The necessary dialogue between big data and trust in Brazil's tax administration

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Introduction

Tax revenue is the primary source of funding for a State's public policies, investments, and infrastructure. The revenue body is the authority responsible for collecting taxes under the law on behalf of citizens (OECD, 2017a) with "a maximum of taxpayer consideration and a minimum of irritation or inconvenience" (Smith, 1969). Tax administrations are routinely assessed on their ability to collect the most revenue, enforce avoidance and prevent evasion, and contain tax compliance costs (Silvani, 1992). Therefore, tax authorities have always sought to improve efficiency (Campbell, 2014), narrow "the difference between the theoretical tax liability and actual revenue collected" (Warren, 2019) and enhance tax compliance.

In developing countries (De Roux *et al.*, 2018), tax authorities play a key role. However, these countries typically have low tax-to-GDP ratios (Brockmeyer and Hernandez, 2016) and even lower levels of compliance (Castro and Scartascini, 2015). In such economies, tax administrations must manage increasing levels of tax evasion as well as the shadow economy, that featuring illegal practices such as "underreporting income, keeping business deals off the books, and exaggerating losses and expenses", to name a few examples (Touchton, Wampler and Peixoto, 2019). In Brazil, for example, tax evasion in 2018 was estimated at around R$345 billion (Brazilian Reais) [1] or around $ 62.1 billion (Dollar)[2].

There is no single remedy for all these challenges, that are not restricted to developing countries, though they are more acute, often than in developed ones. The solution may be the miscellany formed by joining together a simple, fair and well-designed tax system, and a robust and well-resourced tax administration infrastructure, underpinned by a society eager to pay its taxes as they trust their elected government works for the public good. This study narrows down the possible reasons that, as described in the literature, some people pay their taxes and comply with their duties, while others do not. It will explore the relationship between tax authorities and taxpayer compliance, and the innovations that have been employed to strengthen enforcement and to reduce the burden of information.

Tax compliance can be discussed along three theoretical lines. The first theory focuses on enforcement, which is linked to increased compliance because of the risk of punishment. The second theory examines the social environment and the taxpayer's degree of social commitment. It emphasises a cooperative environment and addresses taxpayer needs in order that they fulfil their obligations. The third theory states that, in trust-based interactions, the taxpayer is more likely to pay their taxes voluntarily based on behavioural responses. Enforcement and facilitation are linked with trust, but it goes beyond public perception of tax authorities. It involves concepts such as fairness, simplicity and equality of the tax system as a whole. It is important to note that tax compliance doesn't derive solely from trust in a tax

[1] https://www.sinprofaz.org.br/tag/sofnegometro/
2 https://www1.oanda.com/currency/converter/

authority. The literature explains that tax compliance likely evolves from a broad concept of trust in the government, as well as factors such as government effectiveness, the ability to tackle corruption and political stability (Cummings *et al.*, 2004)(Frey and Torgler, 2007). Although these factors are relevant, they are not in the scope of this study, which aims, primarily, to evaluate trust in Brazil's revenue service – the institution collecting tax.

Since the 1960s, tax administrations have strategically invested in technological tools to improve performance, reduce costs, and increase efficiencies in delivering better benefits for taxpayers and bolstering tax compliance. More recently, Brazil's tax administration has been investing in administrative and compliance structures to improve their capacity to manage and evaluate big data and apply the knowledge for better public decision-making. Today, the tax administration's use of big data is a tool that covers all those dimensions from increasing the capacity for audits, working with third-party data, and improving taxpayer services.

The current challenge facing Brazil's tax authorities is, therefore, how established big data projects can be used to create a more trustworthy relationship with taxpayers. The potential that new technologies brings to the Public Administration is intrinsically linked to a proactive approach by the tax administration to enable more efficiency, a higher level of trust and less corruption (Kirby, 2018). Building trust, from an institutional integrity perspective, necessitates that Brazil's tax authority pursues its legitimate purpose through a clear focus on reducing taxpayer burdens and fostering voluntary compliance, whilst also keeping pace with ever-evolving technology.

Therefore, this paper will seek to understand how these new technologies, especially big data and data analytics, have been utilised to improve tax compliance. Then, it will acknowledge the dialogue between big data, enforcement and trust to understand whether technology can increase compliance in its voluntary dimension, or whether it is able only to target enforced compliance. The research question is further refined as: "notwithstanding the wide utilisation of enforcement, how can Brazil's tax administration use big data to build a more trustworthy tax institution? "The study also aims to create a policy-relevant outcome investigating how governments are managing vast quantities and varieties of information, and how tax administrations can use new technologies, especially big data, to foster voluntary tax compliance, whilst also protecting citizens' privacy.

This paper can contribute to the literature due to its focus on Brazil's tax environment, and the use of modern technologies to build up trust in the tax authority. It analyses the relationship between the use of big data by the Brazilian tax institution and institutional trust, which no other academical paper has done previously. Brazil is an especially interesting case study due to the magnitude of the challenges it faces in combating tax avoidance and evasion. On the one hand, Brazil's tax authority is well-organised and has been investing heavily in new technologies, and it is on a par with tax administrations in developed countries. On the other hand, there is growing disapproval among citizens which is undermining the relationship between the authorities and taxpayers, as demonstrated in the enormous figures of tax evasion as well as the sizeable shadow economy[3] and resulting low levels of compliance and trust. It is also supported by the fact that less than 20% of Brazilians were registered as active personal income taxpayers in 2015, according to the OECD report (2017a).

Regarding the methodology, first, I will conduct a literature review to describe the academic concepts and debates regarding tax compliance theories. Next, I will explore the literature on the automation of information collection and big data in the tax environment, the typologies of big data that have been utilised, and the dialogue between technology, enforcement and trust. The policy challenge section will focus on Brazil's tax administration, beginning with its structure and its approach to compliance. After, I will examine how Brazil's tax authority is using big data and data analytics to improve tax enforcement. Finally, I will apply the Institution-first conception of Public Integrity in the Brazilian context as an instrument of building trust in the tax authority to foster voluntary compliance.

