 (1,692) [4.56]	50.68 (395) [3.68]	153 (10,202) [3.91]
Number of identified ghost purchases/ total number of purchases	0.02	0.02	0.03	0.04	0.05	0.05	0.04
Value of identified ghost purchases/ value of total purchases	0.06	0.05	0.09	0.12	0.14	0.14	0.10
Observations	5,356	4,672	7,949	7,345	7,542	7,118	39,982
<i>Panel B: Non-Ghost Clients</i>							
Revenue (\$000)	853 (12,268) [92.84]	858 (10,823) [101]	783 (8,318) [100]	1,001 (46,440) [105]	1,051 (43,863) [106]	971 (27,793) [97.09]	927 (30,549) [101]
Cost (\$000)	793 (10,909) [87.67]	794 (9,187) [96.90]	727 (7,322) [95.83]	894 (29,794) [99.82]	947 (31,842) [99.63]	918 (25,542) [94.38]	852 (22,493) [96.12]
Tax liability (\$000)	13.40 (475) [0.0281]	14.17 (515) [0.0249]	11.68 (296) [0.0023]	23.79 (3,767) [0.0031]	21.27 (2,711) [0.0188]	14.67 (621) [0.0016]	16.77 (2,007) [0.0096]
Observations	99,830	113,843	125,188	133,444	140,336	143,486	756,127

Note: This table extends Table [1](#) showing descriptive statistics for ghost clients in Panel A and for non-ghost clients in Panel B by year (Columns 1 to 6) and pooled for 2010–2015 (Column 7). Ghost client status is defined at the firm-year level. Amounts from filings prior to the start of the policy intervention. Means are reported along with standard deviations in parentheses and medians in brackets. All monetary figures in thousands of USD.

B International Prevalence of Ghost Firms

Table B1: International Prevalence of Ghost Firms

Country	Source(s)	Description
Chile	González and Velásquez (2013) Jorrat (2001) CIAT (2008)	False invoices have historically represented between 15% and 25% of total VAT evasion in Chile, and this percentage increased significantly in years of economic crisis. Between 1990 and 2003, evasion based on false invoices represented between 16% (in 1992) and 38% (in 1998) of total VAT evasion. In 2004, the share decreased to 15%. While the evasion based on false invoices amounted to 328 billion CLP in 1998, it was about one-third of this amount in 2004, namely 114 billion CLP, which represents 0.2% of the Chilean GDP and 1.2% of the total tax revenue in 2004.
China	Hashimzade et al. (2010)	Tax fraud in claims for VAT rebates on exported products has been identified in China. This is a type of fraud for which a firm requires, among other things, a false VAT invoice. Furthermore, the National Audit Office found that central government departments were embezzling 21 million USD with fake invoices in 2010.
Colombia	Portafolio (2019) DIAN (2021)	The local tax authority has identified 506 firms dedicated to the sale of fake invoices. In Bogotá the authority began investigating 850 firms that were notified about these transactions and did not voluntarily rectify them. Moreover, in 2019, the authorities apprehended a group of people that had been using 15 ghost firms to sell fake invoices since 2005. The estimated tax revenue lost from this scheme was around 2,300 billion COP, which amounted to around 0.2% of the country's GDP for 2019.
Kenya	Mak'Osewe (2019)	The Kenya Revenue Authority (KRA) have highlighted the case of a businessman who allegedly used fictitious invoices to illegally claim VAT refunds for more than 500,000 USD between 2015 and 2018.

