

Electronic Payment Technology and Tax Capacity: Evidence from Uruguay's Financial Inclusion Reform*

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Abstract

The idea that the digitization of transactions in an economy might increase government tax capacity has been prominent in the economic literature and in policy debates. This paper studies the effect of financial incentives on the adoption of electronic payment technology by firms and consumers, and on tax compliance by firms. Exploiting administrative tax and transaction records and quasi-experimental variation generated by Uruguay's Financial Inclusion Reform, we present three main findings. Consumer VAT rebates for credit/debit card transactions trigger an immediate 50% increase in the number of card transactions and an acceleration of the growth trend. Firms, however, are unresponsive to both the increased consumer demand for electronic payment and to a subsidy for point-of-sale terminal (POS) rental fees. The consumer response on its own does not lead to an increase in tax compliance. Endogenous POS adoption and the fact that electronic sales constitute less than 30% of total reported sales among firms with a POS can rationalize this finding.

JEL classification: H26, H32, G18, O16.

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1 Introduction

The idea that electronic transactions limit tax evasion has been a core argument made by the proponents of digitization, from Ken Rogoff’s “The Case Against Cash” to the World Bank’s campaign for [Financial Inclusion](#) and India’s demonetization initiative. Unlike cash transactions, electronic transactions are processed by a third-party, distinct from the two transacting partners, creating a paper trail which governments can access for tax compliance purposes. The existence of such a third-party paper trail, combined with an audit function which leverages the information to target audits, can deter firms from under-reporting these transactions ([Kleven et al. 2011](#)). This would increase reported taxable sales and hence tax liabilities. Following this logic, governments around the world have created incentives to accelerate the digitization of transactions. The most common policies are financial incentives for firms and consumers to adopt and use electronic payment technology.

Yet, whether such incentives have the intended effect on tax compliance depends on endogenous technology adoption decisions by firms and consumers and on the share of transactions ultimately covered by electronic trails. If only firms which are already tax compliant respond to the incentives, or if electronic trails cover a smaller share of transactions than the share which firms already report for tax purposes, an increase in electronic transactions might not affect tax compliance. We study the effect of incentives on the adoption of electronic payment technology and tax compliance in Uruguay, exploiting quasi-experimental variation generated by a large Financial Inclusion Reform. Lagging behind peer countries in terms of financial inclusion (see [Figure 1](#)), the Government of Uruguay created incentives to adopt electronic payment technology for both firms and consumers: subsidies for the rental fee of point-of-sales terminals (POS) for firms, and VAT rebates for credit/debit card payments for consumers. The incentives were rolled out between 2012 and 2016. We evaluate the effect of these incentives, using transaction-level data on all electronic transactions, monthly firm-level VAT declarations and annual corporate income tax declarations for 2006-2015.

We use multiple empirical strategies to study the different incentives and different outcomes. First, we use event studies to examine firms’ reporting behavior around the time of the reform. Second, we follow [Naritomi \(2018\)](#) in conducting a difference-in-difference estimation comparing retail firms to wholesale firms. The idea is that the former group, selling directly to the final consumer, is less tax compliant and more directly affected by the incentives targeting consumers. Wholesale firms, on the other hand, sell primarily to other firms and are thus more tax compliant to begin with. Yet, as wholesalers may be indirectly treated to some extent, we also examine

aggregate outcomes in a regression-discontinuity style analysis around the time of the reform.

We document four sets of results. First, our event studies show that firm reporting behavior changes sharply after POS adoption. In the month in which a firm uses a POS for the first time, both reported output VAT and the net VAT liability increases. This is consistent with evidence from Costa Rica by [Brockmeyer and Hernandez \(2019\)](#).

Second, we find that firms are largely unresponsive to the financial incentives for POS adoption. The subsidy for POS rental are available to almost all firms, including those that already have a POS. Take-up of the subsidy is only gradual and 80% of firms taking up the subsidy already had a POS. For these firms, the subsidy is not associated with any increase in reported tax liabilities. Among retail firms that did not previously have a POS, only a small share take up the subsidy. For these firms, the event of receiving the subsidy is associated with a sudden increase in reported tax liabilities. This mirrors firm behavior in the broader sample of firms adopting a POS.

Contrary to firms, consumers are highly responsive to the incentives. The introduction of the VAT rebates for consumers, which happens two years after the introduction of POS subsidies, is followed by a 50% jump in the number of card transactions, and a 20-25% increase in the volume of card transactions. The trend growth of the number and volume of card transactions also accelerates slightly after the reform. The strong consumer response is facilitated by other reforms mandating the payment of all wages and pensions into bank accounts, and the free provision of minimum banking services (including debit cards) to all citizens. Yet, despite the strong consumer response, firms remain unresponsive. The number of firms with at least one POS, and the total number of POS, display neither a discontinuity, nor a trend break, nor a gradual acceleration.

Finally, we find no evidence for an increase in tax compliance after the introduction of consumer VAT rebates. The aggregate data reveals no discontinuity or trend break, and the difference-in-difference yields a precise zero estimate, and for some specifications even a small negative estimate of the treatment effect on reported output VAT.