Finally, I conclude with some practical recommendations, namely that:

1. The legitimacy of pursuit of the tax administration may calibrate the intensity of the enforcement into the Brazilian context. This could be achieved through various comparative statistical analyses between big data analytics used by the tax authority and active economic, demographic data, such as personal income. This process will determine whether the results of tax analysis truly mirror the economic data on the Brazilian population, or whether they are distorted by bias or impartiality from an unreliable database.
2. Brazil's tax authority should adopt and promote proactive policies on data use and data sharing based on the principles of transparency and accountability. This could be accomplished through the publication of transparent and easy-to-understand policy guidelines which outline personal data privacy protections as well as measures to prevent data misuse by the tax administration.
3. Brazil's tax authority should take a positive approach to adhere to Brazil's data privacy regulation, the General Law of Data Protection (or Lei Geral de Proteção de Dados) which comes into effect on the 3rd of May 2021, as it may provide citizens "greater digital agency" to better understand and manage their personal data.
4. Brazil's tax authority must disclose the extent to which these recommendations are actually met to feature that it fulfils its commitments. This should be done by a regular and publicly available report that includes the results of the analysis suggested in item 1, and an assessment of the policies suggested in item 2 and the adherence to data privacy regulation, item 3.

3 Schneider (2016) defines the shadow economy as "those economic activities and income earned that circumvent government regulation, taxation or observation".

1. Literature Review

From strengthening enforcement to changing behaviour to improving voluntary tax compliance, efficiency in tax collection is of great interest to researchers and governments worldwide (Pampel, Andrighetto and Steinmo, 2019)(Majdanska and Lindenberg Schoueri, 2017). Despite its vital importance, "the difference between the theoretical tax liability and actual revenue collected" is rising steeply in many countries, revealing central issues related to tax administration efficiency and taxpayer compliance (Warren, 2019).

This tax-gap begs the question: Why is it that some people do not pay their taxes, whereas the majority comply with their tax duties? (Thomas, 2013). The decision to pay taxes is referred to in the literature as "the compliance puzzle", and is even described as economically irrational, considering the low risks of audit and penalties (Frey and Torgler, 2007)(Tsikas, 2020). Tax compliance, in turn, is influenced by several elements inherent to a tax authority, including the power of authority, the fairness of procedures and probability of audit, as well as crucial additional elements such as taxpayer behaviour, their perceptions of trust, and their "participation in public goods, and social norms" (Kastlunger *et al.*, 2013).

There is no single solution in the literature to bridging the tax-gap and improving compliance. Theoretical studies have developed some important propositions; however, empirical research "has not yet reached the same level of consensus" of its theoretical counterparts (Castro and Scartascini, 2015). This review is interested in the three main "groups" of theories which may be analysed with independent, but closely linked perspectives, to understand how both sides of tax-gap can be brought together, and how the tax administration can be improved to foster increased tax compliance. It is important to note that there has been little debate in the literature about Brazil or on which of the main theories can be applied to the Brazilian context.

The first group of theories are focussed on enforcement and deterrence, mainly through audits and penalties. Notwithstanding the so-called 'rational economic paradigm', there is no full explanation for why the majority of the population decides to pay taxes, even when there is a low likelihood of punishment (da Silva, Guerreiro and Flores, 2019). The second approach considers taxpayer behaviour and which non-economic elements factor in their decision to pay or evade. The third approach is the 'Slippery Slope framework' which suggests that tax compliance is influenced by the interactions between the power of the authority and levels of the trust in the tax authority. Evidence has shown that trust in government is a key element to predict taxpayer behaviour and is essential to strengthening tax compliance (Cummings *et al.*, 2004)(Hauptman, Korez-vide and Gurarda, 2015)(Mendoza, Wielhouwer and Kirchler, 2017).

Other theories point to the relevance of building trust. The Institution-first concept states that, concerning institutional integrity, the basis of trust is the perception that the institution is pursuing its legitimate purpose to the best of its abilities (Kirby, 2018).

The integrity of public institutions is considered as the next step of governance after anti-corruption and compliance measures. It imposes a higher standard of proactivity, enabling more efficiency, a greater level of trust, less corruption and better welfare outcomes (Kirby, 2018). The Institution-first conception of public integrity is composed of legitimate purpose, legitimate pursuit, commitments and robustness (Kirby, 2018). The primary function of a tax system is to collect revenue. Likewise, it is indisputable that the purpose of Brazil's tax system is legitimated by its constitutional powers and the responsibilities of its elected government. The shape and ability of the tax system are context-related and "have profound effects on the very structure of democratic capitalism itself" (Steinmo, 2003).

Whilst the State needs revenue, the tax authority must be efficient, and it must collect taxes to the best of its abilities "for the right relevant, motivating reason" (Kirby, 2018). Therefore, this working paper argues that Brazil's tax authority should build trust to foster voluntary tax compliance through innovative tools promoting the legitimacy of its pursuit, commitment and institutional robustness.

1.1 Enforcement – The Rational Economic Paradigm

People may report that they pay taxes because the governmental structure forces them to (Brockmann, Genschel and Seelkopf, 2016), and indeed, the deterrence policy is "the most popular instrument" to induce tax payment (Frey and Torgler, 2007) through audits, penalties and even criminal prosecutions. Traditional research focuses on the taxpayer's economic rationale and a belief that the greater the enforcement, the greater the compliance because of the risk of the punishment.

In 1972, Allingham and Sandmo drew upon the "model of crime" (Luttmer and Singhal, 2014) to develop an economical approach to the tax-evasion context. They summarised their theory as "economics criminal activity vs analysis of portfolio and insurance policies in the economics of uncertainty". The authors also found that the decision to evade did not provoke an immediate response from the tax authority, and in some cases, there was no response whatsoever. Considering these uncertainties, a taxpayer could choose to declare properly and pay (risk-free), or deliberately underreport and underpay, assuming the risk to pay their taxes plus penalties if detected by the authorities (Allingham and Sandmo, 1972).