International Prevalence of Ghost Firms (Continued)

Country	Source(s)	Description
Mexico	OECD (2017) Senado de la Republica (2019)	Between 2007 and 2009, Mexico lost around 3 billion EUR in tax revenue because of false invoicing. Between 2014 and 2018, annual tax revenue lost due to ghost firms was about 5 billion MXN, which represents approximately 0.03% of the country's average GDP over the same period. Around 8,500 companies were identified as ghost firms in 2018.
Pakistan	Waseem (2020)	In Pakistan, invoice mills (ghost firms) are an important conduit through which the overclaim of refund takes place. More than 80% of their transactions are with exporters, who use these spurious invoices to obtain excessive refunds. Of the amount overclaimed as refund, nearly 37% is based on invoices issued by ghost firms.
Poland	M. of Finance of Poland (2018)	Between 2010 and 2016, the number and total value of fictitious invoices detected as a result of fiscal controls increased substantially. In 2010, 84,200 bogus invoices were detected, amounting to a total of 3,711.2 million PLN (0.26% of the country's GDP and 1.56% of the tax revenue). In 2016, the number of invoices increased to 421,300, with a total amount of 103,850 million PLN (5.6% of the country's GDP and 34.3% of the tax revenue). The average gross amount for which a fictitious invoice was issued, revealed in tax inspections/audits completed in 2010-2016, was 246.5 thousand PLN in 2016.
Rwanda	Mascagni et al. (2019) Mascagni et al. (2022)	Anecdotal evidence of taxpayers using fake receipts has been documented in Rwanda.
Slovak Republic	OECD (2017)	During 2014 and 2015, the amount of risky VAT detected in domestic invoicing fraud was more than 500 million EUR. This represents 0.64% of the country's average GDP for these two years, as well as 1.81% of the average total tax revenue for these two years.
South Korea	Krever (2014)	In 2011, 1,410 out of 2,000 audited companies and individuals were charged with invoicing fraud, a practice adopted both by firms and individuals.

C Data Appendix

This section provides further details on the data described in Section III. For our analysis, we combine various administrative records from the Ecuadorian Tax Authority (SRI), such as lists of tax IDs identified as ghost firms, notification data, tax forms (F101 for corporations and F102 for sole proprietorships and individuals), purchase annex data, firm characteristics, ownership data, and employment records.

C1 Ghost Firms and Notifications Data

To classify firms as ghost suppliers, we use a list of tax IDs that were identified as being non-existent by SRI. These ghost firms were discovered between January 2016 and December 2017. In total, SRI detected 811 of them in this period.

A subset of client firms registering purchases from the aforementioned ghost firms received a notification from SRI. Specifically, we have data on notifications sent by the tax authority to firms referencing either their Corporate Income Tax (CIT) returns or their Value Added Tax (VAT) returns. In total, 5,007 notification letters were sent to 2,825 firms. We only keep the notifications related to CIT.²² We observe the notification date and the total value of ghost transactions that the firm registered during a given fiscal year. After keeping only CIT notifications sent to economically active firms that filed at least one ghost transaction in the purchase annex in the fiscal year which the notification concerns, we are left with 2,382 notifications which were sent to 1,589 corporate ghost clients for the fiscal years 2010–2015.²³

C2 Purchase Annexes and Tax Returns

All incorporated firms in Ecuador are required to submit an annual tax form and monthly purchase annexes. For sole proprietorships, only those with annual sales above \$100,000, annual costs above \$80,000, or capital above \$60,000 are required to file purchase annexes. On the one hand, purchase annexes contain information about all transactions in which a firm was involved. For each transaction, we observe (anonymized versions of) the tax IDs of the buyer and the seller, the date on which it was registered, its value and the VAT paid. On the other hand, F101 and F102 data contains information on a variety of tax items, such as revenue, costs, tax liability, and profit. Importantly, our F101 and F102 records also include amendments, which are submissions in which corporations rectify information presented in previous tax returns. This data also allows us to compute the change in reported tax items

²²We do not use the data on VAT notifications because we do not have access to VAT amendments, but only corporate tax amendments. Also, whenever a firm receives both types of notifications for a given fiscal year, we only keep the CIT notification.

²³The total number of 5,007 notifications is composed of 4,176 notifications related to CIT and 831 related to VAT. Out of these, 668 notifications were sent to firms that are either not economically active or do not report a transaction from one of the 811 ghost firms in the purchase annex. Economically active incorporated ghost clients were sent 2,382 notifications related to CIT and 329 related to VAT, in total. Moreover, economically active sole proprietorship ghost clients received 1,288 notifications related to CIT and 340 related to VAT. Since we do not have data on amendments filed by sole proprietorships, they are not included in our analysis of the enforcement campaign.

between a firm’s original submission and the post-notification amendment. Lastly, we only keep submissions covering fiscal years 2010 to 2015.

