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Does the Value-Added Tax Add Value? Lessons Using Administrative Data from a Diverse Set of Countries

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The value-added tax (VAT) has become a crucial source of revenue for most governments around the world, especially in lower-income countries: 175 jurisdictions have adopted a VAT as of 2023, up from just 30 at the beginning of the 1980s (Caragher 2023; Ebrill et al. 2001). In 2019, the VAT raised 37 percent of total tax revenue (including social contributions) on average in low-income countries and 22 percent in high-income countries (UNU-WIDER 2023). International organizations such as the International Monetary Fund (IMF) and the World Bank have played a key role in advising countries to adopt the VAT (Baunsgaard and Keen 2010; Brautigam, Fjeldstad, and Moore 2008) to increase domestic resource mobilization and replace tariff revenues lost in the process of trade liberalization. The only major economy without a VAT is the United States.

The widespread adoption of the value-added tax globally has been justified by its appeal as a tax that is both more efficient (because it does not distort firms'

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production choices) and easier to enforce (due to the data trails it generates) than other indirect taxes. However, the desirable properties of a "textbook" VAT may be diminished in the context of low- and middle-income countries (henceforth, "lower-income countries"). These economies feature widespread business and employment informality, limited administrative capacity of both firms and the government, and liquidity constraints. Although basic public finance models are often based on the assumption that taxes are perfectly enforced at no cost, this assumption is unreasonable in most contexts—and especially so in lower-income countries. Real-world VAT systems may also depart from the textbook model due to policy choices, such as the introduction of multiple VAT rates (with the aim of making the tax more progressive or providing tax relief to specific groups of firms), along with limits to firms' ability to obtain tax refunds when they have negative VAT liabilities. It is therefore important to assess how the VAT is performing in practice, and how its performance in lower-income countries compares to higher-income contexts.

As value-added taxes spread across the developing world, an emerging and influential literature has sought to examine their real-world effects (Bird and Gendron 2007; Keen 2007; Ebrill et al. 2001; Tait 1998). In the past, this research typically relied on aggregate data, which meant that it could not identify how individuals or firms respond to the tax system. As administrative data—which are (usually confidential) data collected as part of the tax collection process—became increasingly available to researchers focusing on lower-income countries, a recent literature has emerged to use these data to document departures of the real-world VAT from the textbook model.[1] This paper builds upon the existing literature by providing systematic evidence on the discrepancies between the textbook model of a VAT and its real-world implementation, leveraging micro-level administrative data from VAT records in eleven countries at different income levels, ranging from Ethiopia, with a GDP per capita of \$500, to France, with a GDP per capita of \$45,000. This is, to our knowledge, the first paper that uses VAT administrative data from a wide range of countries and is part of a larger agenda using cross-country administrative data to generate novel facts on public finances and firms (for example, Bachas et al. 2023; Bachas, Brockmeyer, and Semelet 2020).

We start by describing how the value-added tax works and providing a precise definition of what we call the "textbook" VAT model. We then present four empirical facts on the real-world implementation of the VAT, based on the administrative microdata. Finally, we discuss the results of counterfactual policies that involve replacing the VAT with alternative tax instruments, like a retail sales tax or a turnover tax, and outline policy implications and avenues for further research. Despite its shortcomings in the context of lower-income countries, we conclude that the real-world VAT is superior to the alternatives.

[1] A nonexhaustive list of recent studies in this literature includes Waseem (2023), Carrillo et al. (forthcoming), Mascagni et al. (2022), Liu et al. (2021), Benzarti et al. (2020), Almunia et al. (2022), Gadenne, Nandi, and Rathelot (2022), Gerard et al. (2022), and Agrawal and Zimmermann (2019).

Value-Added Tax 101: A Primer

How Does a Value-Added Tax Work?

A value-added tax seeks to tax the value added at each stage of the production chain where it is generated. Specifically, firms use labor and intermediate inputs to produce outputs they sell, either to other firms or to final consumers. The difference between the value of a firm's output and that of its intermediate nonlabor inputs constitutes its value added. In a closed economy, if all value added is taxed at each step in the production chain, the result is equivalent to a sales tax on final consumption imposed at the retail stage because, in an accounting sense, the value of the final consumption good is the same as the sum of value added at each stage of the production chain. Thus, the VAT is often referred to as a tax on consumption.

In the basic textbook version, the value-added tax is applied to all transactions in the economy. When firms buy and sell, the invoices specify both a price and the VAT that is being charged. Each firm has to submit a monthly (sometimes quarterly or annual) VAT declaration where it reports the VAT that it collected when selling its output ("output VAT") and the VAT it paid when purchasing inputs from suppliers ("input VAT"). In a standard VAT system, firms can credit the input VAT they paid to suppliers against the output VAT they collected when selling to customers. Thus, firms only remit to the government the difference between output and input VAT ("net VAT"), ensuring that the tax applies only to a firm's value added and not to intermediate inputs that were already taxed in previous stages in the production chain. Crawford, Keen, and Smith (2010) provide a more detailed outline of the textbook value-added tax.[2]

One challenge for the value-added tax is that business activities and transactions often cross national borders. Thus, policymakers must determine how imports and exports would be treated by their national tax systems. Because the VAT is intended as a tax on final consumption, most VAT systems follow the so-called "destination principle," by which the tax liability on a transaction is attributed to the jurisdiction in which consumption occurs. Accordingly, countries apply VAT on imports, as imports will be consumed in that country's domestic market (either by final consumers or as intermediate inputs), but they do not normally apply VAT on exports because they will be consumed in the destination country that will tax them according to their own laws. Therefore, we say that exports are "zero-rated" under the VAT. As a consequence of the destination principle, exporting firms often end up with a negative VAT liability: they do not collect output VAT on their export sales, but they pay VAT on their inputs (both domestic and imported). A negative VAT liability may also arise for firms that make losses or large capital purchases in a period. In these cases, firms should be able to request a VAT refund from the government.

[2] Financial services firms are usually exempt from real-world value-added taxes or are subject to special rules, as are governments, charities, and research organizations. For a discussion of the merits of these exemptions, see Mirrlees et al. (2011).

Why Is the Value-Added Tax Attractive?

The textbook value-added tax satisfies two concepts of efficiency: production efficiency and revenue efficiency.

Production efficiency means that the economy is at its production frontier, so that there is no way to increase the production of one good without decreasing the production of another good. For a tax to satisfy this property, it must not distort firms' production decisions: the tax should not favor the use of one type of input over another (say, domestic versus imported), nor the production by certain firms over others, nor vertical integration over a distributed supply chain (Diamond and Mirrlees 1971). A value-added tax is production efficient because it does not tax intermediate inputs and, as a result, all firms face the same relative prices and will choose the same input mix regardless of the tax. The ability of firms to credit input VAT against output VAT, so that they only remit net VAT to the government, is key to this production efficiency. In contrast, a turnover tax that applies to all sales (including intermediate inputs) would create incentives for vertical integration—a distortion that would make it production inefficient—because taxes would keep accumulating at each stage of production, resulting in a greater tax burden on consumption (the final stage) for production chains that have more intermediate stages upstream. This phenomenon is called "tax cascading."