Under the traditional deterrence theory, taxpayer compliance is a three-dimensional formula that involves an individual component regarding their risk limit, a legal or regulatory extent of the penalties, and how a tax administration's structure impacts on the probability of an audit (Prichard *et al.*, 2019). This economic model assumes that taxpayers are rational agents aiming to maximise their expected utility, balancing the financial benefit of paying their tax in the proper time with the economic risk of punishment (Castro and Scartascini, 2015)(Frey and Torgler, 2007). This approach presumes a direct relationship between enforcement and compliance, implying that harsh penalties and the probability of getting caught discourage tax evasion (Mendoza, Wielhouwer and Kirchler, 2017)(Castro and Scartascini, 2015).

Deterrence is still a popular way used by tax authorities to punish tax evasion and to treat non-compliance practices (Verboon and van Dijke, 2011). The power of enforcement is considered crucial for some in "shaping the behavior of taxpayers" in low-compliance environments (Silvani, 1992). However, empirical research has yielded mixed results with unclear effects (Kirchler *et al.*, 2010). Many studies have suggested that harsh sanctions and excessive audits may actually backfire, undermining compliance and reducing trust in the whole system (Cummings *et al.*, 2004)(Farrar, Kaplan and Thorne, 2019)(Mendoza, Wielhouwer and Kirchler, 2017).

Furthermore, Allingham and Sandmo recognised that their theory was not comprehensive enough to understand the many reasons that lead a person to decide not to pay their taxes. In their words "there may be other factors affecting utility if one's attempt at tax evasion is detected. These factors may perhaps be summarily characterised as affecting adversely one's reputation as a citizen of the community" (Allingham and Sandmo, 1972).

1.2 Social Context – The Behavioural Approach

Some people comply with the tax system due to a sense of civic duty originating in the social contract that connects society (Slemrod, 2019). They are influenced by the sense of community that pulls them towards public responsibility and reflects the others' level of compliance (Castro and Scartascini, 2015)(Brockmann, Genschel and Seelkopf, 2016). Social behaviour, tax morale, fairness and trust in tax administration are pointed out as different non-economic considerations that impact tax compliance (Prichard *et al.*, 2019).

In contrast to the traditional economic model, which considers the decision to pay taxes in isolation, these behavioural theories analyse the taxpayer in the context of their social environment and their degree of social commitment. Braithwaite (2003) categorised different "motivational postures" that explain the levels of commitment or disengagement between the taxpayer, their community and their taxes. With this approach, distinct regulatory strategies should be applied depending on the degree of compliance, assuming that "the economic model fits best for the group of disengaged and game playing taxpayers and loses validity among taxpayers with different motivational postures" (Kirchler *et al.*, 2010).

A taxpayer's willingness to comply is deeply impacted by the behaviour of their peers (Frey and Torgler, 2007). Tax morale is highlighted as the bridge between individual behaviour and the perception of their community behaviour. In the literature, tax morale is defined as an "intrinsic motivation" to pay taxes. However, for some scholars, this motivation has a moral aspect, meaning that paying taxes is a means of fulfilling one's moral obligation or "contributing to the society" (Cummings *et al.*, 2004). For others, that intrinsic motivation might be guilt, shame, or even to receive a reward for cooperation" (Luttmer and Singhal, 2014). Aside from these intrinsic reasons that lead to paying tax, it is established that tax morale creates a social norm for compliance (Bruno, 2019).

Frey and Torgler (2007) emphasise that the concept of cooperation and the importance of institutions as elements of tax morale are vital to understanding tax compliance. Cooperation can be better translated into the service paradigm, which prescribes a simplification of procedures and the availability of services to reduce the administrative burden on taxpayers. Defenders of this approach believe it fosters a cooperative environment, resulting in a more efficient tax system and enhancing trust in tax authority (Gangl *et al.*, 2013)(Waerzeggers and Hillier, 2016). Additionally, the relationship between individuals and institutions has many dimensions. Theories stress that institutions, especially tax administrations, play a vital role in taxpayer decisions concerning whether and to what extent to pay or evade their taxes. Institutions' effect on individuals' tax morale can be explained by how they perceive institutions, the level of trust and fair interactions with tax authorities, the governmental decisions about on what spend public money and, finally, by the "quality" of institutions, that is, how accountable, stable, effective they are and how well they control corruption (Farrar, Hausserman and Rennie, 2019)(Frey and Torgler, 2007)(Castro and Scartascini, 2015)(Bratihwaite, 2003)(Cummings *et al.*, 2004).

1.3 Trust and Power – The Slippery Slope Framework

The third theoretical perspective which attempts to explain why individuals pay taxes is focussed on trust-based interactions between taxpayers and institutions. Trust in institutions is related to their behaviour "in accordance with normative expectations, and about whether they will continue to do so" (Prichard *et al.*, 2019). Beyond a consensus on the positive effect of trust on tax compliance, scholars analysed trust from various viewpoints. Evidence shows that tax compliance increases when taxpayers have a perception of fairness, meaning that the tax system is fair and well-administered (Cummings *et al.*, 2004). The taxpayer might be willing to pay tax because they regard the tax system as fair, equal and transparent (Slemrod, 2019). Even the perception of how the government spends public money may influence the level of trust, increasing it when funds are directed to considered valued uses such as the fire brigade (Castro and Scartascini, 2015)(Pampel, Andrighetto and Steinmo, 2019).

In a step further, Kirchler (2007) took into account not only economic assumptions but also psychological and sociological determinants, analysing the bond between the tax authority and the taxpayer and its effects-on tax compliance. Indeed, his theoretical concept, well-known as the Slippery Slope Framework, is a three-sided relationship composed of the power of authority, the trust in authority and tax compliance. Trust and power can function independently but also blend and moderate each other (Tsikas, 2020). "Under conditions of low power, compliance increases with the degree of trust", while "under conditions of low trust, compliance increases with the power of the authorities" (Kirchler, Hoelzl and Wahl, 2008). Trust in authorities is defined as "the general opinion of individuals and social groups that the tax authorities are benevolent and work beneficially for the common good" (Kirchler, Hoelzl and Wahl, 2008).