For the F101 and F102 data, in case a firm submitted multiple tax forms for the same fiscal year, we only keep the last (most recent) submission²⁴. Additionally, for the subset of corporations that received a notification from SRI to amend their returns, we keep a maximum of two submissions for a given fiscal year: The last submission before notification, and the last amendment within 90 days of receiving the notification. In case they did not amend their tax returns after the notification date, we only keep their last pre-notification submission.

Then, to clean the purchase annex data, we restrict the sample to transactions in the period 2010–2015, and then ensure that the VAT paid is consistent with the transaction value. We discard any transactions with a negative value, purchases whose value is too large relative to the cost of the buyer and/or the revenue of the seller, and those in which the buyer and seller are actually the same firm²⁵. This data allows us to calculate, for each buyer-year pair, the total number and value of purchases registered.

C3 Ownership, Employment, and Civil Registry Data

We have access to ownership records in which firms register their owners, including each owner’s share. As this data is available from 2011 onwards, we impute the same data from this year to the previous one. This means that we assume that the ownership structure did not change between 2010 and 2011. This data allows us to calculate owner’s capital income, and also to link ghost transactions of a firm to its owner.

In addition, for the employment records, we combine two rounds of employment data from SRI. The first round covers the period from 2007 to 2017, and the second round is available from 2009 to 2016. This constitutes the data we use to calculate labor income for the individuals in our dataset.

C4 Sample of Firms

In Ecuador, corporations file the corporate income tax form (F101), while sole proprietorships file a combined business and individual income tax return (long form F102). Our sample includes these, and also smaller sole proprietorships that file purchase annexes because they want to deduct itemized costs (short form F102). We define a firm as a tax ID that files an F101 or F102 tax form. Most of our analyses restrict the sample to F101 and F102-long-form filers, the only exception being part of the distributional analysis (Figures 1, A1, A4, A5 and A7), which also includes the short form F102 filers.

Furthermore, we restrict the sample to economically active firms. We define a firm-year pair as economically active if it satisfies at least one of the following criteria:

- It submitted an F10X with positive revenues or costs.

²⁴Our data allows us to identify precisely the last submission, as we observe both the date and the exact time of each submission.

²⁵For more details on the data and the cleaning process, see [Adao et al. \(2022\)](#).

- It appeared as a buyer or seller in the purchase annex.
- It had at least one employee.

This results in a list of 216, 578 unique economically active firms for the entire 2010–2015 period.

C5 Combining the Data

To identify whether an amendment took place before or after receiving a notification, we merge the notifications data with the F101 records.²⁶ Additionally, to identify ghost clients, we merge the purchase annex data with the list of ghost firms provided by SRI. For each year, we define a buyer firm as a ghost client if it registered at least one transaction in which the seller is a ghost firm. For the entire period of our sample, we identified a total of 22, 630 unique economically active ghost clients (14, 742 F101 filers and 7, 894 F102-long-form filers).²⁷

Within ghost clients, we make other classifications that we use for certain calculations. Namely, we define a notified ghost client for a given year as a ghost client that received a notification from SRI referencing their corporate tax returns of that year. Furthermore, within notified ghost clients, we define adjusting ghost clients as those that submitted an amendment with a reduction in at least one non-labor cost line item within 90 days of receiving a notification from SRI.

Additionally, to incorporate the ownership data in our analysis, we merge it with the purchase annex and the ghost firm list to identify which firms/individuals are ghost client owners. We define an owner as a ghost client owner if they own shares in a ghost client, independent of the size of their share(s). We then merge this list of ghost client owners with employment and tax forms data to recover their labor and capital income.