Revenue efficiency relates to whether a tax is robust to evasion or, conversely, how well it is able to generate the maximum amount of revenue for a given amount of administrative effort (Best et al. 2015). In the design of the value-added tax, all transactions between two firms should be reported to the government twice—once by the seller and once by the buyer. The government can cross-check the two reports in order to detect potential misreporting. Government use of these so-called "third-party" reports—paper trails created by agents other than the taxpayer in question—has been a prominent subject of the recent tax enforcement and development literature (for example, Naritomi 2019; Pomeranz 2015; Brockmeyer et al. 2019). Moreover, because a VAT generates a large amount of data along the production chain, it lends itself particularly well to technological methods of facilitating data-based enforcement. For instance, e-invoicing and electronic billing machines record transactions, allowing the government to cross-check reports with relative ease and target tax enforcement accordingly.[3]

The paper trails generated by a value-added tax are particularly interesting from a tax enforcement perspective, as the buyer and seller in a transaction have asymmetric incentives to misreport. The buyer would like to overreport the transaction amount to reduce their tax liability, while the seller would like to underreport the transaction amount for the same reason. These asymmetric incentives should

[3] E-billing does seem to improve tax compliance, especially when coupled with more traditional forms of verification (Mascagni, Mengistu, and Woldeyes 2021). However, third-party reporting is not a panacea for improved tax enforcement if taxpayers can misreport on margins not reported by third parties (Carrillo, Pomeranz, and Singhal 2017; Slemrod et al. 2017), if third-party reporting covers only a subset of transactions (Brockmeyer and Sáenz Somarriba 2022), or if the revenue authority lacks the administrative capacity to do systematic cross-checks (Almunia et al. 2022).

prevent a buyer and seller from colluding to misreport the transaction.[4] In addition, the VAT remitted at upstream stages acts as a withholding tax for registered downstream firms, giving them an incentive to report output VAT at least as large as input VAT. Compliance should thus propagate down the supply chain (Waseem 2022). The revenue efficiency of a VAT is aided by the fact that it is levied in small chunks along the entire supply chain, so a substantial drop in VAT revenue will only occur if many firms along the supply chain are noncompliant.

VAT in the Real World: Four Facts

We have already referred to the "textbook" model of a value-added tax. Such a model is characterized by the following features: (1) universal coverage (no exemptions for goods, for smaller firms, or for specific industries); (2) a uniform tax rate; and (3) automatic, costless refund of negative tax liability. A VAT with these features would be neutral to production and consumption decisions in the economy.

However, most real-world value-added tax systems have features that move away from the textbook model. Firms with sales below a certain threshold, for example, are usually not required to register for the VAT; some goods may be exempt from the tax; others may be taxed at a rate below the standard VAT rate; firms may fail to claim input VAT; and refunds may take time to process. In addition to these differences, a substantial fraction of firms in lower-income countries are informal—that is, not registered with the tax administration—and hence do not submit any tax declarations. Overall, taxpayers likely differ in their knowledge about the tax system and in the financial, organizational, and cognitive resources they can draw on to comply with taxes.

In this section, we document four facts that highlight some of the discrepancies between textbook and real-world value-added tax systems. Our analysis is based on administrative VAT-returns data from eleven countries across a range of per capita incomes: Costa Rica, Eswatini (formerly Swaziland), Ethiopia, France, Guatemala, Honduras, Hungary, Pakistan, Rwanda, Senegal, and Uganda. The data should cover all VAT-filing firms in those countries, but typically do not cover VAT collected at the import stage. At the minimum, the declarations include information on a firm's total sales, output VAT, and input VAT. Unless otherwise specified, we will focus on "net" VAT, equal to output VAT minus input VAT, as our measure of tax liability, because this measure is the most comparable across countries. The presence of other variables—such as total purchases, the breakdown of sales into various categories, and credits carried to or from other periods—is not universally available across countries, so not all results are available for every country in our sample. For Pakistan, Rwanda, and Uganda, in addition to declaration-level data, we have access to transaction-level data, which include every sale and purchase reported by a firm

[4] Note that these incentives break down at the final consumption stage. In this case, final consumers cannot credit the value-added tax paid against their own tax liability, so there is more room for collusion between sellers and buyers not to report the transaction for VAT purposes.

to and from other VAT-registered firms. We typically have five years of data for each country, but the available years do not overlap perfectly across countries. For results in which we present a single year for each country, we take the latest available year prior to 2020 for each country, to avoid contamination by the Covid-19 pandemic. The online Appendix for this paper discusses the choices we made in preparing the data and presents additional analyses and robustness tests for many of the facts presented in this paper.

Fact # 1: VAT Revenue Is Highly Concentrated on the Largest Taxpayers

The value-added tax is designed to be broad based, remitted by each firm in the economy in proportion to its value added. The duty of remitting the VAT is meant to be distributed across many firms, in contrast to a retail sales tax, which imposes the burden of remitting the tax on the retail sector alone. Spreading the burden to all firms is thought to protect the VAT against evasion and allow it to raise a substantial amount of revenue. However, in most of the countries included in our analysis, more than 90 percent of VAT revenues are remitted by the largest 10 percent of firms, and this pattern is especially strong in lower-income countries.

Figure 1, panel A, plots the share of value-added tax revenue contributed by the largest 10 percent of firms (by total VAT remitted) against GDP per capita (measured on a log scale). Each dot represents a country–year observation, and there are multiple observations for each country. In lower-income countries such as Ethiopia or Uganda, the largest 10 percent of taxpayers account for 90–95 percent of VAT revenue, and for Pakistan this share reaches up to 99 percent.[5] In high-income countries such as France and Hungary, the level of concentration is somewhat smaller: the largest 10 percent of taxpayers account for around 85 percent of total VAT revenue.[6] Because revenue from the VAT is concentrated in a small number of firms, it may be highly sensitive to changes in the growth rate (or tax compliance behavior) among the top tax remitters.

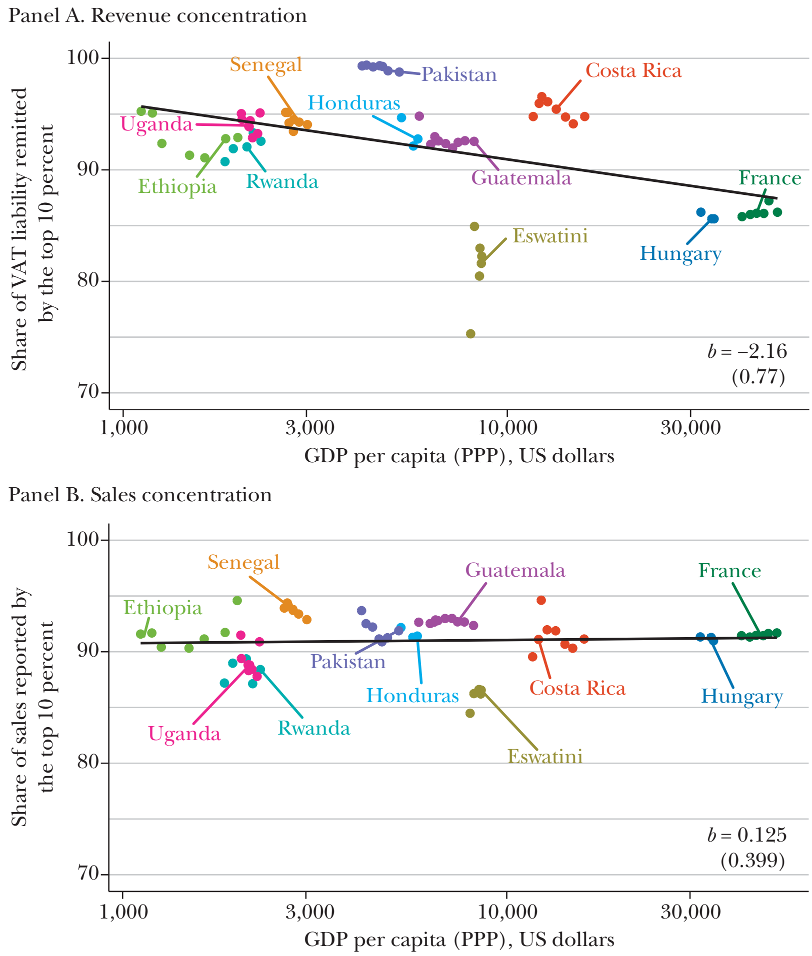
A natural explanation for the concentration of value-added tax revenue is that the firm size distribution is also very concentrated. Figure 1, panel B, shows that the largest 10 percent of firms report about 90 percent of sales revenue in all countries in our sample. While the concentration of sales is indeed very high, it is not correlated with GDP per capita. Thus, features of VAT design and implementation may be more important than economic structure in explaining the differences in VAT revenue concentration between high- and lower-income countries.

