
# Designing a Progressive VAT

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**ABSTRACT:** *This paper presents a novel approach to addressing VAT regressivity, by proposing the adoption of a progressive VAT: a single-rate, broad-base, VAT, whereby tax paid on consumption is re-paid to lower income households in real-time, at the moment of purchase. Such a system can effectively eliminate regressivity, while minimizing the political economy, cash-flow, and welfare stigma obstacles that are often associated with standard welfare transfers used in modern VAT systems. It would also have other significant advantages, particularly in terms of compliance incentives.*



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| Keywords: | Value added tax; VAT design; VAT incidence; political economy of VAT; welfare programs; digital innovation; tax reform. |





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# Designing a Progressive VAT

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# Contents



**FIGURES**

# Glossary

| | | |
|---|---|---|
| B2B | - | Business to Business |
| B2C | - | Business to Consumer |
| DBT | - | Direct Benefit Transfer |
| GST | - | Goods and Services Tax |
| NPISH | - | Non-profit institutions serving households |
| SWS | - | State Welfare Smartcard |
| VAT | - | Value Added Tax |

# Executive Summary

While the spread of VAT worldwide has ensured its characterization as a global tax phenomenon, its perceived regressivity (and the widespread use of exemptions to address it) has been consistently regarded as a major weakness and limitation to achieving high revenue productivity. This paper presents a novel approach to addressing the VAT incidence, by proposing the adoption of a single-rate—broad-base VAT that feels *de facto* progressive to consumers—a Progressive VAT.

The paper demonstrates that the "traditional approach" to addressing regressivity—through the introduction of exclusions from the VAT base—is flawed and will, at best, have modest progressivity gains, and at worst can have the opposite effect of increasing regressivity. It further considers the limitations of the "modern approach"—the introduction of welfare transfers to compensate for the potential adverse impact of VAT on the income distribution—from a political economy, cash-flow and welfare stigma perspective.

The paper argues that a Progressive VAT, whereby VAT paid on consumption is re-paid to lower-income households in real-time, at the moment of purchase, can effectively eliminate regressivity while minimizing the political economy, cash-flow, and welfare stigma obstacles, thus overcoming the limitations of both the traditional and the modern approaches. It would also have other significant advantages, particularly in terms of compliance incentives. The paper concludes that a Progressive VAT would attain the rarest of prizes in tax policy, namely overcoming the standard trade-off between efficiency and equity, by improving equity without significant efficiency losses.

# I. Introduction

VAT is a global tax phenomenon. Invented just under a century ago, it is now applied in over 170 countries worldwide and collects approximately a fifth of global tax revenues (OECD, 2020a; IMF, 2019). While various reasons explain this unparalleled popularity (James, 2015), its capacity for revenue mobilization, along with its perceived efficiency and neutrality, are undoubtedly key contributors. Not, however, its distributional impact. Despite its overwhelming success, VAT is not an uncontroversial tax: although few would argue against its efficiency and neutrality – at least in theory – it is often said that these come at a heavy price, namely its inherent regressivity (Ruiz and Trannoy, 2008; Leahy, Lyons and Tol, 2011; Lustig, Pessino and Scott, 2014; Blasco et al, 2023). Regressivity is not only commonly regarded as the biggest limitation in an otherwise nearly perfect tax (Brockmeyer et al, 2024), but given the centrality of fairness to the way the public thinks – and feels – about taxes, a character-defining one (Keen and Slemrod, 2021; Stantcheva, 2020).

Given the global significance of VAT, both in terms of global reach and revenue collection, addressing VAT regressivity is arguably one of the most important tax policy questions worldwide. Of course, the premise that VAT is a regressive tax *and* that this regressivity should be addressed within the confines of the VAT, is not a settled matter, as discussed further below. That, however, does not take away from the policy relevance of the question, not least because the design of every VAT system in the world reflects those concerns – all VATs include some mechanism for addressing the regressivity of the tax through either exclusions from the VAT base (traditional approach), welfare compensation systems (modern approach), or both.

The traditional approach to addressing the regressivity through exclusions from the base, either through reduced (or zero) rates or exemptions, has its roots in the old European VATs (de la Feria and Krever, 2013), but despite its very significant limitations it is still a common practice worldwide. Although not many recent VATs apply rate differentiation to the extent applied by European VATs, very few have been able to resist the allure of exemptions as a tool to address regressivity. From the 1980s onwards, as the limitations of this traditional approach became clear, a new one developed. Under this modern approach,[1] regressivity is addressed primarily not through the exclusions from the base, but through the expenditure side, via welfare transfers, designed to compensate lower-income households. Pioneered by New Zealand, this modern approach was – and still is – regarded as technically superior, avoiding as it does the significant limitations of the traditional approach. Yet, while various countries around the world did partly adopt this new approach, no has been able to depart entirely from the traditional exclusions from the base, preferring to adopt instead a hybrid approach, whereby some exemptions still apply, alongside a welfare transfer system. This somewhat limited take-up reflects not only the political economy difficulties with the modern approach, but also the practical difficulties with its implementation.

There is now an established literature on progressive consumption taxes, which would entail a departure from current income taxes, and a different legal tax design from that currently adopted by existing VATs. The approach adopted in this paper is slightly different: it does not fundamentally depart from key features of existing tax systems; instead, it essentially proposes a new approach to address VAT regressivity, grounded on the advances of the modern VAT approach, but that overcomes the difficulties of this approach by using real-time technology. In the last decade, real-time technology – the electronic tracking and matching-up of invoices in real-time – has spread throughout the world as an anti-fraud mechanism (Ainsworth, 2012). First introduced in South Korea and Israel (Krever, 2014), real-time technology is now successfully applied in various other countries, most notably in Portugal, Russia, and more recently Slovenia, and Uzbekistan (de la Feria, 2023); several other countries, most notably in Latin America, have also introduced e-invoicing

[1] The expression “modern VAT” to classify the new VAT model, as opposed to the “traditional VAT” used in Europe, appears to have been coined by Ebrill et al (2001).

technology that is just short of having real-time features.[2] The progressive VAT would adapt existing real-time technology, introducing a validation element, to fulfill a different aim—the technology would be used as a distributive tool, in addition to or rather than an anti-fraud mechanism. Using this technology, lower-income households would receive a welfare transfer to compensate for VAT charged in real-time, at the time of purchase. We have designated this new approach to addressing regressivity as “Progressive VAT’, not because the legal design of the tax base itself is progressive or there is a schedule of incremental tax rates, but rather because the operation of the tax will ensure that its outcome is progressive and, perhaps more importantly from a political economy perspective, it will ensure that consumers / taxpayers will experience the tax as progressive. We assess our proposal by using household consumption survey data from two different countries with different income levels, i.e., Mozambique (low income) and South Africa (upper middle income). We conclude that this new approach—while pursuing the same objective—would have significant advantages compared both to the traditional VAT, and the modern VAT, as well as several positive spillovers, particularly in terms of compliance.

The remainder of the paper progresses as follows. Section II provides a brief overview of the VAT regressivity debate, and assesses the limitations of the traditional approach and the modern approaches to addressing regressivity, using household consumption survey data to estimate the distributional impact of VAT base exclusions in Mozambique and South Africa. In Section III, the proposal for a Progressive VAT is presented. Its key design features are set out, and design options considered; we then estimate its distributional and revenue impact, using the same model as that adopted in Section II to assess the traditional VAT base design. Finally, we present an overall comparative assessment of the progressive VAT, considering its potential gains and risks against the traditional and modern VAT.