After assessing the costs of the incentives, which are a relatively small fraction of tax payments, we provide a simple conceptual framework and descriptive evidence to rationalize the findings. We show that firms with a POS register on average less than 30% of their reported sales as electronic sales. Firms thus already report a large share of non-electronic sales and have slack to increase electronic sales without having to increase total reported sales. We can reconcile the non-response to an intensive margin increase in card sales with the extensive margin response to card machine adoption. Indeed, card sales constitute a non-trivial fraction

of firms' reported sales in the period just before card machine adoption. Thus, for firms that under-report heavily prior to adopting a card machine, adopting the card machine is likely to require an increase in reported sales.

This study relates to three connected sets of literature. First, the literature on taxation and development has emphasized third-party reported paper trails as a key tool to enhance compliance. The influential contribution by [Kleven et al. \(2011\)](#) proposes this mechanism theoretically and evaluates it empirically in Denmark. More generally, [Kleven et al. \(2016\)](#) and [Jensen \(2019\)](#) argue that the expansion of third-party information trails is a core driver of increases in tax capacity as countries develop. [Pomeranz \(2015\)](#) and [Naritomi \(2018\)](#) show that third-party reporting improves tax compliance in Chile and Brazil respectively. [Naritomi \(2018\)](#) studies monetary incentives for consumers to request receipts from retailers, and is thus most closely related to our study, with the difference that the incentives in Brazil cover both cash and non-cash transactions.¹ More recent studies in this literature include [Mittal and Mahajan \(2017\)](#), who show that third-party reporting in New Delhi increased compliance by the top 1% of firms, and [Fan et al. \(2018\)](#), who show that the digitization of VAT annexes in China lead to increases in VAT payment, with larger effects observed in the short run (driven by improved tax compliance) than in the long run (when output has decreased and total factor productivity adjusted). All of these studies evaluate the effect of third-party information that is collected by tax authorities with the specific purpose of increasing tax compliance. We show that third-party information generated as a byproduct of accelerated financial inclusion does not lead to increases in tax compliance on the intensive margin, as the information trails cover only a small fraction of the transactions, among of taxpayers which are already relatively tax compliant.²

Second, our studies relates to the literature documenting wide-ranging benefits from financial inclusion for firms and consumers. Financial inclusion is shown to decrease financial transaction costs ([Schaner 2016](#), [Bachas et al. 2018](#)), increase investment ([Dupas and Robinson 2013](#), [Brune et al. 2016](#), [Prina 2015](#)), increase resilience to shocks ([Jack and Suri 2014](#), [Blumenstock et al. 2016](#)) and reduce poverty ([Burgess and Pande 2005](#)). Overall, financial inclusion can spur inclusive growth ([Demirguc-Kunt et al. 2017](#), [Klapper and Singer 2014](#)). Given these

¹[Carrillo et al. \(2017\)](#) and [Slemrod et al. \(2017\)](#) show that third-party reporting is not a panacea, since firms might offset increased third-party reporting (and hence tax compliance) on the sales margin by increasing reported costs. Such offsetting behavior is not a concern for our study, as we do not even detect an increase in reported sales.

²On the expenditure side of public finance, our study relates to a small but growing literature that shows how technology can improve the targeting of public spending and prevent leakages ([Muralidharan et al. 2016](#), [Banerjee et al. 2018](#), [Barnwal 2018](#)), and help monitor government employees ([Duflo et al. 2012](#)).

diverse benefits, it is not inconceivable that financial inclusion also impacts state capacity more broadly. Yet, our findings suggest that only extensive margin adoption of financial technology by firms would help improve state tax capacity. Intensive margin increases in financial inclusion through consumer transactions do not affect tax compliance. It is of course possible that intensive margin increases in card transactions affect state capacity through other channels, for instance by providing a better information set for policy design.

Finally, we contribute to the finance literature. Leveraging variation in financial incentives provided by payment card companies to consumers, this literature has shown that consumers are highly responsive to incentives (Klee 2008, Bolt et al. 2010, Loke 2007, Agarwal et al. 2007). We confirm this finding in a different context and leveraging variation in a different type of incentives, provided by the government rather than by the private sector. The finance literature also highlights that the decision of adopting electronic payment technology is more complex for firms, involving trade-offs between costs (fixed costs, variable costs and tax costs) and benefits, in terms of retaining and attracting consumers (Dalton et al. 2018, Arango and Taylor 2008b, Arango and Taylor 2008a, Beck et al. 2018). Our results of firms' unresponsiveness to incentives is consistent with this. However, our results differ from a recent study by Higgins (2018), who studies financial technology adoption in Mexico, showing that a quasi-experimental increase in the number of consumers with debit cards leads retailers to adopt POS technology. It is likely that contextual differences explain the different results. While card processing firms in Uruguay report all electronic transactions to the government, that is not the case in Mexico, where the government can access this financial information only in case of a full-fledged audit.

The paper is organized as follows. Sections 2 and 3 describe the policy context, data and empirical strategy. Sections 4 and 5 present the results and their interpretation. Section 6 concludes.

2 Policy Context

Despite its development status, Uruguay lagged in terms of financial inclusion. Figure 1, Panel A, displays the distribution of bank account ownership across countries, by GDP per capita. This is the headline financial inclusion indicator from the the World Bank's Findex (Financial Inclusion Index). According to this measure, Uruguay's financial development is lower than that of other countries with a similar level of GDP per capita. A similar picture arises when consider the share of the population with a credit or debit card (Panel B). Uruguay therefore adopted a set of measures designed to accelerate the pace of financial inclusion. In