As authors outline, the power of authority is "the perception of the potential of the tax office to detect illegal tax evasion" through enforcement and punishment. It also comprises the budget allocated to the tax authority and the support from society. Therefore, the power of authority features the 'fear of detection or due to a perceived risk of high fines despite motives for noncompliance" (Batrancea et al., 2019). In the Slippery Slope theory, power impacts tax compliance as long as tax authority has the capacity of coercion, prosecution and punishment (Kastlunger et al., 2013). Bersch, Praça and Taylor (2017), citing Fukuyama, explains that tax authority is an institution that "accumulate and use power". Adding to this idea, Braithwaite (2003) highlights that enforcement is related to the taxpayer decision of shifting power to the tax authority, and consequently results in the "loss of freedom on the part of the taxpayer".

Scholars identify two types of power in the Slippery Slope Framework. The coercive power is described as "the expectation that the influencing part will punish non-compliance" and taxpayers will bear the "monetary, physical, social, or psychological costs" of not complying (Kastlunger et al., 2013). The legitimate power, in turn, is regarded as "correct, legitimized and effective regulation of behavior" (Batrancea et al., 2019). It is not based on force, but on legitimacy, knowledge and information, which can foster tax authority's trustworthiness (Gangl et al., 2012). A compliant taxpayer can understand power as an acceptable way in order to tackle tax evasion. The power of authority can be reinforced, for instance, by "hiring qualified tax inspectors, setting higher audit rates or imposing steeper penalties" (Batrancea et al., 2019). The other side of this equation is that tax authority must exert its power to safeguard equitable and impartial taxation. Otherwise, an honest taxpayer can perceive high power as "a sign of distrust, resulting in resistance to the tax system and ultimately in noncompliance" (Kirchler, Hoelzl and Wahl, 2008)(Batrancea et al., 2019).

According to the Slippery Slope framework, enforced compliance is directly related to the taxpayers' perception of the power of authority's, whereas voluntary compliance relies on the perception that it is trustworthy and benevolent (Kirchler *et al.*, 2010). Thus, enforced compliance is improved by deterrence and enforcement procedures, underlined by a powerful authority that increases the taxpayers' fear of detection and also the likelihood of punishment (Batrancea *et al.*, 2019). In contrast, voluntary compliance is based on determinants beyond deterrence such as trust in the authority and social norms (Mendoza, Wielhouwer and Kirchler, 2017). Instead of fear and a non-cooperative climate, voluntary compliance achieves long-term benefits for tax administration through, for example, the accurate disclosure of tax liabilities as a result of taxpayers being properly registered with their respective authorities (OECD, 2014).

The Slippery Slope framework explains that instruments of power and trust-building tools used by tax authorities can create different kinds of climates depending on how these elements interact and balance each other. An antagonistic climate is characterised by an atmosphere in which the administration and taxpayers work against each other, triggering reciprocal distrust. Mendoza, Wielhouwer and Kirchler (2017) describe their relationship as "cops and robbers", whilst taxpayers require full-time monitoring and the tax authority is perceived as heavy-handed and untrustworthy. In contrast, a service climate also referred to as confidence or synergistic climate, is characterised by mutual cooperation between a tax administration and its taxpayers, underpinned by implicit reciprocal trust. The legitimate power of tax authorities is based on expertise, transparency, and the supportive treatment of taxpayers (Kirchler, Hoelzl and Wahl, 2008) and strengthens the perception that the tax authority pursues its objectives with "competence, motivation, and benevolence" (Gangl *et al.*, 2013). Furthermore, a service climate fosters voluntary compliance that is likely to be perceived as "a sense of obligation" (Kirchler, Hoelzl and Wahl, 2008).

Trust in, and power of authorities need time to mature (Tsikas, 2020) and moderate each other (Kirchler, Hoelzl and Wahl, 2008). As already said, a high level of enforcement can weaken compliance and decrease levels of trust. Empirical research has proved that "an elevated auditing level may signal distrust and lead to the perception that the tax authority and its enforcement actions are excessive and unfair, lowering the level of trust" (Mendoza, Wielhouwer and Kirchler, 2017). However, there is evidence that, in specific contexts, where tax authority is perceived as legitimate and trustworthy, the power of authority might be translated in severe sanctions while can increase compliance (Verboon and van Dijke, 2011). A recent empirical study has proved that the voluntary compliance of the Brazilian taxpayers is sensitive to the raising of trust levels in the tax authority (da Silva, Guerreiro and Flores, 2019). This study that systematically applied the Slippery Slope framework in Brazil evaluated the "relationship between the enforced compliance and the factor power", and concluded that "for Brazilian taxpayers, the power of government authorities represents a major issue for enforced compliance". It also has proven that in Brazil "the existence of trust-based interactions between taxpayers and public administration that leads to voluntary compliance" (da Silva, Guerreiro and Flores, 2019).

Enforcement and facilitation are closely linked with trust, but it goes beyond taxpayers' perception of the tax administration. It involves concepts such as fairness, simplicity and equality of the tax system as a whole (Mascagni *et al.*, 2020). This leads to a discussion of theories which advocate that a tax system perceived as fair, in terms of taxation processes, procedures and structures, is likely to achieve better outcomes and higher levels of compliance. A tax system should also "emphasise all the constraints under which the government must operate, particularly those imposed by the behavioural responses of individuals and companies to the taxes that are levied" (Devereux *et al.*, no date).

1.4 From Automation of Information Collection to Big Data

In addition to understanding the issues influencing taxpayer compliance and their implications for tax revenue (Basrowi, 2019), researchers and governments are also keen to determine how cutting-edge technology can contribute to better policymaking (McGuire, Omer and Wang, 2012). Tax administrations have long faced constraints imposed by limited information, jurisdictions and outdated technologies. To fill these gaps, governments have continuously invested in administrative and compliance structures to improve their capacity for handling large amounts and varieties of information at an impressive speed. From the tax administration perspective, there is an increasing interest for governmental projects that gather large quantities of data, evaluate them and apply the resulted knowledge for improved public decision-making (Gillis and Stephanny, 2014).