# II. VAT Regressivity

Despite the widespread perception of VAT as a naturally regressive tax, the matter is not as straightforward as it initially appears and is far from settled. The main source of contention relates to how regressivity is assessed, namely whether it should be assessed relative to current income, or to current consumption (de Mooij and Keen, 2013). VAT is particularly regressive if its incidence is assessed relative to income, but much less so when it is assessed relative to consumption, which is regarded as a better indicator of lifetime welfare (Caspersen and Metcalf, 1994; Warren, Harding and Lloyd, 2005; Carlson and Patrick, 1989); Cnossen, 1989; Swistak et al., 2015). However, even assuming the regressivity of the VAT a separate albeit related question is whether that regressivity should be addressed internally, i.e., within the VAT system. This, again, is far from a settled matter. Arguably, the most appropriate benchmark for assessing VAT incidence is either the overall tax system (the tax mix) or the public finance mix, i.e., the tax and expenditure systems put together (IMF, 2019). Yet, this is not how we tend to think about fairness and regressivity. In practice, much of the analysis – as well as, critically, public perceptions – focusses on individual taxes, tax-per-tax, rather than on the tax mix or the public finance mix. As empirical studies demonstrate, this focus is explained more by our behavioral responses to taxes, than by rational decision-making.

There is now growing evidence that tax fairness perceptions are heavily influenced by a variety of cognitive biases and heuristics, starting with framing: public judgment on tax fairness can be manipulated by choice of frame, namely individuals focus solely on the component of the tax system they are asked to consider, and fail to consider information on other components of the tax system (McCaffery and Baron, 2003). Moreover, there is a tax disaggregation bias, which can be seen as an extension of the mental accounting heuristic: individuals have an intuition about what a fair tax ought

[2] Whilst others are in the process of adopting either real-time technology (e.g., Poland) or e-invoicing (e.g., the Philippines).

to look like, and will judge the fairness of that one tax individually, failing to take into account other elements of their tax system in their appraisal (Thaler, 1985; Thaler, 1999; McCaffery and Baron, 2003).

This empirical evidence largely explains why responses to concerns over VAT regressivity that concentrate on the tax mix, i.e., the progressivity of the overall tax system, or on the public finance mix, where progressivity is better achieved through the expenditure side, often fall on deaf ears. Our analysis – and, ultimately, our proposal – concentrates, therefore, on how to address VAT regressivity within the constraints of that tax, i.e., within the VAT itself.

## Traditional Approach to Addressing Regressivity

The use of exclusions from the base – exemptions and zero or reduced rates – as an instrument to address VAT regressivity is nearly universal. Indeed, although rate differentiation tends to be both comparatively more frequent and higher in older VATs, some newer VATs, such as the Indian or Chinese VATs, still apply multiple rate systems; in addition, even in countries with a single rate system, exemptions to address regressivity are common (OECD, 2020a). Overall, although new VATs tend to have a much broader base than the old European VATs, no country in the world, including New Zealand, applies a single rate VAT and no exemptions. This reality is at odds with much of the literature.

Although early literature on optimal consumption taxation does provide backing for the use of differentiated rates (Ramsey, 1927; Corlett and Hague, 1953; Sandmo, 1987), there is limited support to be found in the literature on optimal taxation theory or otherwise (OECD, 2010; Sorensen, 2007; Kleven, 2004) for the use of differentiated rates as applied in real VATs. This is partly because there is extensive evidence that exclusions from the base carry significant costs beyond the obvious loss of revenue, namely significant qualification problems, loss of neutrality and distortions to competition, opportunities for tax planning and avoidance, and increased compliance and administrative costs (de la Feria and Walpole, 2020). Importantly, the limited literature support also results from the fact that there are significant doubts as to the effectiveness of exclusions from the base to address VAT regressivity.

As a pre-condition for exclusions from the base to result in decreased regressivity, the tax decrease must be passed on to consumers, in the form of price reductions. Theoretically, this should indeed be the case; in practice, however, the VAT incidence is far from clear (Benedek et al., 2020). While results are not uniform and show instead varying degrees of pass-through to consumer prices, empirical evidence from the last decade cast significant doubts upon the full pass-through assumption.[3] The main take-away from existing literature is that prices tend not to reflect changes in VAT rates—or at least, not fully. Yet, even assuming that, given the heterogeneity of the response to VAT reductions, exclusions from the base will indeed affect prices, there are still no guarantees that regressivity will – or can – be addressed.

Given the regressive nature of VAT, at least at the higher-income deciles, it seems intuitive that applying VAT reduced rates or exemptions to essential products in particular will protect low-income households and limit the regressivity of the tax. Until recently, however, significant data challenges – as discussed below – meant that there was limited evidence on the distributional effects of exclusions from the VAT base. This has changed in the last decade, with several papers using microsimulation models and survey data on income and consumption to estimate the impact of VAT base design on revenue, poverty, and distribution. Overall, these indicate that VAT regressivity will not necessarily decrease with the introduction of exclusions from the base, in essence because consumption, even of essential items, is overwhelmingly by the highest income households; And if it does, it happens at a very high cost in terms of revenue forgone. To efficiently improve VAT incidence through a system of exclusions, one would have to target inferior goods (whose consumption declines as income rises). However, this is very difficult to attain as countries' consumption baskets include very few such

[3] For a review of the latest literature, see Buettner and Madharova (2021).

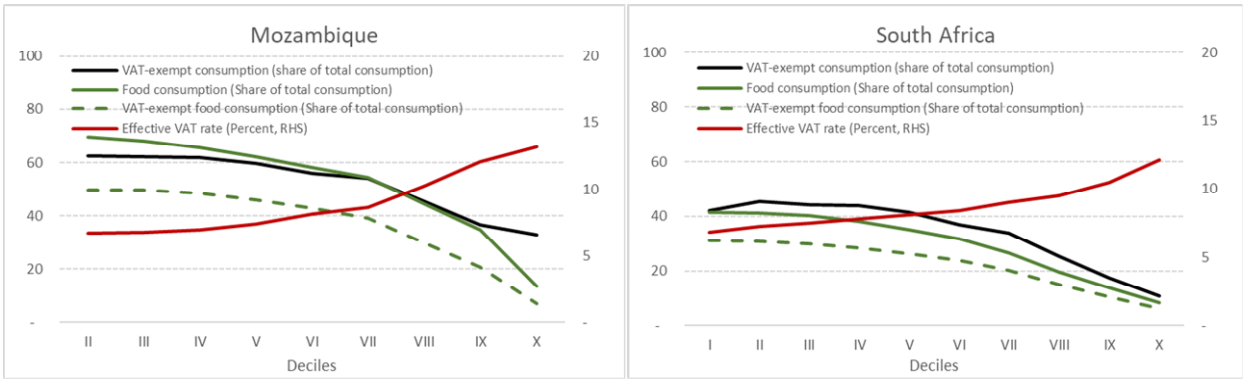
goods. Consequently, countries addressing VAT equity through the traditional approach (exclusions from the VAT base) forgo significant revenue, providing a much higher subsidy to the better-off households. (Warwick et al., 2022; IMF 2019, Boeters et al., 2010). The picture is even worse when high levels of informality are taken into account (Bachas et al., 2020).

We take a similar approach to evaluate our proposal. Using two country examples – Mozambique and South Africa – at different levels of development and, presumably, exhibiting different consumption patterns. We then evaluate VAT incidence and compare our proposal of a Progressive VAT against the traditional VAT approach.[4]

*Consumption Patterns and Distributional Impact of VAT Base Exclusions*

At face value, the logic behind the traditional VAT approach is straightforward—the higher relative importance of targeted (excluded) spending, the higher the benefit conveyed to households. In other words, the effective VAT rate is inversely correlated to the relative importance of non-fully taxed consumption. The consumption patterns observed in our sample of countries provides credence to this logic. While there are some noticeable differences between the two countries, the general pattern holds, namely on average spending on food accounts for a significant share of total expenditures–54 percent in Mozambique and 30 percent in South Africa, on average – and its relative importance decreases with households' income level. For example, in Mozambique it declines from 73 percent of total consumption for the lowest decile to 14 percent for the top decile; in South Africa the range is 41 to 8 percent, respectively. While on average 54 percent of consumption in Mozambique is targeted by VAT reliefs, its share declines from 65 percent for the lowest decile to 33 percent for the top one. In South Africa, 34 percent of consumption benefits from VAT reliefs—from 42 percent for the bottom decile to 11 percent for the top one. As shown in Figure 1, most of the VAT reliefs are targeted at food items in both countries.