C6 Other Calculations and Adjustments

Individuals’ income: To create Figures [1](#), [A1](#), [A4](#), [A5](#) and [A7](#), we calculate each individual’s total income in the following way. We define individual i ’s income in year t as the sum of their labor and capital income in that year:

$$Total\ Income_{it} = Labor\ Income_{it} + Capital\ Income_{it}. \quad (1)$$

Labor income is the sum of the annual salaries earned by individual i from the firms they were employed at in year t . Capital income is the sum of income obtained through firm ownership—obtained by multiplying their ownership share in a firm by the firm’s profit—and

²⁶We exclude from the analyses all observations associated with 3 firm IDs whose original filing dates take place after the notification date. These are likely the result of data entry mistakes.

²⁷Note that a few firms file F101 in one year and F102 in another year. Thus, the sum of unique F101 clients and F102 clients over 2010–2015 does not add up to the number of unique ghost clients. Furthermore, if a firm filed both F101 and F102 in the same year, we only consider the F101 filing.

other rents:

$$Capital\ Income_{it} = \left(\sum_{n=1}^N Share\ Owned_{int} \times Profit_{nt} \right) + Other\ Rents_{it}, \quad (2)$$

where $n \in \{1, \dots, N\}$ indexes the firms in our sample.²⁸ *Other Rents* include professional fees, dividends, financial rents and other forms of taxable income, all of which are reported in the individual income tax returns (F102).

Income percentiles: To compute percentiles across the distribution of individuals' total income, we add a random value between \$1 and \$5 to the total annual income of each individual. This ensures that all 100 percentile bins include the same number of observations.

Finally, note that we follow a procedure similar to equation (2) to attribute ghost purchases to individuals, namely:

$$Ghost\ Purchases_{it} = \sum_{n=1}^N Share\ Owned_{int} \times Value\ of\ Ghost\ Transactions_{nt}. \quad (3)$$

²⁸For sole proprietorships (F102) that are not in the ownership data, but for which the tax ID of the owner is the same as that of the firm, we treat the ownership share as 1.

D Full Text of a Sample Notification

D1 Original (in Spanish)

Estimado Contribuyente:

En virtud de lo dispuesto en los numerales 2 y 9 del artículo 2 de la Ley de creación del Servicio de Rentas Internas, esta institución tiene la facultad de efectuar el control de los tributos internos del estado y la atribución de solicitar a los sujetos pasivos o a quien los represente cualquier tipo de documentación o información vinculada con la determinación de sus obligaciones tributarias o de terceros.

El artículo 9 de la Ley de Creación del Servicio de Rentas Internas, establece que los directores del Servicio de Rentas Internas ejercerán, dentro de su respectiva jurisdicción, las funciones que el Código Tributario asigna al Director General del Servicio de Rentas Internas.

Mediante la Resolución No NAC-DGERCGC14-00313, publicada en la edición especial del Registro Oficial No. 134 de 30 de mayo de 2014, se expidió el nuevo Estatuto Orgánico de Gestión Organizacional por Procesos del Servicio de Rentas Internas, mismo que es aplicable desde el 01 de noviembre de 2014, según lo dispuesto en la Resolución No. NAC-DGERCG14-00873.

Que, mediante Resolución No. PEO-JURRDR15-00000009 publicada en el Registro Oficial No. 435 el 10 de Febrero de 2015, en ejercicio de la facultad que le confiere la ley, la Dirección Provincial de El Oro del Servicio de Rentas Internas resolvió delegar a quien desempeñe las funciones de Jefe Provincial de Gestión Tributaria, la facultad de expedir y suscribir el presente acto.

El artículo 94 del Código Tributario respecto a la caducidad de la facultad determinativa, señala:

Art. 94.- Caducidad.- Caduca la facultad de la administración para determinar la obligación tributaria, sin que se requiera pronunciamiento previo:

(..)

2. En seis años, contados desde la fecha en que venció el plazo para presentar la declaración, respecto de los mismos tributos, cuando no se hubieren declarado en todo o en parte;

El artículo 17 del Código Tributario sobre el hecho generador, señala:

Art. 17. - Calificación del hecho generador. - Cuando el hecho generador consista en un acto jurídico, se calificará conforme a su verdadera esencia y naturaleza jurídica, cualquiera que sea la forma elegida o la denominación utilizada por los interesados.