The automation of information collection reshaped the core of the tax administration process. Automation is understood as "mechanical or electronic systems for the performance of repetitive tasks at high speed" (Smith, 1969). Tax administrations have strategically invested in technology since the 1960s to improve performance, reduce costs, and increase efficiencies in delivering better benefits for taxpayers and bolstering tax compliance (Prichard *et al.*, 2019). Smith, back in 1969, cited automation and data processing as "complex systems" to, among other things, Memory Mass Storage and processing, and high-speed data (Smith, 1969).

The automation process in government follows technological advances in the private sector, and has gradually brought the tax administration from electronic fiscal devices to electronic transmission of taxpayer declarations, to using third-party data and beyond (Casey and Castro, no date)(Majdanska and Lindenberg Schoueri, 2017).

1.4.1 How Automation Dialogues with Enforcement and Trust

Automation and technological advances are often used by tax administrations to enforce compliance. Enforcement strategies include increasing the number audits and the speed of their processing to detect evasion or avoidance, and swifter punishments for a greater number of non-compliant taxpayers. Moreover, tax administrations can seamlessly exchange information with different government agencies and access. Even transnational data are accessible through automation (Jacobs, 2017).

Data on consumption are usually mentioned as an example of technological advances in accessing information by the tax administration. On the one hand, the use of digital payment methods enables tax authorities to reconcile individual consumption with reported income and wealth. On the other hand, those digital payments might be used as third-party reporters to cross-check business declarations (Jacobs, 2017).

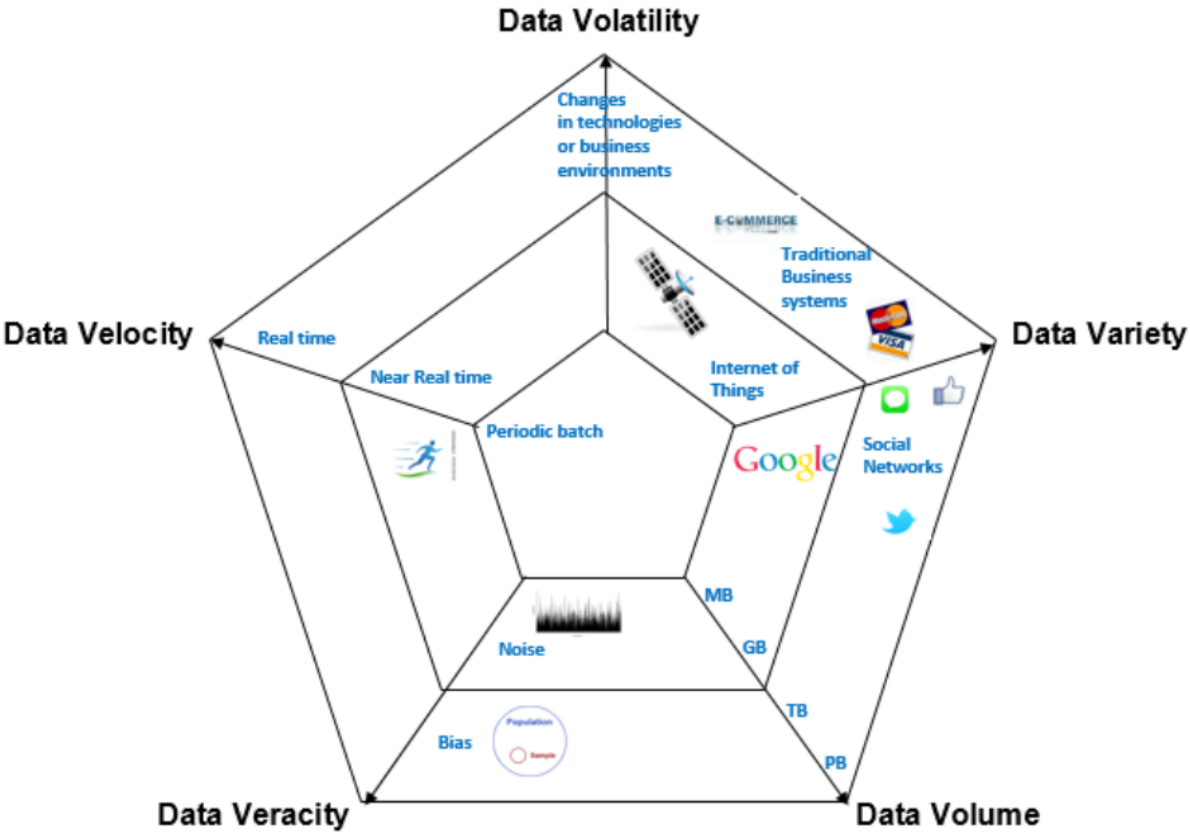
Beyond enforcement, in the last decades, automation is suggested as a means to enhance trust in governments (Krishna, Fleming and Assefa, 2017). First, automation has made the development of different services possible. The so-called "service paradigm" is recognised as having made great progress towards reducing tax compliance costs and building up trust in the tax administration (Farrar, Kaplan and Thorne, 2019)(Chen, Grimshaw and Myles, 2017). Second, technology may make the tax system more impartial, transparent and easier to understand (Jacobs, 2017). Prepopulated tax returns are often cited as "one of the most significant innovations over the last twenty years in personal income tax systems" (van Dijk *et al.*, 2020) for increasing efficiency and simplifying compliance. However, as a downside, evidence shows that if those pre-filled tax returns were not accurate, they could undermine tax compliance and impact on trust level (Chen, Grimshaw and Myles, 2017)(van Dijk *et al.*, 2020). The study has revealed that taxpayers "may be especially tempted" if the prepopulated returns comprehend inaccurate information that can provide an advantage "at little moral costs". The authors have explained that the compliance level decreases when prepopulated returns contain mistakes that can be beneficial for taxpayers (van Dijk *et al.*, 2020). An explanatory hypothesis is that the lack or inaccurate information implies that the tax authority does not have access to enough information (Chen, Grimshaw and Myles, 2017).

1.4.2 Typology of Big Data Used by Tax Authorities

More recently, tax authorities have been investing in big data, artificial intelligence and algorithms design (Wang *et al.*, 2020). From the taxpayer perspective, these new ways of managing information are streamlining to comply with their duties voluntarily and thus reduce the compliance burden. From the tax authority stance, these methods are helping to detect evasion and avoidance whilst promoting efficiency (Martinez and Lessa, 2013).