**Figure 1: Relative Importance of Food and VAT-exempt Consumption**

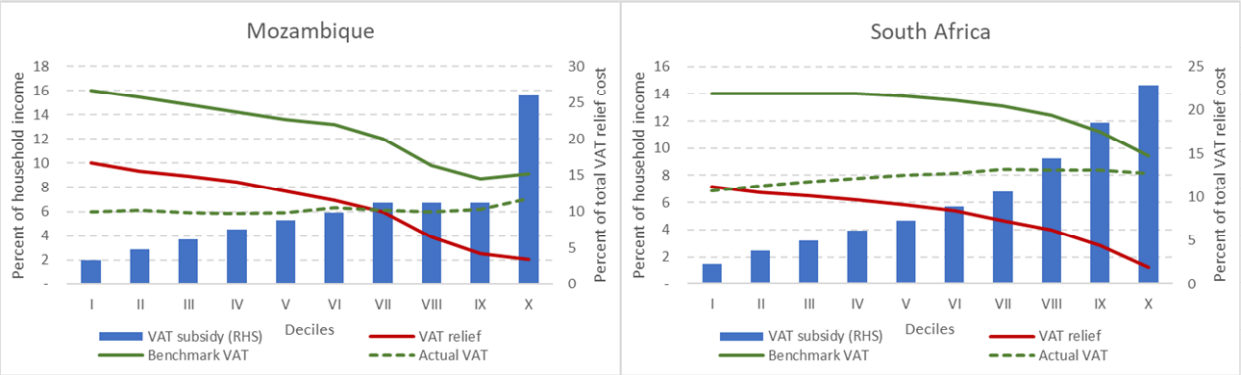



While the share of consumption relieved from tax declines with income level and the VAT incidence improves – as the effective VAT rate increases – it does so at a very high cost to the budget (Figure 2). In the case of Mozambique, the VAT imposes almost a flat burden of around 6.1 percent across the income distribution with a slight uptick for the top decile—to 7.1 percent, implying therefore only modest progressivity. In South Africa, a slightly higher level of progressivity is achieved—the VAT burden (measured against income) increases from 6.8 for the bottom decile to 8.2 percent for the top decile. Such outcome is due to the amount of subsidy households receive—while the subsidy in itself is progressive, i.e., the amount of subsidy as a share of income decreases with income level, its absolute amount increases with income, implying the better off households receive more benefit. Our estimates thus indicate that countries are foregoing substantial amounts of revenue in their quest to make VAT more progressive; for example, in Mozambique over 35

[4] Details of our model and assumptions are provided in the Appendix.

percent of the potential VAT revenue is forgone due to various VAT reliefs, and most of it accrues to the upper deciles—the top decile receives more (26 percent) than the bottom four (22 percent). In South Africa, even a larger share of the VAT subsidy benefits the rich—the top decile receives 44 percent of the total, more than the bottom seven deciles (26 percent). These findings are in line with what is commonly found in other empirical studies (Warwick et al, 2022, IMF, 2019).

**Figure 2: Impact of Reliefs on VAT Incidence**




Note: VAT relief denotes the difference between the benchmark VAT (VAT applied at a standard rate to all consumption) and the actual VAT—all shown as a percentage of household income

## Modern Approach to Addressing Regressivity

Given the significant limitations of the traditional approach, there is unsurprisingly limited support in the literature for exclusions from the VAT base. Therefore, in the 1980s, an alternative approach to addressing VAT regressivity was implemented in New Zealand: under what became known as the 'Modern VAT' approach, regressivity is addressed not through the base (or rates), but through the expenditure side, namely with welfare transfers to lower income households. At the core of this approach was the idea that regressivity is better addressed outside the VAT system: either through progressive income taxes (relying on the tax mix); or through welfare transfers (relying on the public finance mix). Where accompanied by welfare transfers, single-rate, broad-base consumption taxes, not only increase efficiency, but reduce inequality (Correia, 2010; Warwick et al, 2022).

The modern approach to addressing regressivity was adopted in various countries, primarily in newer VATs, but never again in its nearly pure form as implemented in New Zealand (James, 2015). More commonly, welfare transfers were introduced – in new VAT systems, such as the Canadian, or in older VAT systems, such as those in several Latin American countries – as part of a hybrid system, in which some exclusions from the base still applied to essential products or services, or sectorially, to compensate for the removal of specific exclusions from the base – primarily in older VATs, such as the Portuguese. There are also variations as regards the transfer method, in particular, some countries, such as New Zealand, Argentina or Colombia apply cash transfers (public finance mix), whilst others carry out transfers through the tax system (tax mix), such as Canada, where the compensation takes the form of an income tax credit.[5]

[5] Worth noting that some countries also provide VAT deductions against personal income tax, where the aim however is not to decrease the regressivity of the tax, but rather to incentivize compliance (Fenochietto and Benitez, 2021), see further below.

Given the technical superiority of the modern approach in addressing VAT regressivity, however, the obvious question that arises is why is adherence to the modern approach not more widespread, and on the contrary, adherence to the traditional approach, i.e., exclusions from the base, is still so prevalent?

# III. The Progressive VAT

While a purely progressive consumption tax – which would calculate VAT rate of each product in real-time, based on the income level and consumption level – would be impossible, from the 1980s onwards, there have been several proposals for the introduction of progressive consumption taxes, most notably the Flat Tax and the X-Tax. In common, most of these proposals – although not all (Grinberg, 2006) – have the fact that they are designed to substitute income taxation, and thus entail a substantial departure from current tax structures worldwide (Bradford, 2021; Weisbach, 2002; McNulty, 2000). More recently, an identical approach has been suggested, which proposes a progressive consumption tax to substitute personal income taxes, but that, similarly to ours, uses new technology to address some of the previously identified implementation challenges (Viswanathan, 2022). Our proposal is much more modest. The proposed progressive VAT is not intended to substitute existing income taxes, nor would it require a complete overhaul of existing tax systems, rather it is designed to answer a very specific question, namely: how can the inherent regressivity of the VAT be addressed effectively, without compromising efficiency, and avoiding the political resistance to base-broadening tax reforms that have prevented the spread of the modern VAT? The answer lies broadly in the harnessing of new digital tax technologies.[6]

## Political Economy Considerations

Two main reasons explain this relatively low adherence to the modern approach, namely targeting difficulties, and political dynamics. In the case of some countries – typically, middle and low-income countries – the lack of capacity to target those on lower incomes imposes genuine constraints on the potential use of welfare instruments to address VAT regressivity. In these cases, when there are no other means of compensating lower-income households due to poor targeting capacity, there is indeed an equity – and efficiency – argument to justify the use of exclusions from the VAT base to minimize the distributional impact of the tax (Keen, 2013; Bird and Gendron, 2007; van Oordt, 2018). Although, recent surveys indicate that most low and middle-income countries have now in place one or more unconditional cash transfer programs (Warwick et al., 2022), targeting is often still regarded as problematic in low-income countries (Warwick et al., 2022; Alatas et al., 2012). This, however, is not the case in high-income countries, which generally tend to have strong tax administrations and welfare-targeting capacity. The prevalence of reduced rates and/or exemptions to address VAT regressivity concerns in these countries – even in newer VATs such as the Australian or Canadian GSTs – cannot be explained by targeting difficulties or lack of alternative distributional instruments, but primarily by political constrains.[7]

While there is widespread awareness of this reality (OECD, 2010)– and even though there is a growing literature on the political economy of taxation more generally— until recently the political constraints of VAT base design were not well-understood. In a recent paper, however, light is shed upon the various political dynamics that determine that design (de la Feria and Walpole, 2020). These dynamics can be separated into two sequential steps, in both of which various political

[6] The use of these technologies was also recently proposed by Cordoba Garces (2021), but as a means to increase the effectiveness of welfare transfers, rather than to overcome political economy obstacles.