What explains the stronger concentration of value-added tax revenue in lower-income countries? One potential explanation is the different levels of administrative capacity across countries. When such capacity is limited, it is rational for governments to focus most enforcement efforts on the largest taxpayers, since the expected

[5] Eswatini (former Swaziland), a small country in southern Africa, features a lower degree of VAT revenue concentration and it is an outlier in this dimension.

[6] Using publicly available information, we observe that the corresponding share in 2019 was 84 percent in the United Kingdom (HMRC 2018–2019) and 87 percent in Spain (AEAT 2019). Thus, France and Hungary appear to be representative of other high-income European countries, rather than outliers.

Figure 1
Revenue and Sales Concentration



Source: Derived from VAT declaration data from each country.
Note: Panel A plots the share of a country's VAT liability that is contributed by the largest 10 percent of firms against country GDP per capita (on a log scale). Each dot represents a country–year observation. Shares are calculated using firm-level data aggregated by calendar year, for firms with positive sales. The VAT liability is defined as max(0, output VAT - input VAT). This is our preferred measure of tax liability, as it is not affected by withholding systems and credits being carried forward from previous periods, and is therefore the most comparable across countries. In addition, this method allows us to calculate revenue concentration without drawing on refund data, which is not available for all countries. The largest 10 percent of firms are those that have the largest tax liabilities. Panel B plots the share of reported sales that are contributed by the largest 10 percent of firms, for firms with positive sales. The largest 10 percent of firms are those that have the largest sales. The slope coefficient displayed on the graph is from a simple regression of y on x, with standard errors clustered at the country level.

return of auditing them is higher in terms of additional tax revenue. Indeed, while revenue authorities in all countries spend relatively more resources on the enforcement of large taxpayers compared to small ones, the focus on the former is stronger for lower-income countries (Bachas, Fattal Jaef, and Jensen 2019). However, it is difficult to quantify the importance of this factor, because administrative capacity is hard to measure in a consistent manner across countries.

A second potential explanation is the existence of registration thresholds for the value-added tax. Most countries establish a minimum size threshold below which firms are not required to register in the VAT system. Firms below the threshold are allowed to register voluntarily for the VAT or, in some cases, can opt into a simplified tax where the tax base is total sales revenue. Assuming that the revenue collected from small firms is negligible, having a lower registration threshold would mechanically increase the share of revenue from the largest 10 percent of firms. In order to compare VAT registration thresholds across countries, we divide the level of their thresholds by each country's GDP per capita. According to this metric, registration thresholds are significantly higher in lower-income countries, with a median threshold of 1,600 percent of GDP per capita, in contrast to 50 percent of GDP per capita amongst high-income countries. Thus, the level of VAT registration thresholds is unlikely to drive the negative correlation between VAT revenue concentration and GDP per capita.

The exclusion of small firms from the value-added tax is a clear departure from the textbook model and distorts production efficiency, as VAT-registered firms remit tax on sales to unregistered firms, but the latter cannot claim back any tax paid on their inputs. Unregistered firms are therefore incentivized to purchase intermediate inputs from other unregistered firms or to use more labor inputs, which are untaxed under the VAT. There is indeed evidence that the VAT does provide incentivizes for registered and unregistered firms to operate in separate supply chains, as de Paula and Scheinkman (2010) show empirically in Brazil and Gadenne, Nandi, and Rathelot (2022) show in India. Relatively higher VAT registration thresholds in lower-income countries likely increase the magnitude of supply chain segmentation and further diminish production efficiency.

If setting a registration threshold for the value-added tax hurts production efficiency, why is this policy so common? The main reason is that the cost of complying with the VAT is disproportionally higher for small firms than larger ones (Coolidge 2012; Yesegat et al. 2016; Highfield et al. 2019). Moreover, the administrative cost of managing a VAT is up to three times larger in low-income countries than in high-income ones (Crandall, Gavin, and Masters 2021). Thus, setting the VAT registration threshold at the optimal level requires trading off the production inefficiency and revenue loss generated by exempting small firms from the VAT system against the compliance and administrative costs created by including them (Keen and Mintz 2004). These costs are absent in the textbook VAT model, but important in the real world.

In sum, the concentration of revenues from the value-added tax is extremely high among all countries, and particularly so in lower-income countries. These results suggest that the burden of the VAT is not spread as broadly across firms as one might think. A potential reason for this pattern that we have not yet considered is that the tax applies broadly to (almost) all transactions of firms registered for this tax. As we discuss in the next section, however, in many countries a substantial share of transactions among registered firms are exempt or subject to a reduced VAT rate.

Fact # 2: Effective Tax Rates Are Lower for Larger Firms

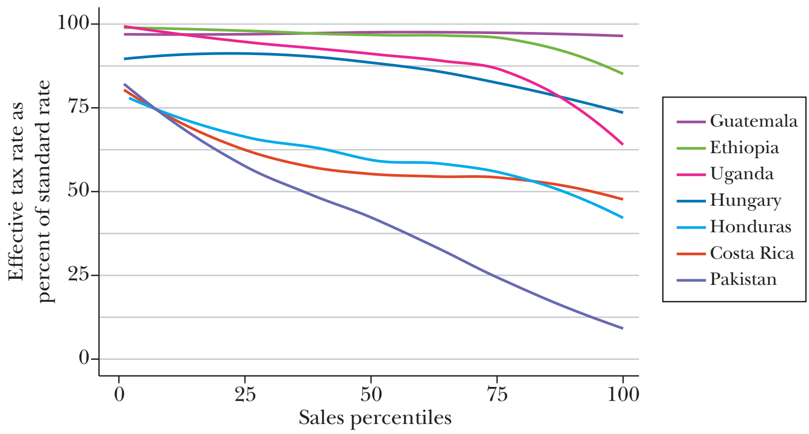
A key feature of the textbook value-added tax is that all transactions of goods and services are covered by the same tax rate, called the "standard" VAT rate. Exemptions for certain goods or services move the VAT away from a broad tax on all value added and distort input choices of firms. In addition, multiple VAT rates distort consumers' final consumption choice—by inducing them to consume relatively more low-rated goods—and thereby also affect firms through the demand channel.[7] There is some evidence that eliminating VAT exemptions and reduced rates and redistributing the resulting revenue through a means-tested transfer program would increase welfare (Crawford, Keen, and Smith 2010). Yet VAT exemptions and reduced rates are found in abundance in almost all countries. Governments justify them on multiple grounds, such as to reduce the tax burden on the poor (exemption or reduced rating of food and utilities) or to promote the consumption of goods and services they perceive will benefit the economy (exemption or reduced rating of books and information technology services).