It is important to note that there is no consensus in the literature regarding the definition of big data. To understand this concept, one must first review the elements of data itself. Data is understood as being the "the most divisible or atomized useful unit" which is gathered and relates the "object or phenomenon under investigation", and precedes the analysis that can be developed (Schroeder and Cowls, 2014).

The so-called absolute definition has established four criteria to classify any data as big data (Gandomi and Haider, 2015). The criteria are: (1) the volume of data generated or processed; (2) the velocity in with these data are stored and analysed; (3) the variety of sources and data types; and (4) the veracity and standards of the collection (Schroeder, 2016). Although this concept is well-accepted and understood, it is unclear how it should be applied to data which only partially satisfy the criteria, or that possesses an unquantifiable level of veracity and variety. The image below illustrates how these characteristics are connected, including the volatility of the technology. It should be read from the centre outwards, taking into consideration that the individual elements can interact with one another in different stages.



(Hammer, Kostroch and Quiros, 2017)

Beyond discussions on the definition of big data, there are some characteristics which help to identify and classify these data (Cockfield, 2015). The first is that big data "represents a step-change in the scale and scope of knowledge about a given phenomenon" (Schroeder and Cowls, 2014), meaning that it is now possible to connect seemingly unconnected information and enable useful insights as a response to a threat (Tropina, 2017)(Hammer, Kostroch and Quiros, 2017). Second, big data possesses an incredible predictive power that can frame policymaking and set priorities (Tropina, 2017). Furthermore, it does not require scientific validity since it sits outside the scientific research area.

For this paper, I have adopted the concept of big data by Schroeder (2016). He states that it should be defined by a paradigm "relative to the prevailing technological and analytical capacity of the day" as "having access to data of a scale and scope that is a leap or step change from what was available before and to be able to perform computational analysis on these data" (Schroeder, 2014). This definition was chosen, rather than the others because it is not liked to a specific amount of data or capacity for processing them. On the contrary, it emphasises the importance of the 'step change' in managing data, what fits in the tax authority evolution handling with big data. This study recognises that tax authority should not be fully prepared for gathering and processing a large amount of data. However, it suggests that tax authority must acknowledge the leap in the availability of data and its analysis potential.

Based on Schroeder (2016), it is possible to compare taxation with his typology of big data business models. The first category he mentions is the "data users", which in the tax context could be described as the tax authority itself. The data user is the entity which handles the data for making better decisions and aggregating value into its core purpose. The second type is "data suppliers", who are, in the author classification, companies that gather raw data and package them for sale. As with the private sector, organisations could discover that the data they collect for a primary goal may also be useful for tax administration. Lastly, "data facilitators" have already been providing infrastructure, consultancy and outsourced analysis for tax administrations that do not yet have the technical expertise.

1.4.3 How Big Data Dialogues with Enforcement and Trust

The potential of big data application on tax administrations depends on the operational capacity and the legal framework of each government. The technological ability to access and gather a large amount of structured and unstructured data from public and private datasets is the first step in developing a big data project (Tropina, 2017). Next, the operational capacity should include predictive analysis and data mining, which, along with statistics, could identify patterns, create compelling knowledge, and orientate decision-making (Varian, 2014). In addition to technological capacity, the legal framework, privacy, and security and quality boundaries must be well-established before a tax administration moves towards big data (Hammer, Kostroch and Quiros, 2017).

There are several examples of tax administration use of big data to prevent tax avoidance and tackle tax evasion (Tropina, 2017). There are also academic evidence and data analysis techniques that allow tax administrations to be a step ahead of evaders (Mehta *et al.*, 2019). These prove that tax administrations need to update their arsenal of tools to deal with the impact of the digital world on taxation. Indeed, big data is already being used by criminals to evade taxes, target taxpayer information for fraud, steal identities to be used to file false tax returns (Tropina, 2017), and to create loopholes in the tax system. This environment has posed an increasing challenge on authorities as long as the traditional enforcement strategy is far more costly and time consuming (Tropina, 2017) than what the digital context demands. Nevertheless, big data and the resulting knowledge produced have been used to strengthen enforcement, maintain non-compliant taxpayers under surveillance, and increase public perception of the power of the tax authority.

Notwithstanding, big data and data analytics must be a call to develop more trustworthy tax institutions. Digital technologies have the potential to help tax administrations be more transparent, impartial, accurate and efficient in their procedures, so long as they can simplify administrative processes and reduce time and costs for taxpayers (Krishna, Fleming and Assefa, 2017). Processing and analysing large amounts of data may also benefit tax administration by helping to forecast tax revenue with accuracy and transparency, which has a great impact on the elaboration of the public budget. Finally, big data can facilitate the estimation of tax revenue statistics whilst aggregating macroeconomic data and its impact on taxation and the creation of new indicators (Hammer, Kostroch and Quiros, 2017).

Despite these anticipated advantages, there are few studies about the dialogue between big data and trust in authorities. Though scholars and technical reports agree that governments should concentrate on privacy, confidentiality and cybersecurity concerns when adopting big data (Hammer, Kostroch and Quiros, 2017)(Varian, 2014). What is certain is that big data alone is not the answer for building trust in tax authorities, fostering voluntary compliance and, consequently, narrowing the tax-gap. When considering the future of tax administration and the new possibilities that can be technology presents, it is crucial first to assess the tax policy and the foundation of the relationship between tax authority and taxpayers. This working paper may raise more questions than are able to be addressed in one study.

For this reason, it will focus specifically on the Brazilian context, given Brazil's tax administration has already accessed big data through some projects, such as the Public System of Digital Bookkeeping (SPED). Moreover, there is a hint of the necessity of the need to building trust in Brazil's tax authorities and strive for voluntary compliance, as seems to be the case in the state of São Paulo, where in 2018 they created a Tax Compliance Stimulation Program (TCSP) by the complimentary Law number 1320 (da Silva, Guerreiro and Flores, 2019). This demonstrates the appetite among policymakers for taking an alternative approach to raising tax compliance in Brazil. The Law asserted its intention of developing a "mutual trust" environment, whilst the government of São Paulo explained, at the time of the ratification of the Law, that the Programme

> *"introduces a new logic of action by the state tax authorities, focused on support and collaboration, to gradually replaces the model excessively focused on drawing up of infraction notices, which generates great legal insecurity and induces administrative and judicial litigation"*[4].