[7] Although, as discussed below, cash-flow and welfare stigma considerations can also be a factor.

and behavioral factors present obstacles to broad-based VATs, as follows: a first step, when the main factors at play relate to the comprehension of the proposed tax policy; and a second step, when the main factors at play concern trust in the proposed tax policy. While these two steps are often sequential., that is, trust comes into play when the true effects of the policy are highlighted and the information asymmetry is overcome, at times the two steps happen concurrently.

The starting point is the information asymmetry between the general public, i.e., voters, and policymakers. While analysis is often based on the assumption that voters and politicians have access to the same information, in reality it is too costly time-wise for voters to collect extensive information about each policy (Stiglitz, 1998), and voters should instead be 'rationally ignorant' (Downs, 1957). It is generally unreasonable to expect voters to fully understand the tax system and its legal and economic effects (Alt et al., 2010; Mercier, 2020), but more so as regards consumption taxes, and their distributional impact. General consumption taxes, and VAT particularly, are neither intuitive, nor salient (Sausgruber and Tyran, 2005; Gamage and Shanske, 2011; Finkelstein, 2009; Bird, 2010). The information asymmetry, generally present in public policy, but enhanced in the case of consumption taxes by their less intuitive nature and their lower tax salience, presents itself as a fertile ground for manipulation by special interest groups, set to benefit from the maintenance or introduction of preferential VAT regimes.[8]

Yet, information asymmetry and lobbying by special interest groups only partially explains the political resistance to broad-based consumption taxes. If those were the only problems, providing clear information to voters on the effects of reduced rates or exemptions, would presumably be sufficient. While it would be comforting to think that this would be the case, experience shows that it is not (de Mooij and Keen, 2013): combatting information asymmetry is necessary, but not sufficient to overcome resistance. This is because, even when information is symmetric, there is a trust problem that is partially explained by cognitive biases.

The effectiveness of providing information on the effects of VAT concessions is dependent, first and foremost, on whether that information will be believed by voters (and individual policymakers). The non-intuitive nature of consumption taxes generally, and VAT in particular, however, may prevent that from happening: a fairness-centric narrative arguing for the redistributive effects of reduced rates to essential products "feels" naturally intuitive; on the contrary, explaining that those concessions may in fact have negative distributional effects, does not. Intuition is a powerful decision-making motor, particularly as regards complex politics and economics issues (Mercier, 2020; Sunstein, 2015; Boyer and Peterson, 2018), and when confronted with information that is inconsistent with that intuition voters (or individual policy-makers) may experience cognitive dissonance (Konow, 2000). Even in the absence of cognitive dissonance—or where the new information is so convincing as to overcome it—status quo bias  come into play, particularly as regards tax reforms. Believing that the current system is unlikely to yield the envisaged benefits is not the same as believing a new system would be better. What if the proposed system is even worse that the existing one?

Every public policy reform generates uncertainty that is experienced asymmetrically between losers and gainers: while losers are easily identified, gainers are more uncertain (Fernandes and Rodrik, 1991), either because the gains are diffuse (for example, through the whole population), or because there are no guarantees they will indeed take place. Reduced VAT rates or exemptions may be unlikely to bring the envisaged benefits, but what if the benefits envisaged by a base-broadening reform do not materialize? Voters—as well as businesses—may experience loss aversion. This loss aversion is also manifested in a tendency by voters to regard so-called two-step policies—those whereby the first step is the removal of a benefit, and the second, subsequent, step is the attribution of a different benefit—with suspicion (Stiglitz, 1998), as the temporal gap between the two steps would tend to increase the aversion.

[8] An analysis of how these lobbying narratives are created, and what determines their success, is provided in de la Feria and Walpole (2020).

A possible route to overcoming the skepticism of two-step policies, and decrease the status quo bias and loss aversion, is to (partially) merge the two steps, that is, to grant a new benefit at the same time as the old one is removed. This is where a progressive VAT may assist: while it may not be possible to frontload the various benefits that result from a broad-base general consumption tax—not least revenue and efficiency gains—it is now possible to introduce welfare transfers, which protect lower-income households, at the same time as tax becomes due.

## Advances in Digital Tax Technology

The developments over the last decade in using digital technology by tax systems are nothing short of outstanding. Until now these new technologies have been used primarily to facilitate tax compliance and enforcement – not only are taxpayers increasingly making use of automated systems in tax compliance, but perhaps more importantly, tax administrations are increasingly reliant on new technologies as compliance-enhancing, and risk assessment, tools. One of the most notable of these is real-time technology, which allows control of invoices, transactions, or both, in real-time. Various types of real-time, anti-fraud technology are now applied throughout the world: from the Golden Tax System in China, which operates as an invoice-matching clearing mechanism focused on B2B transactions (Herbain, 2018; Schenk et al., 2015), to the Split Payment Mechanism, first introduced in Poland and now applied in various European countries, which acts as a *de facto* collection mechanism (Herbain, 2018).

For the purposes of a progressive VAT, the most promising real-time systems are those that require the systematic reporting of B2C transactions to data warehouses, to prevent under-reporting. While the origins of these systems can be traced back to the invoice-matching technology applied in South Korea (Krever, 2014), and e-invoicing systems in Latin America, it is in countries such as Israel, Portugal and, perhaps mostly impressively, Russia, and more recently, Slovenia and Uzbekistan, where those systems have been most successfully implemented. While these systems differ in a variety of ways, they have important common features, namely they all link cash registers in the retail sector to massive data warehouses, which record every B2C transactions in real time. The Russian and Uzbek real-time systems also apply to B2B transactions, with businesses required to submit every invoice to the data warehouse; the data warehouse is then linked to a risk-assessment AI, which identifies audit targets (Giles, 2019); in the case of Uzbekistan, the AI goes even further, by being able to generate an individual risk factor for every VAT registered business in the country (de la Feria, 2023; UzDaily, 2022). The Portuguese real-time system, on the contrary, only applies only to B2C, but as opposed to the Russian, the invoice information sent to the data warehouse identifies individual taxpayers, through their personal tax numbers; the system is devised as a positive incentive to compliance—if consumers request that their tax number is added to the electronic invoice, they accrue two benefits, namely the invoice is added to a monthly lottery, and part of the VAT paid is deducted from their income tax assessment (Wilks et al., 2019). Whilst there are some questions as to the effectiveness and the distributional impact of this type of positive incentive on compliance levels (Fenochietto and Benitez, 2021), the Portuguese system demonstrates the potential of real-time technology to identify and potentially validate individual taxpayers' status and entitlement.

The success of these real-time systems in preventing VAT fraud is nothing short of outstanding: in Russia, the VAT gap has reportedly decreased from 20 to 1 percent (Giles, 2019); and in Portugal, from 16 to 12 percent (Wilks et al., 2019). Yet, the potential uses for this technology are far from being restricted to tax compliance and enforcement. Digital technology is already being used for other ends, such as to increase internal consumption,[9] and more recently for welfare transfers in the context of the pandemic.

[9] This is the case in San Marino, where the SMaC or San Marino Card, can be used to pay digital credits to customers buying at SMaC registered establishments, see IMF (2019).

Although historically the practice of tax administrations delivering benefits is not new, and many countries do it regularly – half the staff in the New Zealand tax administration, for example, is involved in delivering benefits (Keen and Slemrod, 2021) –it is fair to say that in the wake of the COVID-19 pandemic there has been a massive acceleration in the use by tax administrations of new technologies for welfare transfers. Amongst the most notable developments in this regard is mobile money, a service that allows mobile value to be stored on a mobile phone and sent to other users via text message, which has been successfully deployed by tax authorities in developing countries to carry out cash transfers to low-income individuals. First introduced in South Africa and the Philippines just over a decade ago, mobile money quickly spread throughout the world: in Kenya, for example, the local mobile money system, M-PESA, was adopted by the overwhelming majority of households even before the pandemic, and was credited not only with lifting 2 percent of Kenyan households out of poverty and increasing per capita consumption levels, but also with decreasing gender inequality (Suri and Jack, 2016; Suri, 2017). These digital technologies, like mobile money, proved invaluable during the pandemic.