Cuando el hecho generador se delimite atendiendo a conceptos económicos el criterio para calificarlos tendrá en cuenta las situaciones o relaciones económicas que efectivamente existan o se establezcan por los interesados con independencia de las formas jurídicas que se utilicen. (El subrayado corresponde a la Administración Tributaria).

El artículo 10 de la Ley de Régimen Tributario Interno en el último inciso del numeral 16, en concordancia con el artículo 26 de su reglamento de aplicación, establecen:

Art. 10.- Deducciones.- En general, para determinar la base imponible sujeta a este impuesto se deducirán los gastos que se efectúen con el propósito de obtener, mantener y mejorar los ingresos de fuente ecuatoriana que no estén exentos.

(..)

Sin perjuicio de las disposiciones de este artículo, no serán deducibles los costos o gastos que se respalden en comprobantes de venta falsos, contratos inexistentes o realizados en general con personas o sociedades inexistentes, fantasmas o supuestas.

Art. 26.- No serán deducibles los costos o gastos que se respalden en comprobantes de venta emitidos por empresas inexistentes, fantasmas o supuestas, sin perjuicio de las acciones penales correspondientes.

En tal sentido, los artículos 24 y 25 del Reglamento para la Aplicación de la Ley de Régimen Tributario Interno, establecen las definiciones de empresas fantasmas o supuestas e inexistentes; señalando lo siguiente:

Art. 24.- Definición de empresas inexistentes.- De manera general, se considerarán empresas inexistentes aquellas respecto de las cuales no sea posible verificar la ejecución real de un proceso productivo y comercial. En el caso de sociedades, y sin perjuicio de lo señalado, se considerarán como inexistentes a aquellas respecto de las cuales no se pueda verificar su constitución, sea a través de documentos tanto públicos como privados, según corresponda.

Art. 25.- Definición de empresas fantasmas o supuestas.- Se considerarán empresas fantasmas o supuestas, aquellas que se han constituido mediante una declaración ficticia de voluntad o con ocultación deliberada de la verdad, quienes fundadas en el acuerdo simulado, aparentan la existencia de una sociedad, empresa o actividad económica, para justificar supuestas transacciones, ocultar beneficios, modificar ingresos, costos y gastos o evadir obligaciones. La realización de actos simulados, será sancionada de conformidad con las normas de defraudación, tipificadas en el Código Tributario.

El Servicio de Rentas Internas al revisar la información que dispone en sus bases de datos, ha identificado que registra operaciones con empresas que han sido consideradas para efectos tributarios como inexistentes, fantasmas o personas naturales y sociedades que realizan actividades supuestas y/o transacciones inexistentes, por lo cual deberá justificar la veracidad del hecho económico y por ende del gasto registrado en su (s) declaración (es) de las transacciones que se detallan a continuación:

Cuadro No. 1 Transacciones con empresas fantasmas o inexistentes, así como con personas naturales y sociedades con actividades supuestas y/o transacciones inexistentes

La Resolución No. NAC-DGERCGC16-00000356 publicada en el Segundo Suplemento del Registro Oficial 820 de 17 de agosto de 2016, dispone:

Art. 7.- Corrección de declaraciones.- Los contribuyentes que hubiesen utilizado en sus declaraciones, los comprobantes de venta, documentos complementarios y/o compro-

bantes de retención emitidos por empresas inexistentes, fantasmas o personas naturales y sociedades que realizan actividades supuestas y/o transacciones inexistentes, según corresponda, de no contar con documentación que respalde la realidad económica de la o las transacciones, deberán corregir sus declaraciones, cumpliendo para el efecto con lo establecido en la normativa tributaria vigente. En el caso del impuesto a la renta, la corrección a realizar afectará al estado de resultados del ejercicio fiscal respectivo; para el caso del impuesto al valor agregado, se realizará la corrección de la declaración a partir de la cual se genere un valor a pagar de impuesto por la disminución del crédito tributario. En caso de que esta Administración Tributaria detecte que un contribuyente no corrigió sus declaraciones, pese a encontrarse en el supuesto señalado en el inciso anterior, podrá ejercer su facultad determinadora para establecer el o los valores de impuesto que correspondan, con los respectivos intereses, multas y recargos que le sean aplicables, sin perjuicio de las acciones penales que se pudieren iniciar de conformidad con el Código Orgánico Integral Penal y demás normativa vigente.