To assess the extent to which real-world value-added tax systems depart from the principle of uniform taxation, we examine the difference between standard and "effective" VAT rates. We calculate the effective tax rate as the actual net VAT collected, divided by the total value added. More specifically, using our firm-level data, we can look at dispersion in effective tax rates across firms of different sizes and across industries. We then discuss the efficiency consequences of the observed pattern of effective tax rates.

Effective value-added tax rates can vary due to rate differentiation or exemptions across goods and services. The variation is hence driven by a policy choice to offer exemptions and reduced rates and by firms' decisions to report selling exempt and reduced-rated goods, which may or may not correspond to their actual sales. Our measure of the effective tax rate should not be affected by evasion, assuming that a firm seeking to underreport its net value-added tax would also proportionally reduce its value added, so as to not attract the attention of the tax authorities (though it is possible that firms make mistakes). In our calculations of effective tax rates, we exclude exporters (defined as firms with exports worth at least 30 percent of their sales), because exports are always zero-rated under the destination-based principle, so zero-rating of exports cannot be thought of as a deviation from the textbook VAT.

[7] Rate differentiation for a consumption tax may be optimal from a welfare-maximizing perspective if a linear income tax is the only available tool aside from the consumption tax (Ramsey 1927). However, Atkinson and Stiglitz (1976) show that a uniform consumption tax rate is optimal if the policymaker can also use a nonlinear income tax and if the consumers' utility function is weakly separable in goods and leisure.

Figure 2
Effective Tax Rates as a Percent of Standard Tax Rate



Source: Derived from VAT declaration data from each country.
Note: This figure shows effective tax rates as a percentage of the statutory tax rate (STR), by firm size (total sales) percentiles, fitted with a LOESS ("locally estimated scatterplot smoothing") polynomial. For the actual values of effective tax rate by firm size percentile and the fitted curve, see the series "actual" in online Appendix Figure A.4. Effective tax rate is defined as annual net VAT over annual value-added, where net VAT = (output VAT - input VAT), and value added = (total reported sales - total reported purchases). Effective tax rate are winsorized at the standard rate (or at the higher rate of VAT in Honduras). Exporters (defined as those where annual exports are >30 percent of total sales) are excluded, as the zero-rating of exports is taken to be part of the "textbook" VAT system. Including exports does not substantially alter the pattern observed. Note that input nonclaiming—as described in fact #3—does not affect this result, as nonclaiming on inputs is also associated with nonclaiming of purchases, so net VAT is in line with value added. The statistics shown in this figure are not available for France, Senegal, or Rwanda as VAT declaration data in these countries do not include total purchases, so value added cannot be calculated. Results for Eswatini are not included due to issues with large numbers of firms paying ETRs greater than the standard rate.

Figure 2 shows that the effective value-added tax rate is below the statutory rate in most of the countries in our sample, and that the gap decreases with firm size—although with substantial variation across countries. In Honduras, firms at the 10th percentile of firm size face an effective tax rate that is 75 percent of the standard rate, compared to firms at the 90th percentile, who face an effective tax rate that is 45 percent of the standard rate. In Ethiopia, firms at the 10th percentile face an effective tax rate almost exactly equal to the standard rate, while firms at the 90th percentile face an effective tax rate that is 90 percent of the standard rate. These patterns stand in contrast to effective tax rates for the corporate income tax, which Bachas et al. (2023) found to follow an inverse U-shape, with higher effective tax rate for firms in the middle of the distribution and lower effective tax rate for small firms and very large firms.

The effective value-added tax rate can be lower for larger firms either because larger firms are more likely to sell products that happen to be exempt or reduced-rated or because smaller firms are less likely to report selling exempt or reduced-rated goods. The reporting explanation seems more likely, because a closer look at this data shows that even in narrowly defined sectors where large firms are likely to produce the same goods as small firms, larger firms have much lower effective tax rates than small firms. Small firms may not claim exemption or reduced-rate (even if the goods they sell are eligible) either because they lack the knowledge that such provisions exist or because the compliance costs associated with keeping track of sales of exempt, reduced-rated, and standard-rated goods are too large. In the presence of high compliance costs, small firms may be willing to trade off a higher tax liability for reporting simplicity.

In most countries in our sample, exemptions are more important (as a percentage of total sales) than differentiated rates in driving a wedge between the effective and the standard value-added tax rates. Exceptions to this pattern are high-income France and Hungary and middle-income Eswatini, which rely more on reduced rates. VAT exemptions have long been recognized as a source of substantial departure of real-world VATs from the textbook model, especially if they occur in the middle of the production chain (Ebrill et al. 2001). Consider the case of a farmer that sells wheat to a mill, which then sells flour to a bakery, which sells bread to consumers. If flour (but not wheat) is exempt from VAT, then the farmer remits VAT on sales to the mill but the mill cannot reclaim the input VAT. The mill does not remit VAT when selling to the bakery, and the bakery remits VAT when selling to the final consumer but, again, cannot reclaim any input VAT. In effect, the value added by the farmer has been taxed twice—when selling to the mill, and again when the bakery sells to the final consumer without reclaiming input VAT. A vertically integrated firm, which does farming, refining, and baking itself, faces a lower tax liability than a production chain with three separate firms.[8] This example also highlights how seemingly well-meaning political rallying cries such as "don't tax the poor" or "don't tax small farmers" may end up hurting the sectors they seek to protect.

In addition to distorting firms' production choices, exemptions and reduced rates also affect the revenue efficiency of the value-added tax in three ways. First, they result in a loss of revenue due to a lower effective tax rate. In lower-income countries, exemptions and reduced rates cost on average 30 percent of total VAT revenue, though with substantial variation between countries of a similar level of income. Second, as discussed earlier, the revenue efficiency of the VAT is, in theory, generated by interlinkages between firms. Exemptions and reduced rates can create breaks in the VAT chain, allowing firms that are upstream from exempt firms the opportunity to evade. Third, exemptions and reduced rates increase the complexity of the VAT system, which at a minimum increases the administrative burden of the tax and at worst creates an opportunity for evasion by product misclassification (Fisman and Wei 2004). In one case, the UK tax authority had to clarify that children's clothing made from goat fur was zero-rated, with the exception of goat fur from Mongolia, Tibet, or Yemen, which was standard-rated.

Equity is also a relevant issue. A growing literature has studied the effect of value-added tax exemptions and reduced rates on consumers. For example,

[8] For a deeper discussion of this example, see Iddrisu, Parekh, and Phillips (2023).

widespread VAT exemptions for food are regressive in lower-income countries, as poorer consumers purchase food from the informal sector, which does not directly benefit from VAT exemptions (as discussed in this issue by Bachas, Jensen, and Gadenne). There has been less focus on equity between firms, though this margin may be particularly relevant in lower-income countries, where larger firms tend to have richer owners, hire more formal workers, and pay higher wages (Ulyssea 2018; Brown and Medoff 1989). The fact that larger firms seem to benefit the most from VAT exemptions and rate differentiation weakens the rationale for using the VAT as a tool for redistribution.

In short, exemptions and reduced rates create a gap between the effective and standard value-added tax rates. The existence of this gap, and the fact that its size is strongly correlated with firm size, imply that the VAT distorts firms' production choices, is less revenue-efficient and can make the VAT less equitable.

Fact # 3: Nonclaiming of Input VAT Is Common among Small Firms

With a broad-based value-added tax, all firms (except those using only labor inputs) should claim input VAT. This feature is important for production efficiency because accounting for input VAT is what ensures that the tax does not distort firms' input mix nor create incentives for vertical integration. The feature also matters for revenue efficiency because the practice of reporting each transaction twice, by the buyer and the seller in a transaction, generates information trails used for tax enforcement.