2. Policy Challenge

2.1 Brazil's Tax Administration – Structure and Approach

The Federative Republic of Brazil is comprised of 26 States, the Federal District, and over 5,000 municipalities (De Mello *et al.*, 2009). Each level of government has its own

[4] https://www.saopaulo.sp.gov.br/spnoticias/nos-conformes-e-aprovado-pela-assembleia-legislativa-de-sao-paulo/

power of taxation, management and autonomy, and has the ability to provide its community with effective and efficient public services due to its proximity with the population, relevant benefits and lower costs (Oates, 1999). Brazil's tax burden is considered one of the highest among the developing countries, reaching 35% of the Gross Domestic Product (GDP) (Gobetti and Orair, 2017). The Organisation for Economic Co-operation and Development (OECD) revealed in a 2017 report that "the net revenue collection did not reach 50% of total government revenue in 2014" (OECD, 2017b).

Usually, tax administrations, including Brazil's, are assessed on their ability to collect the most revenue, enforce avoidance and prevent evasion (Silvani, 1992). The traditional approach is focussed on expanding enforcement and facilitating tax payments over the perspective that if the weak enforcement is not strong and agile enough to prevent tax avoidance and to tackle tax evasion fully, tax compliance might end deteriorated. However, if taxpayers are unwilling to comply with their tax obligations voluntarily, then these programmes will prove too costly and not achieve their objective (Touchton, Wampler and Peixoto, 2019).

From the tax administration viewpoint, enforcement has been at the core of Brazil's Federal tax authority strategy. This is underlined from its multi-year strategy plan for 2020[5], which asserts a 24.03% growth in procedures of registering of tax credit after an in-person inspection by auditors. The deterrence strategy is also exposed in the higher penalties that, by law are at least 75% of the tax levied and can reach up to 225% of the amount evaded (da Silva, Guerreiro and Flores, 2019). Despite the elevated level of enforcement, Brazil's tax administration in 2018 faced an estimated R$345 billion (Brazilian Reais)[6] or about $ 62.1 billion (Dollar)[7] due to tax evasion. The existence of the shadow economy, which in 2014 was estimated at nearly 39% of the GDP, highlights one of the great efforts to identify and register those taxpayers who should be part of the system in order "to reduce the underreporting, and the consequent loss in tax revenues" (Khwaja and Iyer, 2014).

There are few academic reviews about Brazilian taxpayer behaviour and their tax morale (da Silva, Guerreiro and Flores, 2019). However, the results of a 2015 global survey that examined socio-cultural and political values revealed that Brazilians tend not to pay their taxes (Pereira and Silva, 2020). This reinforces the perception of a weak and unreliable relationship between Brazilian citizens and the State, which has historical roots (Martinez and Coelho, 2019)(Pereira and Silva, 2020). It is also supported by the fact that less than 20% of Brazilians were registered as active personal income taxpayers in 2015, according to the OECD report (2017a).

The tax environment in Brazil may reveal a hybrid situation which has been attracting the attention of scholars to understand how taxpayers' behaviour is influenced by

5 https://receita.economia.gov.br/dados/resultados/fiscalizacao/arquivos-e-imagens/plano-anual-de-fiscalizacao-resultados-de-2019-e-plano-para-2020.pdf
6 https://www.sinprofaz.org.br/tag/sonegometro/
7 https://www1.oanda.com/currency/converter/

Brazilian tax authorities' power and integrity. For one side, there is a well-structured tax administration which has been investing in new technologies to enforce compliance and narrow the tax-gap. For the other side, there is a higher tax burden and an ever-rising amount of tax evasion (da Silva, Guerreiro and Flores, 2019).

An empirical study (2019) that evaluates, among other things, the "relationship between the enforced compliance and the factor power" in the Brazilian context, concluded that "for Brazilian taxpayers, the power of government authorities represents a major issue for enforced compliance". The authors, when analysing their second hypothesis – that a high perception of tax authorities' power by taxpayers leads to greater enforcement of tax compliance – found that "higher trust was more associated with lower enforced compliance, a higher power was associated with higher enforced compliance, and older age was associated with higher enforced compliance" (da Silva, Guerreiro and Flores, 2019). These findings align with the literature, which observes that tax evasion decreases only to a certain level of enforcement, and that elevated auditing levels can backfire, leading to both reduced voluntary compliance and trust in institutions (Mendoza, Wielhouwer and Kirchler, 2017).

In turn, tax administrations around the world have begun to accept that social context, legitimacy, fairness and trust all impact compliant or non-compliant tax behaviour (OECD, 2013), and that they should "perform their role as tax collectors giving careful regard to the relationship of trust that needs to exist between them and their customers" (OECD, 2017a). At the same time, tax administrations have been managing the new world of possibilities brought by technologies (Campbell, 2014). Despite having high levels of enforcement and low trustworthiness, Brazil's Federal tax administration stands out for its use of technology and its efforts to improve services and facilitation for taxpayers (OECD, 2017a). In its report, the OECD explains that Brazil's tax authority has "on-time filing rates in excess of 95% across all four return types", and that it is an effective rate to measure the performance of the tax administration (OECD, 2017a).

Another example is the implementation in around 1994 of Electronic Fiscal Devices (EFDs) for state-level consumption collection, which has been cited by scholars as an exceptional innovation project (Casey and Castro, no date). The initiative involved the Federal Revenue Service, State tax administrations, and the voluntary participation of some corporations (Dias, De Mello and Fernandez, 2010). The project let to wide-spread adoption of electronic documents in Brazil's corporate sector, created a national framework for digital files, and eased the relationship with different tax authorities for multi-regional business (Casey and Castro, no date)(Campbell, 2014)(De Mello *et al.*, 2009). As an additional positive side effect, it led organisations to invest in their technology infrastructures by improving their IT systems and data controls (De Mello *et al.*, 2009). The use of EFDs increased the administration's transparency, simplified processes and reduced costs for taxpayers.