Por consiguiente y de conformidad con lo señalado en la normativa vigente, las transacciones efectuadas con comprobantes de venta, documentos complementarios y/o comprobantes de retención emitidos por los sujetos pasivos anteriormente descritos en los cuales no se pueda probar la realidad económica de tales operaciones conforme lo dispuesto en el Art. 17 del Código Tributario; se deberá realizar la respectiva corrección de la o las declaraciones en función del siguiente detalle de diferencias establecidas por la Administración Tributaria, sin perjuicio que más adelante se pueda detectar diferencias adicionales:

Cuadro No. 2 Diferencias en la (s) declaración (es) de Impuesto a la Renta por transacciones con empresas fantasmas o Inexistentes, así como con personas naturales y sociedades con actividades supuestas y/o transacciones inexistentes

Con estos antecedentes, se le otorga el plazo de diez (10) días hábiles, para que presente sus declaraciones sustitutivas de Impuesto a la Renta y del Impuesto al Valor Agregado, modificando la (s) diferencia (s) correspondiente (s) a las transacciones realizadas con ese (esos) contribuyente (s), liquidando el impuesto más los intereses y multas correspondientes.

En el caso de que no se cumpla con lo solicitado en el plazo otorgado o no se justifique documentalmente, el Servicio de Rentas Internas, en ejercicio de las facultades establecidas en la ley, iniciará los procesos de control y aplicará las sanciones pertinentes, para garantizar el estricto y correcto cumplimiento de la normativa tributaria, sin perjuicio de impulsar las acciones penales a las que tuviere lugar.

De igual manera se hace conocer al contribuyente lo dispuesto en el quinto inciso del artículo 101 de la Ley de Régimen Tributario Interno, en su parte pertinente, señala:

(...)

Cuando la enmienda se origine en procesos de control de la propia administración tributaria y si así ésta lo requiere, la declaración sustitutiva se podrá efectuar hasta dentro de los seis años siguientes a la presentación de la declaración y solamente sobre los rubros requeridos por la Administración Tributaria. (Énfasis añadido).

En caso de requerir mayor información al respecto del presente oficio puede acercarse a las oficinas del Departamento de Gestión Tributaria de la Dirección Provincial El Oro, ubicadas en la Av. 25 de Junio, Km 1 $\frac{1}{2}$ vía a Pasaje.

El presente oficio no constituye un acto de determinación tributaria, sino una comunicación meramente informativa que tiene como finalidad poner al tanto al sujeto pasivo sobre las diferencias que la Administración Tributaria ha detectado como consecuencia del análisis y los cruces de información respectivos. La Administración Tributaria se reserva el derecho de ejercer la facultad determinadora en el caso en que el sujeto pasivo no regularice las diferencias detectadas de conformidad con lo previsto en el Código Tributario y la Ley de Régimen Tributario Interno.

Finalmente, se advierte que el numeral 20 del artículo 298 del Código Integral Penal, al referirse a la defraudación tributaria, establece que la persona que simule, oculte, omita, falsee o engañe a la Administración Tributaria con el fin de evadir el cumplimiento de las obligaciones tributarias o para dejar de pagar en todo o en parte los tributos realmente debidos, en provecho propio o de un tercero, valiéndose de personas naturales interpuestas, o personas jurídicas fantasmas o supuestas, residentes en el Ecuador o en cualquier otra jurisdicción, será sancionada con pena privativa de libertad de cinco a siete años.