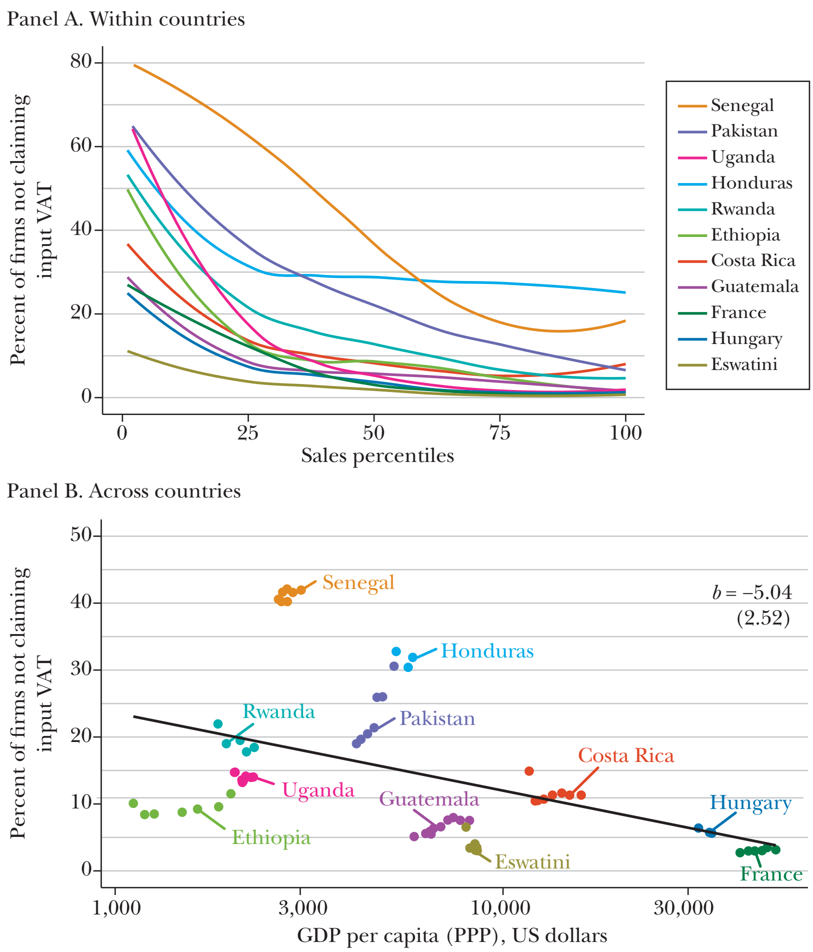
However, a substantial share of firms do not claim input VAT, despite reporting positive sales. Small firms are especially likely to avoid doing so, as shown in panel A of Figure 3. Across countries, around 40 percent of the smallest firms in the VAT (those in the bottom 5 percent of the sales distribution) do not claim any input VAT. The pattern is particularly striking in some countries, such as Senegal, where close to 80 percent of small firms have no input claim. Input nonclaiming is generally more common in lower-income countries than in higher-income countries, as shown in panel B.[9]

Firms may choose not to claim input value-added tax for several reasons. A firm should not claim input VAT if it did not make any input purchases or if it purchased only untaxed goods, such as goods supplied by informal or unregistered firms, or goods that are exempt from VAT. Indeed, the nonclaiming of input VAT by small firms can in some cases be seen as a corrective feature, rather than a bug, of the VAT system (Keen 2008). For a production process in which goods move from the informal to the formal sector, the VAT indirectly taxes the value added in the informal sector, because formal firms cannot reclaim input VAT on purchases from informal firms.

On the other hand, a situation in which firms do not claim input value-added tax for legitimate VAT-taxed purchases creates a clear departure from the textbook

[9] Note that input VAT nonclaiming does not drive the previous result on effective tax rates, as firms that do not claim VAT on inputs generally do not report any purchases, meaning that the effective tax rate, or the ratio of net VAT to value added, simply corresponds to the VAT rate applied on sales.

Figure 3
Input VAT Non-claiming



Source: Derived from VAT declaration data from each country.
Note: Panel A plots the share of firms not claiming input VAT by firm size (total sales) percentiles, fitted with a LOESS ("locally estimated scatterplot smoothing") local polynomial. For the actual values of input nonclaiming by percentiles and the fitted curve, see the series "baseline" in online Appendix Figure A.8. A firm has zero input VAT if they have declared zero input VAT over the entire year, conditional on reporting positive sales. Panel B plots the share of input VAT nonclaimers by country–year GDP per capita. The slope coefficient displayed on the graph is from a simple regression of y on x, with standard errors clustered at the country level.

VAT system. To see if firms are failing to claim input VAT paid on taxable transactions rather than simply not having any purchases or having exclusively nontaxable purchases, we use transaction-level data which detail all transactions that take place between VAT-registered firms. These data show that, of the firms which did not declare any input VAT on their VAT declaration, a large proportion—45 percent in Uganda (Almunia et al. 2022) and 79 percent in Rwanda (Mascagni et al. 2023)—could have claimed input VAT, as another VAT-registered firm did record selling to them. In a closer examination of this data, input nonclaiming is not associated with differences in production technology or in the likelihood of making nontaxable purchases across sectors. The correlation between input nonclaiming and firm size is almost unchanged when we control for the sectoral composition of firm-size groups.

Input nonclaiming is, in some ways, a paradox. Tax authorities typically assume that small firms underreport their tax liability, and tax evasion rates are indeed greater among small firms, as documented in Pakistan by Best, Shah, and Waseem (2022) and in Senegal by Bachas et al. (2022). However, by not claiming input value-added tax, some small firms seem to be "leaving money on the table." As with the previous discussion, small firms may be trading off tax liability against compliance costs. Indeed, evidence from taxpayer interviews in Rwanda (Mascagni et al. 2023) suggests that firms do not claim input tax credit due to a lack of knowledge of the VAT system, failure to file receipts, inability to claim input VAT within the allowed time frame, and concerns that it will make the firm more likely to be audited.

What policy implications follow from this phenomenon? Input value-added tax nonclaiming breaks the production efficiency of the VAT. Intermediate inputs are effectively untaxed for large firms but are taxed for small firms that do not claim input tax credits. Goods produced by supply chains made up of small firms hence face a higher tax burden than goods produced by supply chains of larger firms. Input VAT nonclaiming also has equity implications, given that small firms tend to have poorer owners, workers, and customers. The impact on revenue efficiency is unclear. Input VAT reduces tax liability, so not claiming input VAT would increase tax revenue, all else equal. However, some firms may not be claiming input VAT because they are also underreporting their sales and they wish to appear small to the tax authority. Widespread input VAT nonclaiming, and broken VAT chains more generally, weaken the withholding mechanism of the VAT (Waseem 2022) and the ability of tax authorities to use third-party information from transaction-level data to monitor tax compliance.

These findings, along with the previous finding that small firms are less likely to claim exemptions or reduced rates, relate to a growing literature on suboptimal tax filing behavior. For example, in a study of small firms in Rwanda, Tourek (2022) finds that many report exactly the same amount of income tax each year. After a reform reduced the tax liability for small firms, a large share of treated firms continue to report the same amount of tax as they did previously. Our findings may also be the reason why many countries have established simplified tax regimes that allow small firms to pay an alternative tax, often a "turnover tax" based on total firm sales, instead of the value-added tax (Wei and Wen 2019). As noted earlier, a turnover tax is a sales tax that is applied on sales of firms. It is usually applied at a rate lower than the VAT, but does not allow credit of tax paid on inputs and hence cascades through the supply chain. For instance, Ethiopia and Senegal have turnover tax regimes with rates between 2 and 10 percent, depending on the firm's sector. By not claiming input VAT, small firms are effectively paying a high-rate turnover tax, even when a more favorable alternative is available.