With many governments turning to direct cash transfers to protect vulnerable households (OECD, 2020b), these payments reached an unprecedented scale in countries around the globe: in Argentina, Pakistan and Peru, for example new support programs covered one-third of the population, while in the Philippines over 70 percent received emergency transfers (IMF, 2020a), and in Brazil, beneficiaries of direct cash transfers jumped from 14 to 50 million (IMF, 2020b). However, such a substantial expansion of welfare programs required digital solutions, not only to help deliver these transfers more efficiently and quickly to the intended beneficiaries, including those in the informal sector, but equally to minimize physical contact at a time when most countries were under some form of lockdown, and applied mobility restrictions to the general population. These digital solutions had to address two challenges in particular, namely: (i) identification and validation of direct cash payment beneficiaries (*targeting*); and (ii) development of mechanisms for delivering payments efficiently (*payment method*) (IMF, 2020a). Early evidence indicates that there was indeed a successful uptake in the use of digital technology to deliver welfare payments during the pandemic: in Eswatini, for example, monthly payments to the elderly were fully migrated from paper checks to electronic fund transfers (IMF, 2020b). As discussed below, the use of digital technologies to deliver cash transfers, has also included VAT-related payments, as in the case of Colombia.

New digital technologies, particularly real-time technology – now further tested during the pandemic – provide significant opportunities to decrease VAT regressivity, while retaining the policy and administrative advantages of a broad-based VAT, levied at a single rate. Over the years, there have been a few proposals for a personalized VAT: Ainsworth (2006), for instance, proposed ‘digital VAT’, or ‘D-VAT’, scheme whereby those eligible to purchase goods and service free of VAT would do so using a biometric ID card; Barreix et al. (2012; 2022) proposed a similar version of a personalized VAT where the benefits are delivered through crediting an e-card in the amount equivalent to the monthly VAT liability calculated on a presumptive basis. While these proposals have advantages, there were various limitations to their implementation. The most obvious one is that, at the time these proposals were made, developments in digital technology were still at an early stage; but perhaps even more significantly, they have two main disadvantages, namely they can amplify VAT refunds, which is of particular concern in developing countries, and the time discrepancy – i.e. non-real-time compensation – means political economy obstacles are likely to persist.

A more direct approach is to use biometric identification to target cash compensation, a possibility that countries are beginning to experiment with, as follows. In 2013, India established the Direct Benefit Transfer (DBT) system as a way of paying subsidies to citizens living below the poverty line directly through their bank accounts. The processing of payments is based on the Aadhaar (unique identity number), which covers 93 percent of the adult population. In the run-up to the introduction of Goods and Services Tax (GST) in India, there was public discussion of mitigating its distributional impact by—instead of introducing reduced rates or exemptions — using the DBT system (through Aadhaar-linked bank

accounts) to supplement the incomes of the poorest. However, with the DBT at a preliminary stage, India opted instead to introduce a narrow-base VAT (IMF, 2019).

In 2018, Thailand introduced a system to pay back consumption tax to the recipients of the government's welfare scheme. State Welfare Smartcard (SWS) holders—unemployed and/or with low income—swipe their cards at shops with electronic data capture terminals, with five percentage points of the 7 percent VAT returned to their e-wallet, one percentage point going towards contribution to the National Savings Fund or the holder's savings account and the rest to the Revenue Department; the rebate is capped at around US$16 equivalent per month. Five months after its launch, there were 14.5 million smartcard holders, and the Government had transferred around US$650 thousand to the e-wallets, and an additional amount of around US$120 thousand to the holder's savings account.

In March 2020, also Colombia introduced a new welfare transfer program, as a response to the COVID19 pandemic, to compensate for a VAT base broadening reform, using mobile money. The new scheme required the expansion of mobile money in record time to improve the speed of secure cash transfers in a manner that would comply with social distancing rules. Yet, despite these limitations and some public skepticism (Cordoba Garces, 2021), the scheme still had a positive effect on measures of household well-being, such as food access and financial health (Londono-Velez and Querubin, 2022). Also noteworthy is the fact that the Colombian program is only one of several VAT compensation (targeted) schemes now applied in Latin American countries (Argentina, Bolivia, Ecuador, Uruguay), which make use of new technologies (Barreix et al. 2022). In Uruguay, for example the VAT compensation scheme in place since 2022 uses a digital wallet ('tuapp') to make payments.

Whilst real-time technology – and thus the Progressive VAT – is still be beyond the reach of many low-income countries, the early success of these targeted programs are encouraging signs of what can be achieved by a broad-based VAT, which instrumentalizes digital technology to decrease its regressivity, even in countries that pre-pandemic had relatively less-developed digital payments systems. It is of course possible that despite these advances, some remote, rural areas, primarily in developing countries, may still be hard to reach, but given that those situations often fall outside the scope of VAT – either due to VAT registration thresholds or informality – these limitations would have very limited, or no impact on our proposal.

## Concept and Design of the Progressive VAT

The Progressive VAT, as per our proposal, works in essence as an umbrella concept, i.e., there are core design elements, but it also allows a variety of options, as summarized in Figure 3 below. The core design elements are three-fold, namely: *(i)* full taxation of all consumption at a single VAT rate, thus no merit exemptions or reduced rates; *(ii)* payment of a VAT compensation subsidy; and *(iii)* a digital mechanism that allows payment of this subsidy in real-time, at the moment of purchase. Within the parameters of that core design, there are various design options in terms of substantive scope, objective scope, and payment method. Notwithstanding, the most critical design options concern the choice of the objective scope of the VAT compensation mechanism, namely whether the compensation is targeted or universal, and if so, what the threshold amount used should be.

**Figure 3: Progressive VAT: Design Features**

| Core Design Features | | |
|---|---|---|
| **Tax Base** | **Compensation Mechanism** | **Payment Method** |
| Broad-base tax: one rate, no merit exemptions. | Compensation for VAT paid by low-income individuals or households, at the moment of payment. | Real-time compensation through digital technology. |

| Optional Design Features | | |
|---|---|---|
| **Compensation Mechanism** | | **Payment Method** |
| *Subjective Scope* | *Objective Scope* | Through integrated personalised tax system, and centralised bank transfers, if possible; or through digital wallet / money, and mobile devices, if not possible to integrate banking system. |
| *Unit of assessment*: by individual; or by household.<br><br>*Scope*: given to citizens on low incomes; or to all citizens, if targeting not possible. | *Scope*: targeted compensation to low income; or one standard payment (universal subsidy), if targeting not possible.<br><br>*How much I*: if targeted compensation possible, what threshold level (e.g., only first decile, or all up to, say, eight decile); if targeting not possible (universal subsidy), how much.<br><br>*How much II*: if targeted compensation possible, all paid VAT; or VAT up to a ceiling based on average consumption.<br><br>*How much III*: if targeted compensation possible, same compensation for everyone below the threshold, or different compensation levels for those on different incomes (e.g., full compensation for lower deciles, partial compensation to upper eligible deciles). | |

In this context, for the purposes of completeness, we consider three design alternatives in assessing our proposal, as follows:

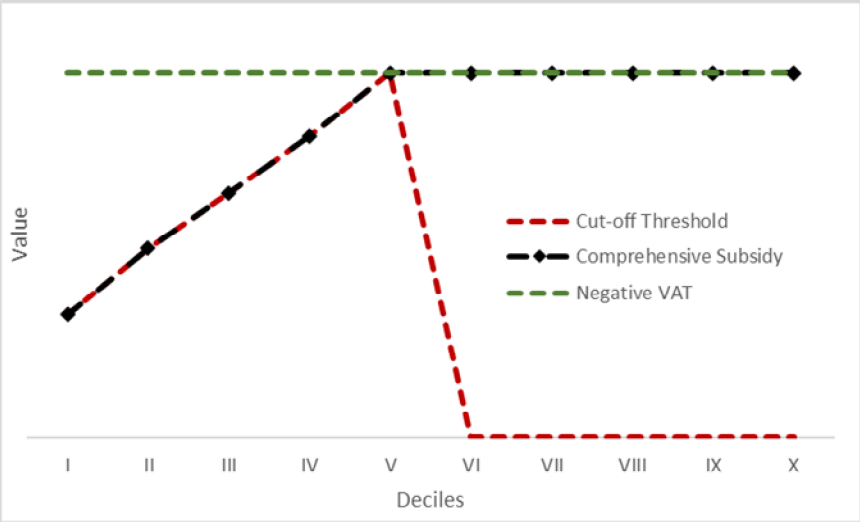
- *Scenario 1*: a simple cut-off threshold, where households with income below a certain threshold do bear any VAT, regardless of what they buy (consume) – this threshold could be aligned with a median income of a chosen decile, or any other amount of choice.
- *Scenario 2*: a universal subsidy VAT where all consumers receive VAT compensation equal to the amount of VAT charged on their purchases (consumption) regardless of what they buy (consume), but no more than the threshold amount.
- *Scenario 3*: a negative VAT where all consumers receive a VAT subsidy equal to the threshold amount, regardless of their income level and what they consume.