Así mismo, los representantes legales y el contador, respecto de las declaraciones u otras actuaciones realizadas por ellos, serán responsables como autores en la defraudación tributaria en beneficio de la persona jurídica o natural, según corresponda, sin perjuicio de la responsabilidad de los socios, accionistas, empleados, trabajadores o profesionales que hayan participado deliberadamente en dicha defraudación, aunque no hayan actuado con mandato alguno.

D2 Translation

Dear Taxpayer:

Under the provisions of paragraphs 2 and 9 of Article 2 of the Law on the Creation of the Internal Revenue Service, this institution has the power to carry out the control of the internal taxes of the State and is entitled to request from the taxpayers or those who represent them any type of documentation or information related to the determination of their tax obligations or those of third parties.

Article 9 of the Law on the Creation of the Internal Revenue Service establishes that the directors of the Internal Revenue Service shall exercise, within their respective jurisdiction, the duties that the Tax Code assigns to the General Director of the Internal Revenue Service.

Through Resolution No NAC-DGERCGC14-00313, published in the special edition of Official Gazette No. 134 of May 30, 2014, the new Organic Statute of Organizational Management by the Internal Revenue Service Processes was issued. This statute is valid since November 1, 2014, as stated in Resolution No. NAC-DGERCG14-00873.

That, through Resolution No. PEO-JURRDRI15-00000009 published in Official Gazette No. 435 of February 10, 2015, in exercise of the power granted by law, the El Oro Provincial Office of the Internal Revenue Service decided to delegate the power to issue and subscribe the present act to whoever performs the functions of Provincial Head of Tax Management.

Article 94 of the Tax Code, regarding the expiration of the determinative faculty states:

Art. 94.- Expiration.- The power of the administration to determine the tax obligation expires, without requiring prior pronouncement, if:

(..)

2. In six years, counted from the date on which the period for filing the declaration expired, with respect to the same taxes, when they have not been declared in whole or in part;

Article 17 of the Tax Code on the tax-triggering event states:

Art. 17. - Qualification of the tax-triggering event - When the triggering event consists of a legal act, it will be classified according to its true essence and legal nature, regardless of the chosen form or the denomination used by the interested parties.

When the triggering event is defined according to economic concepts, the criteria to rate them will consider the situations or economic relationships that actually exist or are established by the interested parties, regardless of the legal forms used. (The underscore corresponds to the Tax Administration.)

Article 10 of the Internal Tax Regime Law in the last subsection of section 16, and in accordance with article 26 of its implementing regulations, establishes:

Art. 10.- Deductions.- In general, to determine the taxable base subject to this tax, the expenses incurred in order to obtain, maintain and increase the income from Ecuadorian sources that are not exempt will be deducted.

(..)

Without prejudice to the provisions of this article, the costs or expenses that are supported by false sales receipts, non-existent contracts or those in which the counterpart is a non-existent, ghost, or alleged person or company, will not be deductible.

Art. 26.- Costs or expenses that are supported by sales receipts issued by non-existent, ghost or alleged companies shall not be deductible, without prejudice to the corresponding criminal actions.

In this sense, Articles 24 and 25 of the Regulation for the Application of the Law of Internal Tax Regime establish the definitions of ghost, alleged or nonexistent companies, noting the following:

Art. 24.- Definition of non-existent companies.- In general, nonexistent companies shall be defined as those for which it is not possible to verify the actual execution of a productive and commercial activity. In the case of the companies indicated, and without prejudice to this, those for which it is not possible to verify their incorporation, either through public or private documents, will be considered non-existent.

Art. 25.- Definition of ghost or alleged companies- Ghost or alleged companies shall be considered as those that have been constituted through a fictitious declaration of will or with deliberate concealment of the truth. That is, those who, based on a simulated agreement, feign the existence of a company, business, or economic activity, to justify alleged transactions, hide profits, modify income, costs and expenses or evade tax obligations. Taking part of simulated actions will be sanctioned in accordance with the rules of fraud, which are described in the Tax Code.