Being registered for the value-added tax may have advantages for small firms as well. As mentioned before, it provides them with access to a broader range of VAT-registered customers. In the context of the United Kingdom, Liu et al. (2021) show that, although being registered for VAT strictly increases tax liability for firms whose sales exceed their purchases, the general equilibrium benefits of VAT registration through increased sales to other firms outweigh the direct increase in tax liability. Consistent with this explanation, we find that a substantial share of firms in our data (30 percent in Pakistan, 65 percent in Senegal) appear to have voluntarily registered for the VAT despite having taxable sales below the relevant VAT registration threshold.

Input nonclaiming is a puzzling behavior. However, revenue authorities usually worry more about input overreporting, which can lead to illegitimate claims for refunds for the value-added tax. We turn to the issue of refunds in the next section.

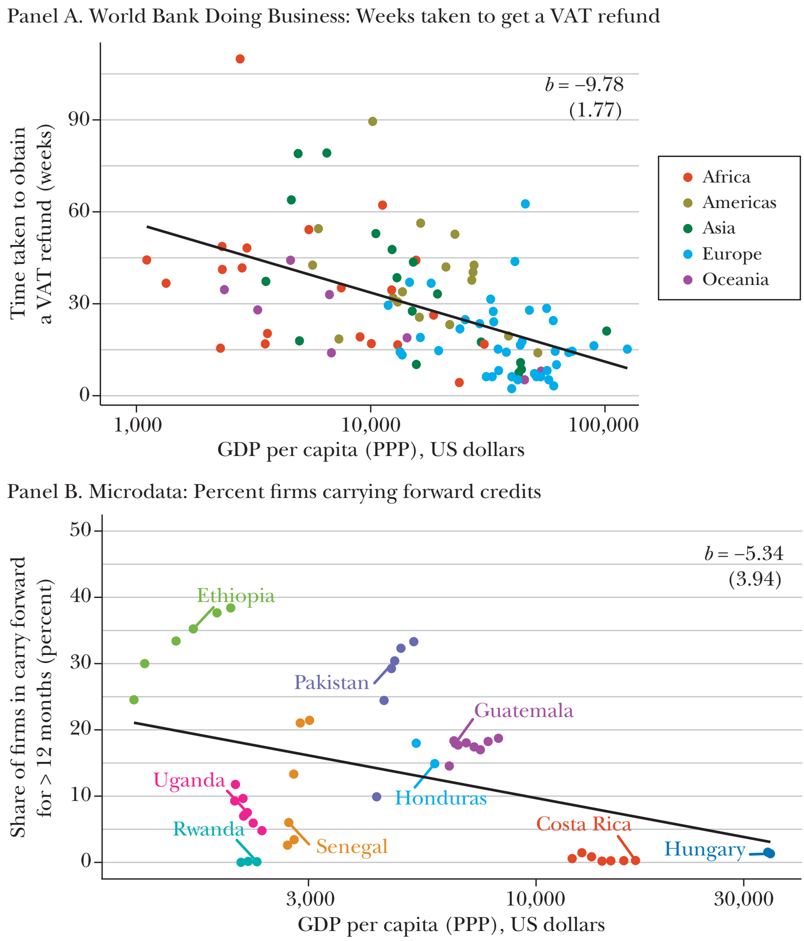
Fact # 4: Value-Added Tax Refunds Are Often Delayed

Refunds arise naturally in value-added tax systems, whenever a firm's input VAT credit exceeds its output VAT liability. This issue is often relevant for exporters due to the destination-based nature of the VAT. However, refunds can also arise for nonexporting firms if their purchases exceed sales in a given period or if they sell goods taxed at a reduced rate. (In addition, some VAT systems exempt large capital purchases from VAT to reduce the need to process refunds.) The textbook VAT model requires refunds to be processed quickly and costlessly, minimizing disruptions to firms' cash flow and production processes.

We draw on multiple data sources to examine the extent to which refunds arise in real-world value-added tax systems and how they are processed. We start by drawing on the World Bank Doing Business indicators, which rely on surveys of business leaders and accountants in 190 countries. Figure 4, panel A, shows that the time required for firms to receive a VAT refund is negatively correlated with the country's GDP per capita. A typical firm in a high-income country can expect a VAT refund within 10 weeks. In lower-income countries, the refund process takes an average of 45 weeks, with some extreme outliers, such as Pakistan, where the refund process takes 79 weeks on average.

One explanation for refund delays is that governments need time to evaluate legitimate concerns about tax fraud that arise with a value-added tax. For most other taxes, evasion simply results in a low or zero tax liability. Under the VAT, tax evaders can instead claim large sums of money from the government in the form of refunds. Even high-income countries have struggled with this issue; for example, one study found that the United Kingdom and Germany were losing between 1 and 2 percent of VAT revenue due to "missing-trader" fraud (Keen 2007). In this form of fraud,

Figure 4
Refund Delays



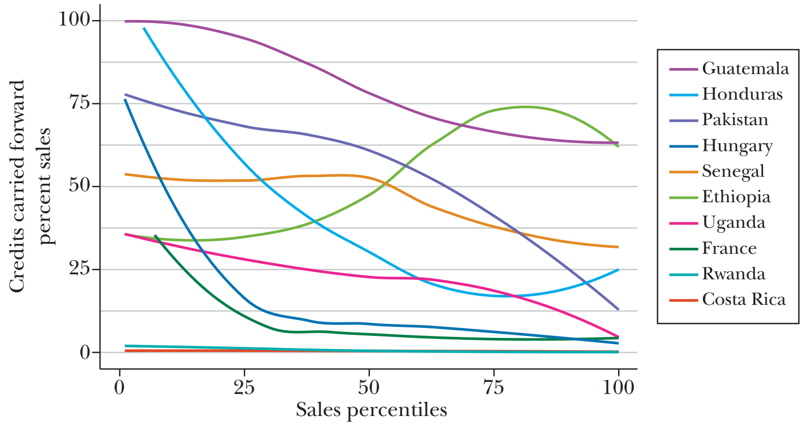
(continued)

a firm claims input tax credit for nonexistent "purchases" from a supplier firm, and then the firm disappears before remitting any output VAT. The challenge is even more severe in lower-income countries. Waseem (2023) finds that two-fifths of VAT refunds in Pakistan are based on invoices issued by "invoice mills"—fake firms that exist only to generate spurious value-added tax credits. Thus, tax authorities may respond to the threat of evasion through increased scrutiny of refund requests. In Rwanda and Uganda, for instance, all requests for value-added tax refunds trigger some type of verification.