Scenario 1 reflects the true Progressive VAT approach, whilst Scenarios 2 and 3 would constitute alternative targeted social programs.

## Revenue and Distributional Impact

We apply our model to the three scenarios set out above to assess the revenue and distributional impact of the Progressive VAT. In our analysis, households are represented by income deciles, and the threshold amount corresponds to the median income of a decile of choice. In Figure 4, we use the fifth decile of the income distribution to show a stylized distribution of the VAT compensation under our alternative scenarios. Unsurprisingly, the higher the threshold amount, the higher the overall cost of the compensation mechanism; overall, the revenue cost of the compensation mechanism is lowest for the cut-off threshold scenario (*Scenario 1*), and highest for the negative VAT scenario (*Scenario 3*). At lower threshold amounts the cost of the universal subsidy VAT (*Scenario 2*) is closer to the negative VAT (*Scenario 3*), and at higher threshold amounts, it is closer to the cut-off scenario (*Scenario 1*).

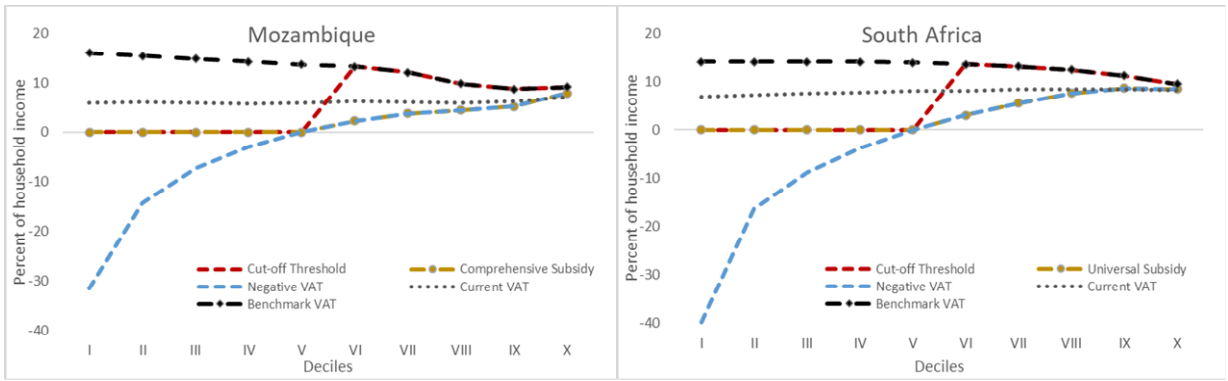
**Figure 4: Stylized Distribution of Compensation under a Progressive VAT**




Note: The threshold amount corresponding to the median income of the 5th decile. Value (vertical axis) does not imply any specific amount; it is meant to compare, in a stylized manner, levels of subsidy for the three scenarios considered.

The VAT incidence of the three design alternatives is measured against income. While the actual incidence will vary with the threshold amount – as shown in Figure 5 – the underlying relation remains constant, namely: low-income households pay no VAT up the cut-off decile (threshold amount) under the cut-off threshold scenario (*Scenario 1*) and the universal subsidy VAT (*Scenario 2*) and receive additional refund under the negative VAT (*Scenario 3*). The universal subsidy VAT (*Scenario 2*) and the negative VAT (*Scenario 3*) overlap for deciles above the threshold amount, exhibiting smooth progressivity, i.e., an increase in the effective tax rate, whereas the cut-off threshold scenario (*Scenario 1*) leads to a steep increase of the effective tax rate for households with incomes above the threshold amount. It would be possible to conceive as a design option whereby the amount of compensation is different depending on the income decile. While this would have the advantage of smoothing the Progressive VAT incidence, it would add complexity to an otherwise relatively simple design.

**Figure 5: Progressive VAT Incidence: Mozambique and South Africa**



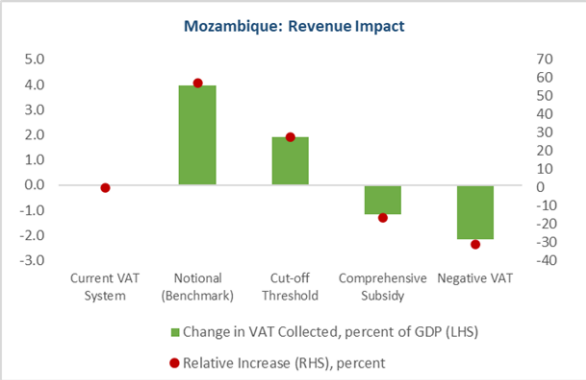

Our approach to evaluating the Progressive VAT is straightforward. For both countries (Mozambique and South Africa), we calculate the VAT incidence and revenue yield under each alternative and compare them with the existing VAT design

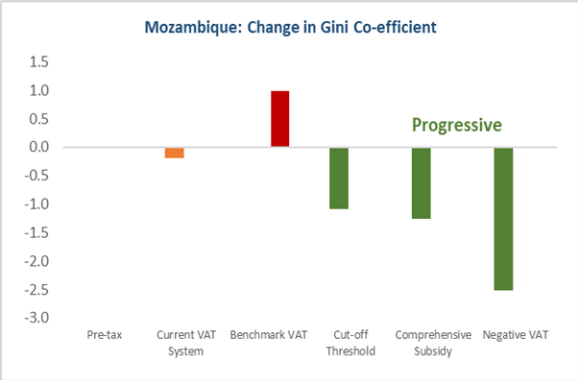
– as per Section II – as well as a benchmark VAT. The VAT incidence is measured by the change in the Gini coefficient vis-à-vis the no VAT scenario (i.e., as if no VAT applied); similarly, the impact on revenue is measured by the difference in revenue yield under each alternative, and our two benchmarks, namely the existing VAT design (with exclusions from the VAT base) and the benchmark VAT (with no exclusions from the VAT base). We then run some sensitivity analysis by varying the threshold amount.

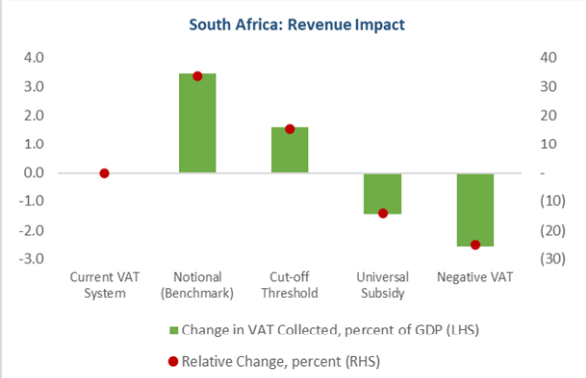
**Figure 6: Change in Revenue Yield and Gini Coefficient (3rd Decile Cut-off)**

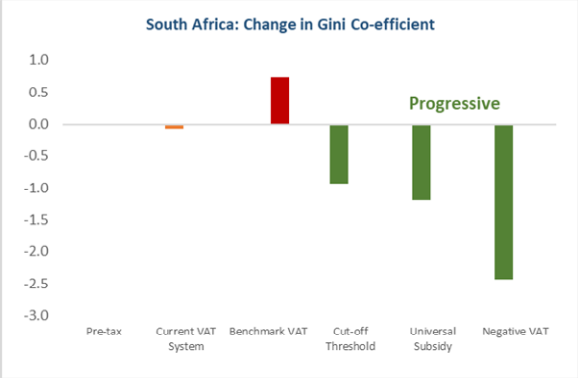

Figure 6 presents results for Mozambique and South Africa for the threshold amount set at the median income of the third decile. The cut-off threshold alternative (*Scenario 1*) would achieve a small degree of progressivity – when compared to that achieved under the current VAT system – while increasing the revenue yield by 40 percent in Mozambique and 25 percent in South Africa (or 3 and 2.6 percent of GDP, respectively). The two other design alternatives (*Scenarios 2 and 3*) would not materially change the revenue yield but would achieve a higher degree of progressivity—the Gini coefficient would change by one percentage point under the universal subsidy VAT (*Scenario 2*), and nearly 1.5 percentage point under the negative VAT (*Scenario 3*) in Mozambique; while in South Africa, the change would be 0.9 and 1.25 percentage point, respectively.