The Internal Revenue Service, while reviewing its records, has identified that your firm registers transactions with companies that are considered non-existent, ghosts, or individuals and companies that perform alleged activities and/or non-existent transactions for tax purposes. Therefore, you must justify the veracity of the economic event and consequently of the expenses recorded in your tax form(s) for the transactions detailed below:

Table 1 Transactions with ghost/nonexistent companies, or with individuals and companies with alleged activities and/or nonexistent transactions

Resolution No. NAC-DGERCGC16-00000356, published in the Second Supplement to the Official Registry 820 of August 17, 2016, stipulates:

Art. 7.- Amendment of tax returns.- The taxpayers that registered in their returns the sales receipts, complementary documents and/or withholding statements issued by nonexistent companies, ghosts or individuals and companies involved in alleged activities and/or non-existent transactions, in case of not having documentation that supports the economic reality of the transaction(s), must amend their returns, complying with the provisions of current tax regulations. Regarding income tax, the required amendment will affect the income statement of the respective fiscal year. In the case of the Value Added Tax, the tax return amendment will be implemented in cases in which this leads to a tax payment for the reduction of the tax credit. In the event that this Tax Administration detects that a taxpayer did not amend their filings, despite being in the situation indicated in the preceding paragraph, it may exercise its assessment authority to determine the corresponding tax value or values, with the applicable interest, fines and surcharges, without prejudice to the criminal actions that may be initiated in accordance with the Comprehensive Organic Penal Code and other current regulations.

Therefore, and in accordance with the current regulation, transactions registered with sales receipts, supplementary documents and withholding statements issued by the aforementioned taxpayers for which the economic reality of the transaction cannot be verified in accordance with the provisions in Art. 17 of the Tax Code; the applicable amendment of the return (s) must be implemented, according to the following breakdown of differences established by the Tax Administration, without prejudice to the possibility that further differences may be detected in the future:

Table 2 Differences in Income Tax Return(s) for transactions with ghost or non-existent companies, as well as with individuals and companies involved in alleged activities and/or non-existent transactions

In this context, you are granted a period of ten (10) business days to submit your amended Income Tax and Value Added Tax returns, modifying the difference(s) corresponding to the transaction(s) registered with that (those) taxpayer(s), and paying the outstanding tax plus the applicable interest and fines.

In the event that the request is not complied with within the given term or that no documents are submitted to validate the transaction, the Internal Revenue Service, in exercise of the authority established by the law, will initiate the correspondent control processes and implement the applicable sanctions, to ensure the strict and correct compliance with the tax regulations, without prejudice to starting any applicable criminal actions.

Likewise, the taxpayer is informed of the provisions of the fifth paragraph of Article 101

of the Internal Tax Regime Law, which states, in its relevant part:

(...)

When the amendment originates in control processes undertaken by the Tax Administration itself and if the Administration requires it, the amendment may be submitted up to six years after the filing of the return and only on the items required by the Tax Administration. (Emphasis added).

If you need more information about this resolution, you can go to the offices of the Tax Management Department of the El Oro Provincial Office, located at Av. 25 de Junio, Km 1 $\frac{1}{2}$ road to Pasaje.

The present document does not constitute an act of tax determination, but a merely informative communication, whose purpose is to inform the taxpayer about the differences that the Tax Administration has detected as a result of analysis and cross-checking of information. The Tax Administration reserves the right to exercise the determinative power in the case in which the taxpayer does not rectify the detected differences in accordance with the provisions of the Tax Code and the Internal Tax Regime Law.

Finally, it is noted that paragraph 20 of Article 298 of the Comprehensive Criminal Code, when referring to tax fraud, states that any person who simulates, conceals, omits, misrepresents or deceives the Tax Administration to avoid complying with their tax obligations or to stop paying in whole or in part the taxes owed, for own benefit or for the benefit of a third party, using straw individuals, or ghost or alleged companies, residents in Ecuador or in any other jurisdiction, will be sanctioned with a custodial sentence of five to seven years.

Likewise, the legal representatives and the accountant, regarding their declarations or other actions they carry, will be responsible as authors in the tax fraud for the benefit of the individual or company, as applicable, without prejudice to the responsibility of the partners, shareholders, employees, workers, or professionals who deliberately participated in said fraud, even if they were not following orders.