Another widely held and more cynical view is that refund delays arise because cash-constrained governments seek to obtain free financing from firms. In most lower-income countries, tax authorities are not obliged to pay interest on delayed VAT refunds. Even in countries where tax authorities are required to pay interest on delayed VAT refunds (such as Indonesia, Kenya, and Zimbabwe), this does not

Figure 4
Refund Delays *(continued)*

Panel C. Microdata: Credits carried forward as a percent of sales, by firm size



Source: Derived from VAT declaration data from each country.
Note: This figure documents VAT refund delays across and within countries. Panel A shows the number of weeks taken for firms to receive a VAT refund, based on the World Bank Doing Business Survey among business leaders and accountants (World Bank 2020; 2019 or latest year available). The findings are unchanged when we drop the four countries for which irregularities in the Doing Business indicators have been found. Panel B plots the share of firms (with positive sales) which carry forward VAT credits from previous periods in at least twelve consecutive VAT filings. Firms usually file VAT every month. We drop the small subsample of firms in specific countries that are allowed to file less frequently. The slope coefficient displayed on the graph is from a simple regression of y on x, with standard errors clustered at the country level. The statistics are not available for Eswatini due to data limitations. Panel C shows a LOESS ("locally estimated scatterplot smoothing") local polynomial of the accumulated amount of credits carried forward over annual sales, by firm size, for the latest year of data available in each country. Online Appendix Figure A.12 reproduces this figure with the actual values of credits carried forward as percent of sales, by firm size percentiles, and the fitted line. In other graphs, the percentiles of sales for the *x*-axis are constructed by taking percentiles of average sales across the entire sample, due to concerns about measurement error in sales affecting both the x and y variable. Credits carried forward as a percent of sales is winsorized at 100 percent.

happen in practice (Pessoa et al. 2021). As the stock of refund requests can be as high as 30 percent of gross VAT receipts (Pessoa et al. 2021), with the funds already sitting in government coffers, it is a tempting pot of money for governments to tap into. As one example, Pessoa et al. (2021) claim that indebted countries such as Greece delayed VAT refunds after the 2008 financial crisis. In lower-income countries, where budgets are already heavily constrained, paying all refund claims might not even be feasible without reducing public spending.

Delaying or not paying value-added tax refunds diminishes the production efficiency of the VAT. It could force firms to substitute away from taxed to untaxed inputs such as labor. Exporters with a higher share of intermediate inputs generate large refund requests and would be most vulnerable to slow payment of VAT refunds. Using panel regressions at the industry-country level, Sharma (2020) studies the response of exporters to the adoption of the VAT, finding that a 10 percent higher industry-level share of intermediate inputs is associated with an 8 percent decline in exports originating from that industry after the VAT's adoption.

In many value-added tax systems, the alternative to claiming a VAT refund is to "carry forward" the negative VAT liability. The idea here is that the negative VAT liability will be used as a tax credit against the firm's future VAT liabilities. Most countries actually *require* nonexporting firms to carry forward their negative VAT liability for several periods or until the amount becomes sufficiently high before they can claim the outstanding amount as refund. This policy is justified by the desire to prevent firms with relatively small tax credits from overwhelming the refund system. However, the result is that in some countries refunds are available (either de facto or de jure) only to exporters or large firms. Yet even when firms are allowed to request a refund rather than carry tax credits forward, they may choose the latter option if the refund process is believed to be slow, to require costly compliance actions, or to be associated with a higher audit probability than carry forward.

In our administrative data, carry-forward tax credits are captured in a consistent manner, allowing us to examine variation within and across countries. In Figure 4, panel B, we show that the share of firms carrying forward credits for at least twelve consecutive months is higher in lower-income countries, indicating a more pronounced departure from the textbook value-added tax system in which substantial carry forwards must not arise. In Hungary and Costa Rica, where the VAT refund system is relatively quick (ten weeks in Hungary, according to World Bank data), the share of firms that are carrying forward credits for more than twelve consecutive months is almost zero. The share is much more substantial in Pakistan, Senegal, and Ethiopia, where between 20 and 40 percent of all firms have been carrying forward credits for more than twelve months. The amounts carried forward are quantitatively important. On average, across the countries in the sample, the value of credits carried forward is equivalent to 42 percent of total annual sales (Figure 4, panel C). In all countries except Ethiopia, smaller firms carry forward a higher share of credits relative to sales, including even high-income countries such as France and Hungary.

The implications of the prevalence of carry forwards for the production and revenue efficiency of the value-added tax depend on whether firms have accumulated their tax credit legitimately or fraudulently. If negative tax liabilities are legitimate, our findings imply that real-world VAT systems generate cash constraints for a much wider group of firms than previously thought. The discussion surrounding VAT refunds tends to focus on exporters (Slemrod and Velayudhan 2022; Sharma 2020), but only 1–2 percent of firms export a substantial share of their sales, compared to the 20–40 percent of firms that carry forward credits for more than twelve months. On the other hand, if these firms' negative tax liabilities are generated illegitimately, our findings suggest that tax authorities may need to allocate some audit resources away from refund requests to the large number of firms that carry forward credits.

Most countries in our sample have provisions for large exporters to be "fast-tracked" for value-added tax refunds. This is presumably because refund claims by large exporters are more likely to be legitimate, as they are under tighter monitoring from the tax administration (Basri et al. 2021; Bachas, Fattal Jaef, and Jensen

2019). Also, misreporting domestic sales as exports is difficult, due to the third-party reporting of exports by customs. Despite these fast-track provisions, exporters (defined as having annual reported exports greater than 30 percent of annual sales) are typically more, not less, likely to be carrying forward credits for more than twelve months, compared to other firms. This pattern suggests either that the refund fast-track for exporters is not effective or that exporters do not use this option, choosing instead to carry forward the accumulated credits.

Overall, the fact that firms face delays in obtaining refunds constitutes an important departure from the textbook value-added tax system—a departure that is again more pronounced in lower-income countries. Managing the VAT refund system is often one of the biggest challenges for tax authorities in lower-income countries.

Should the Value-Added Tax Be Replaced by a Retail Sales Tax or a Turnover Tax?

Given these numerous departures of real-world value-added tax systems from the textbook model and the real-world complexities involved in administering the VAT, several countries have recently considered replacing it. For example, Zambia briefly considered in 2019 replacing its VAT with a turnover tax largely due to problems with managing refunds (as reported in Asquith 2019), Malaysia actually replaced the VAT with a turnover tax in 2018 (Avalara n.d.), and Ghana introduced a sales tax on top of the VAT in 2018, partly to reduce the likelihood that firms will require a refund. The closest alternatives to a broad-based VAT are the retail sales tax and the turnover tax, which applies to the sales of firms at all levels of production. However, we will argue that these alternative taxes seem unlikely to perform better than the VAT in lower-income countries.

A textbook retail sales tax should be equivalent in both revenue and incidence to a textbook value-added tax. To see this, consider our example of a farmer-mill-bakery supply chain again and assume that the whole chain is in the VAT net with no exemptions or tax evasion. In a retail sales tax, the entire tax would be remitted by the bakery alone on its sales to final consumers. In contrast, in a VAT the tax would be remitted by each business in the supply chain in proportion to their value added, and the total amount of tax would be exactly the same that the government would receive under a retail sales tax. In fact, absent any enforcement concerns, a retail sales tax would arguably be preferable to a VAT, as it raises the same amount of revenue at lower compliance costs.

We use transaction-level data from Pakistan to simulate the counterfactual retail sales tax revenue the country would collect if it were to apply a retail sales tax at the same rate as the value-added tax.[10] To estimate the retail sales tax base, we

[10] Although we have access to transaction-level data for Rwanda and Uganda, we are not able to identify firms in the retail sector in a precise way in these data. We hence conduct the retail sales tax simulation using the Pakistan data only, as they are most suitable for the purpose. For details of the calculations

sum all sales reported by retail firms where the other party to the transaction is not a VAT-registered firm (that is, either final consumers or unregistered firms). We then apply the standard value-added tax rate to this base to get the counterfactual retail sales tax revenue. However, this calculation finds that the retail sales tax would raise at most one-third of VAT revenues in Pakistan. Why? The retail sector is typically less tax-compliant than other sectors in the economy, because sales to final consumers are reported to the government by one side only, in contrast to other transactions that are reported separately by both the seller and the buyer. Conversely, upstream stages in the supply chain (like manufacturers and importers) are relatively more tax-compliant, as upstream firms are larger and more tightly monitored by the tax administration. In effect, collecting VAT from the upstream firms is a form of tax withholding that does not exist in the retail sales tax (Waseem 2022).