**Figure 7: Change in Revenue Yield and Gini Coefficient (5th Decile Cut-off)**




As we noted earlier, the results are very sensitive to the choice of the threshold amount: unsurprisingly, the higher the threshold, the more costly the program, but also the higher the progressivity. For example, assuming a cut-off threshold scenario (*Scenario 1*) at the median income for the fifth decile (see Figure 7) would reduce the revenue gain from 40 to 27 percent of current collections in Mozambique, and change the Gini coefficient by one percentage point, thus improving progressivity levels; in South Africa, the revenue gain would be reduced from 25 to 15 percent, and progressivity would be improved by 0.9 percentage point. The universal subsidy VAT (*Scenario 2*) would reduce revenue collections by 17 percent and improve the Gini coefficient by 1.3 percentage points in Mozambique, while the negative VAT (*Scenario 3*) would hurt the government revenue even further – by 31 percent – but improve the Gini coefficient by 2.5 percentage points. Results for South Africa are similar—both Scenarios 2 and 3 would lead to revenue loss (14 and 25 percent revenue less, respectively, compared to the current level of collections) while further improving the progressivity of the VAT—by 1.2 and 2.4 percentage points for Scenario 2 and 3, respectively.

The actual design of the Progressive VAT would thus need to find a balance between revenue and (tax) equity objectives—in all our design scenarios they are inversely correlated: the more revenue is forgone, i.e., used for equity-improving subsidy, the higher levels of progressivity can be achieved. Higher progressivity can be further achieved if different levels of compensation are granted, depending on income level. Regardless of what option is taken, however, there is ample scope to improve progressivity compared to the current VAT design. On balance, our preference would be for a cut-off threshold, with possible different levels of compensation depending on tax administrative capacity. This is because the higher inequality gains in a universal subsidy or negative VAT would be partially offset by a less favorable public finance mix: less revenues would leave less scope for public expenditure, which could itself result in inequality gains. On the contrary, the cut-off threshold system would result in inequality gains, as well as revenue gains – with a consequent positive impact on the public finance mix. Notwithstanding this, a universal subsidy or a negative VAT type

system could be a second-best option, where targeting is impossible, despite the advances done in this regard during the pandemic.

## Main Gains and Spillovers

While design options do have an impact on outcomes – in particular in terms of revenue gains and decrease in inequality levels – overall, our proposal would result in significant gains vis-à-vis existing approaches to minimizing VAT regressivity, regardless of design alternatives. Below, we summarize the main gains, as well as some envisaged spillover effects. It is important to acknowledge that, while on the main gains there are no significant trade-offs associated with our proposal, in terms of spillovers there are some potential risks attached. As discussed below, these risks should be taken into account when designing a Progressive VAT, so as to minimize them and pre-empt any potential negative effects.

One of the main gains of the Progressive VAT, when compared to either the traditional or the modern VAT, are *equity gains*. As demonstrated above, while design has an impact on extent of the equity gains, it is clear that regardless of the design options adopted, a Progressive VAT has a positive impact on reducing inequality, going beyond the mere decrease in regressivity. Moreover, in addition to the general impact on inequality, and based on the Kenyan experience with digital money, it is not unreasonable to assume other potential inequality gains, namely as regards gender equality. These results are in strong contrast with both the limited distributional impact of the traditional VAT, and the negative distributional effects of the modern VAT, –when welfare transfers are not possible. However, even where welfare transfers are possible, the use of real-time technology under our proposed Progressive VAT carries advantages that are not insignificant when compared to the modern VAT model.

First, in terms of cash-flow, the time disparity between the moment when VAT is paid and when the welfare transfer is received results in cash-flow costs, which can have a significant impact on those at the lower end of the income distribution. This absence of time disparity also limits the potential for VAT refund problems, often present in developing countries (Pessoa et al., 2021), as the revenue never enters government coffers, thus decreasing any scope for loss aversion. Second, the use of real-time technology reduces the possibility of welfare stigma, and the psychic costs associated with being on welfare (Besley and Coate, 1992). There is now robust evidence that benefiting from welfare transfers is associated with stigma, and that self-blame and internalization of shame is a frequent aspect of those who experience that welfare stigma (Bolton et al., 2022). New empirical evidence also suggests that social image concerns have a significant impact on stigma, and thus actions that are less observable by others decrease stigma (Bursztyn and Jensen, 2017; Celhay et al., 2022). This evidence suggests that the Progressive VAT has two key elements that will allow the decrease in stigma: (i) real-time compensation will feel like an exemption, rather than a welfare payment; and (ii) as opposed to other welfare programs which require presentation of physical evidence to avail of the transfer (e.g. cards or food stamps), real-time technology is not observable – neither the cashier at the retailer shop, nor other shoppers will be able to ascertain whether someone is receiving VAT compensation or not. Finally, in New Zealand there has also been an argument made that deficient indexation of welfare transfers means that VAT expenditure of low-income households is not fully compensated under the current system (Boston, 2019); this, again, will not be the case with the Progressive VAT, as the compensation via real-time technology ensures that it is *de facto* indexed to prices.

In addition to equity gains, the Progressive VAT would also result in significant *revenue gains*, compared to the traditional VAT. When compared to the modern VAT, the situation is less clear—in principle, there would be no revenue gains; however, while in the short-term the transition to a Progressive VAT will entail an increase or diversion of administration costs, it is possible to envisage a small gain in the medium term due to lower administrative costs resulting from automation. On the other hand, there is also a potential elimination of tax authorities' loss aversion – as the welfare

expenditure is less visible than under the modern VAT – leading to potentially less scrutiny and control over the operation of the expenditure; this risk may, however, be addressed through proper budgetary expenditure reporting.

Finally, the Progressive VAT also results in significant *efficiency gains*, when compared with the traditional VAT; and in significant *political economy gains*, when compared with the modern VAT. *De jure,* the Progressive VAT is a broad-base, single-rate VAT, with a compensation mechanism for lower-income households; *de facto*, however, it will feel to consumers as an individual VAT exemption or zero-rate, only available to those on lower incomes. This will not, of course, prevent special interest groups from mounting a campaign in support of general VAT concessions, but it will make the fairness narrative less credible: under a Progressive VAT, the poorest are already protected. From the perspective of consumers, distrust of the "two-step" policy and the loss aversion triggered by the loss of a perceived benefit (generalized lower VAT), in exchange for a potential future benefit (a time-delayed welfare transfer), never sets in, as the loss and the benefit are concurrent, so lack of trust is likely to play a lesser role. Some political economy resistance may still arise, particularly as regards the establishment of the cut-off threshold, but these are likely to be significantly smaller and easier to overcome, not least because lobby groups would have little to gain in participating in that debate. .