Our basic calculations are probably too optimistic for the retail sales tax. Once a value-added tax was replaced with a retail sales tax, the paper trails flowing from upstream sectors to the retail sector would no longer exist, likely worsening the tax compliance in the retail sector even further. Moreover, although a retail sales tax could in theory tax services, it usually does not. This matters, because as economies develop, they undergo a structural transformation, shifting from the production of physical goods to services. For this reason, replacing a VAT with a retail sales tax in a lower-income country could be a step backwards, leading to erosion of the tax base as the country develops. Similarly, owing largely to difficulties in distinguishing between business-to-business and business-to-consumer transactions, a retail sales tax often ends up taxing business inputs despite not being designed to do so. For example, consider a baking soda sold to a consumer (business-to-consumer transaction) and sold to a bakery (business-to-business transaction). In principle, the retail sales tax should apply only to the first transaction. But for all practical purposes, it is not feasible to distinguish between the two transactions with the consequence that the retail sales tax also applies to an intermediate business input. This tax cascading, in which a tax is applied repeatedly to the gross value of sales along a supply chain, results in effective tax rates that may vary in haphazard ways, adding another layer of inefficiency into the tax system.[11] In short, while a retail sales tax is nondistortionary in basic public finance theory, it is not necessarily a welfare-maximizing policy in lower-income countries.

What about replacing the value-added with a turnover tax—a tax applied to all sales, both intermediate and final? A turnover tax is broad based and potentially straightforward to collect. The main concern is that because such a tax is applied to gross sales through the supply chain, not to value added, the tax rate would be applied multiple times, leading to tax cascading and creating a wedge between the prices of taxed and untaxed inputs. However, because there is no adjustment of tax anywhere in the supply chain, a turnover tax could theoretically be applied at a

described in this section comparing a retail sales tax and a turnover tax to a value-added tax, see the online Appendix.

[11] For a deeper discussion of the issues created by retail sales tax, see Fox (2012).

lower rate while raising the same amount as the current VAT. Our own calculations based on data from our eleven-country sample suggest that the revenue-neutral turnover tax rate varies across countries but is more than one-half of the standard VAT rate for most countries in our sample. The typical revenue-neutral turnover tax rate in our sample is about 5–8 percent. Note that a turnover tax would be imposed on imports, and because imports are relatively easy for tax officials to track through customs data, it would tend to put imports at a disadvantage. Any good with a longer supply chain across firms would also be at a disadvantage, thus distorting production. There would be a tax incentive for firms to integrate vertically, to avoid the cascade of the turnover tax. Although we are not aware of any empirical study that estimates welfare losses from tax cascading, simulations in Keen (2014) show that such losses could be sizable. Indeed, the welfare losses from cascading and vertical integration are likely to be first order and can easily dwarf any gains from the lower compliance costs of a turnover tax. In fact, the distortions generated by a broad-based turnover tax might be so large that it might not even be possible to recover the VAT revenue with a turnover tax.

Many countries do use turnover taxes for small taxpayers, often allowing small firms to opt for the simplicity of a turnover tax, generally in lieu of either a value-added tax or a corporate income tax. For the set of countries in the available IMF data (Wei and Wen 2019), the average turnover tax rate is 3.6 percent. The distortionary effects of a turnover tax for small taxpayers only are likely to be substantially less than those of a broad-based turnover tax because there is limited opportunity for the tax to cascade, especially if small taxpayers are more concentrated towards the retail end of the production chain.

In sum, our calculations with respect to a retail sales tax and a turnover tax suggest that, despite the practical challenges of a value-added tax, especially in lower-income countries, it still dominates the alternatives in terms of both production and revenue efficiency.

Discussion

In an ideal world, a textbook value-added tax is an efficient way to raise revenue. In the real world, actual VAT systems fall short of this ideal, especially in lower-income economies. Revenue is heavily concentrated among a few large firms. Exemptions and reduced rates mean that effective tax rates vary substantially across products and firms, even within the same industry. Nonclaiming of input VAT by small firms suggests that the VAT chain is highly fragmented. Slow and ineffective VAT refunds constrain the liquidity of many firms, including exporters, effectively widening the wedge between the prices of taxed and untaxed goods. Our within-country analyses suggest that small firms appear as if they report VAT in a way that disadvantages them, for example by not claiming input VAT on legitimate purchases or not claiming exemptions and reduced rates when larger firms in the same industry do claim them. At the same time, other studies have shown that smaller firms are much more likely to evade (Best, Shah, and Waseem 2022).

The outcomes of real-world value-added taxes that we document in this paper are due to a combination of policy choices, the administrative implementation of those policies, and the structural features of the economies in which VATs are implemented. An underlying theme is that real-world VAT systems display considerable heterogeneity, even in countries with similar levels of GDP per capita. For example, standard VAT rates are broadly similar across countries, bar a few outliers, and uncorrelated with countries' income levels, both in our sample and in a broader cross-section of countries. Exemptions and reduced rates lead to a slightly larger VAT revenue loss in lower-income countries compared to higher-income countries, but this difference is neither economically nor statistically significant. Instead, differences in VAT exemptions and reduced rates between countries with similar income per capita are much more substantial than differences across income levels. Moreover, real-world VAT systems seem to also change frequently, as, for example, new rate categories, exemptions, or administrative procedures are introduced. This creates uncertainty for firms, all the more so as policymakers use the VAT system not only as a tax instrument but also as a tool for redistribution and fiscal stimulus.

The variations of real-world value-added tax systems provide considerable scope for research on the determinants and outcomes of VATs, as this paper has suggested. One topic for future work is to examine the extent to which small firms leave money on the table while simultaneously engaging in tax evasion, or whether there are multiple types of small firms whereby some of them are naïve—not claiming input VAT, exemptions, or reduced rates—and others are sophisticated evaders (as suggested in Almunia et al. 2022). Such an analysis could provide a better understanding of the equity impact of the VAT and its features.

Although the value-added tax in practice is far less production efficient and revenue efficient than the textbook model, especially in lower-income countries, replacing it with alternative indirect taxes would create serious problems. The main alternatives, namely a retail sales tax or a turnover tax, would either not raise nearly as much revenue as the VAT or would do so at a high cost to production efficiency.

Thus, improving the functioning of value-added taxes in the real world offers a potentially more productive agenda. VAT withholding or "reverse charging," for example, may limit tax evasion by small firms by mandating larger firms, government, or payment providers to remit tax on behalf of small firms. Withholding has not been extensively discussed in this paper due to the inconsistent reporting of withholding across countries, but an emerging literature has documented its positive impact on compliance (Brockmeyer and Hernandez 2022; Garriga and Tortarolo 2022). Effective fast-track mechanisms for refunds are another system tweak that could substantially improve the functioning of real-world VATs. Finally, thinking about how to optimize the use of third-party and digitally-reported data for enhancing VAT systems in a way that takes into account both spillovers and general equilibrium effects in the production network are important tasks for both policy-makers and researchers.

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