In terms of spillover effects, the main positive is likely to be *compliance enhancement*. There are three ways in which the Progressive VAT can result in higher compliance. First, while VAT is theoretically self-enforceable (Pomeranz, 2015; Waseem, 2020), self-enforceability does not cover all aspects of the production chain, and in particular, it is absent at the last element of the production chain, namely B2C transactions. Accordingly, it is precisely at this stage, when the elements of self-enforceability are absent, that fraud tends to occur (de la Feria, 2020). By incentivizing the request for an invoice by customers, the Progressive VAT *de facto* extends the self-enforceability features to that last stage of the production chain – as recent empirical evidence suggests, consumers are extremely responsive to VAT rebate incentives (Brockmeyer and Samarriba, 2022).

Second, the Progressive VAT also creates an incentive against informal suppliers: usually informal suppliers can apply lower prices than VAT registered suppliers; however, since informal suppliers cannot deduct input VAT, there will usually be some tax embedded in the price. Normally, that tax element is not enough to offset the cost of the formal VAT charged; but to the extent that the customer is not actually paying the formal VAT, then the price charged by the VAT-registered business is likely to be lower than the one charged by informal businesses. In time, although firms have been recently found to be generally less responsive to VAT compensation schemes than customers (Brockmeyer and Samarriba, 2022), this may create an incentive for formalization.

These significant compliance incentives must, nevertheless, be seen in the context of new fraud risks. The most significant of these is the possible sharing (or sale) of the digital wallet or PIT number by lower-income households to others not entitled to avail of the VAT compensation. This risk, while always present, is however significantly limited by the setting-up of a maximum compensation threshold. The second fraud risk is the increase in the incentive to under-report income, as under-reporting will now bring not only an advantage in terms of income taxes but will also carry a VAT advantage. Although this incentive may be offset by the creation of a disincentive to misrepresent private consumption as business expenditure, empirical evidence on the bunching effect created by the VAT registration threshold suggests that the risk of under-reporting may be significant (Liu et al., 2021; Liu et al., 2022). One possible way to counteract, or at least minimize, this incentive is to adopt a progressive approach to compensation, with more than one threshold, whereby those on the lowest deciles of the income distribution would get full-compensation for VAT expenditure, while those on medium incomes would be only partly compensated for their VAT expenditure.

Other possible spillover effects, include cross-border shopping gains, as well as privacy protection risks. In terms of potential *cross-border shopping gains*, there are two elements: *(i)* since the Progressive VAT will only cover domestic supplies, it will protect the domestic (consumption) tax base and provide a disincentive to cross-border purchases; and *(ii)*

since the Progressive VAT will only be available to residents, it will in practice export the (consumption) tax base. Insofar as *privacy protection risks* are concerned, it must be acknowledged that these new technologies are extremely intrusive. Their usage by tax administrations is therefore not without significant risks, particularly in the context of possible cybercrime attacks, and the possible misuse of the collected data by autocratic regimes, as well as risks of biased algorithms (de la Feria and Grau Ruiz, 2022). These risks are of course already present in countries that use these technologies for anti-fraud purposes, but implementation of a Progressive VAT would require particular attention to be given to cyber-security systems, as well as legal guarantees to limit the potential for data misuse.

# IV. Conclusion

Disaggregation bias aside, VAT regressivity is regarded as the biggest drawback of an otherwise nearly perfect tax. The traditional approach to addressing regressivity – exclusions from the base – not only caries significant efficiency costs, but its impact on regressivity is, at best, limited; while the modern approach to addressing regressivity – welfare transfers, outside the VAT system – scores high on efficiency, it carries high political economy costs, and at least in developing countries, some implementation difficulties. The aim of our proposal for a Progressive VAT is to address the regressivity problem, without enduring the efficiency costs of the traditional VAT, or the political economy costs of the modern VAT.

While this paper concerns specifically VAT, the core elements of our proposal to ensure its progressivity hold for any consumption taxes, either general – such as the Retail Sales Tax – or special – such as sugar or carbon taxes. For example, although it is unlikely that we would want to make carbon taxes fully progressive – as this may undermine their main function, namely externality correction – we may want to consider decreasing their regressivity, at the lower deciles of the income distribution. Real-time technology may also have applications in other areas of the tax system, for example on personal income taxes and social security contributions. Regardless of our future policy options, our proposal signals the end of the inherent regressivity of consumption taxes: they may still be regressive, but no longer inherently so. Thanks to digital technologies, we can now design consumption taxes that are *de facto* progressive, in a relatively straightforward manner, and without compromising efficiency or neutrality. There are, of course, risks, but there is now a path on how to design taxes that are both efficient and equitable – and given the potential rewards, from a policy perspective that is undoubtedly a path worth exploring.

# Appendix: Modeling Approach and Assumptions

We use microsimulation in our modeling, an approach employed in numerous studies focused on evaluating distributional impact of a VAT. To construct our model, we first reconcile data captured in household surveys with private final consumption as recorded in national accounts through extrapolation.[10] Then we derive net household expenditure by subtracting VAT from gross spending recorded in household surveys—per spending category and per income decile. We do so using publicly information on the VAT treatment of various goods and services, estimates of value added derived from supply-use tables where available (assumed otherwise), and assumptions on the level of informality.[11] In the next step, we use the net expenditure to calculate back gross expenditure under three VAT scenarios, as follows: *(i)* full taxation; *(ii)* VAT, as imposed by countries in our sample, i.e., with exclusions from the base; and *(iii)* a Progressive VAT in three different designs. These three different designs are: (1) threshold cut-off, where consumers below the chosen threshold (corresponding to income decile) do not bear VAT and those above the threshold do not receive any VAT subsidy (simple cut-off, no tampering); (2) a universal subsidy VAT approach, where all consumers receive a subsidy equal to the VAT actually paid but no more than a chosen ceiling amount which may be set up arbitrarily or correspond to a notional amount of VAT payable by a chosen income group, say, the fifth decile; and (3) a negative VAT approach where all consumers receive the same amount of subsidy, resulting in a higher transfer than potential VAT paid by low income households. The difference between gross and net expenditures allows us to observe the amount of VAT by each decile, which we then use in simulating and assessing the various design options. Our analysis is static and does not account for any behavioral response—neither does it account for changes in consumption patterns, or levels of non-compliance.

The biggest challenge in our modelling stems from the limited reliability of income data in household surveys. The inherent difficulty to measure income is especially problematic for lowest deciles where, as is common in developing countries, most income is non-wage and prone to underreporting.[12] One of the common approaches to overcome this challenge is to use consumption data as a proxy for income in line with the permanent income hypothesis. While we do not dismiss the rationale for this approach, we adopt a different one, namely we assess our proposal using annual income. We do so for two reasons, namely: *(i)* our progressive VAT design has an annual timespan; and *(ii)* the annual income perspective tends to be the one favored by policymakers, so that from a political economy perspective it also makes sense to use that approach.

To make up for the income measurement deficiency, we substitute the reported income levels with incomes derived from consumption data using the metric of marginal propensity to consume.[13] For simplicity, we assume that income matches consumption for the lower-band deciles (marginal propensity to consume implied to be 1) and a declining propensity for the upper five deciles to the weighted average of 0.7. While this approach is not perfect, and it does increase a margin of error, our modelling results are consistent enough to allow us to be confident in the conclusions discussed in the paper.

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[10] While the analysis could be performed using the level of consumption captured by household survey datasets, extrapolating it, albeit imperfect, allows for better approximation of the true VAT base. It is by no means, however, a full VAT base, as government and NPISH consumption are not included. While this approach is suitable for assessing VAT incidence, it may underestimate revenue gains.

[11] Supported by findings by Bachas et al. (2021).

[12] Misrepresentation of farming (or trade and business) and personal income is the main reason for inaccurate reporting of income, as noted in Deaton (2019). Other important factors include, lack of response, response errors, including underreporting bias, and an array of cognitive factors, including misunderstanding of income concepts, memory fallibility and “motivated misreporting” (income sensitivity issue), see Moore, Stinson and Welniak (1997).

[13] An alternative would be to substitute the reported income levels with consumption for deciles where the reported incomes are lower than consumption. Both approaches implicitly assert that incomes cannot be lower than consumption. While we assume this to be a reasonable assumption on the aggregate level, we do recognize that certain households borrow to sustain their consumption.

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