Regardless of the level of enforcement adopted, the use of technologies by Brazil's tax administration fits into the different compliance dimensions from increasing the capacity of audits, to dealing with third-party information, and to improving taxpayer services. In the Brazilian context, the current challenge is to move from an enforced approach to a trustworthy environment, strengthening the integrity of the tax authority through knowledge produced from the big data analysis.

2.2 Brazil's Tax Administration – Use of Big Data

Brazil's tax administration has recognised that big data and data analytics may offer solutions to its challenges. The higher levels of tax evasion and tax avoidance in Brazil, combined with continuous reductions in the institutional budget have greatly increased the pressure on the tax administration for innovation and efficiency, leading to a "significant but gradual transition towards" data-driven approach (Schroeder, 2016). Tax authorities have invested in expanding their capacity to implement taxpayers' risk profiles, flag audit topics, cross-check information and maximise data value (Majdanska and Lindenberg Schoueri, 2017)(Martinez and Coelho, 2019).

The big data era started in Brazil with the storage, process and analysis of administrative data. This kind of data, usually in high-volume, is generated and processed in governmental systems (Hammer, Kostroch and Quiros, 2017). In the next phase, the focus was to access, combine, and share other official sources through proprietary government databases such as the National Department of Mineral Production and the Central Bank datasets. At that moment, Brazil's tax administration strengthened its relationship with data facilitators, from the private sector and even public enterprises, which supported infrastructure, offered consultancy and provided data analytics. Big data then became a reality for the tax authority, and with this came the new capabilities to gather, process and analyse an enormous volume of proprietary and various sources data, almost in real-time (Gupta, Keen and Shah, 2017). Tax administrations are using big data and algorithms in several ways, for instance, to accurately prepopulate tax returns, cross-check third party information, and access and link cross-country data.

Furthermore, there are other data frontiers that some tax administrations, such as the U.S. Internal Revenue Service (Houser and Sanders, 2018), has already reached. The era of online personal data, social network profiles and the possibilities brought about by biometrics are promoting theoretical and practical debates about the limits which tax administration can go to bring together relevant tax information.

2.2.1 Big Data and Enforcement in the Brazilian Context

Big data and data analytics play a key role in the enforcement environment that prevails in Brazil. Tax audits, which are the primary verification activities, have been translated into the digital world. Technological tools provide more accurate controls for inconsistencies and irregularities (Brasil, 2020), and enhance the productivity and targeting by the administration on "higher risk" areas and taxpayers (Campbell, 2014)(OECD, 2017a). The Public System of Digital Bookkeeping (SPED) (Campbell, 2014) is often cited as an example of effort of modernisation of Brazil's tax authorities (Brasil, 2020)(Gillis and Stephanny, 2014). The system includes the electronic sending, receiving and storing of invoices between sellers and buyers (OECD, 2017a), and provides tax authorities with a full overview of tax accounting information to determine the tax liability (Martinez and Lessa, 2013) and to apply penalties in "near real-time", where necessary (OECD, 2017a). Therefore, the SPED has increased "the number of audits, their assessed value and total tax collected" (Dias, De Mello and Fernandez, 2010).

Still, it is clear there are many opportunities for enforcement tax policies, considering the tax authority has the potential to learn a great deal more about many more taxpayers. Brazilian taxpayers and anyone who has access to are legally bound to report any tax-relevant information. Moreover, third party reports enable the tax administration to obtain direct information on most income sources, sharply reducing the reliance on self-reporting (Saez and Zucman, 2019)(Cockfield, 2015). Tax information may disclose detailed personal data which gives the authorities the ability to build up a full profile of an individual's identity, including their income, financial obligations and dependency status (Cockfield, 2015).

From this perspective, governments can decipher "legible"[8] individuals so policies can accurately target tax collection and recover (Hatfield, 2015). 'Legibility' is used as a form of State organisation to collect revenue because governments "can only exert their power on what they can know about"[9]. James Scott emphasises that a government's lack of knowledge about its population is related to how well it manages individuals' information. The higher the systematisation and organisation of the data, the higher the State's knowledge, control and manipulation[10]. Likewise, the extent to which every individual is legible is changing dramatically as a result of improved technologies that read enormous databases, and due to almost infinite digital footprints, an individual left behind.

A concern raised by some scholars is that those digital footprints become the social "essential traits and tendencies" (Andrejevic and Gates, 2014). The greatest risk is that the "metadata" is taken as the "atomized useful unit" (Schroeder and Cowls, 2014) of the social material, leading policymakers to predict wrong social behaviours or, what is worst, to create or amplify different kinds of bias. It is plausible to imagine, for instance, that wealthier people are already much more aware of the potential and relevance of their personal data[11], and what to do (or not to do) online to protect it and to escape tax authority attention (Harrington, 2015).

8 In the words of Yale political scientist James Scott (Rule, 2009).
9 https://www.cato-unbound.org/print-issue/487
10 James C. Scott, Lead Essay, The Trouble with the view from above, accessed on https://www.cato-unbound.org/print-issue/487
11 https://www.businessinsider.in/from-hiding-their-mansions-on-google-maps-to-building-500000-panic-rooms-rich-people-are-sparing-no-expense-to-keep-their-lives-private-and-secure/articleshow/66681557.cms

Besides, there are some challenges related to the tax system that encompass not only data sources, data quality and tax authorities' use of it, but also taxpayer privacy and confidentiality. An article in The New York Times Magazine clearly said that "privacy is the currency of our online lives, paying for petty conveniences with bits of personal information"[12]. Personal data is shielded by privacy, which assures "an individual's interest in how his or her personal information is collected, processed, and used" (Hatfield, 2015). Nonetheless, the legal framework allows tax authorities to collect, hold and use personal data without explicit consent "so long as it is relevant for tax purposes" (Hatfield, 2017). As in a dystopian world, this could be intrusive and authoritarian, increasing State control and undermining individual rights as every personal detail could be deemed "tax relevant" (Boyd and Crawford, 2012)(Houser and Sanders, 2017). In this sense, intrusion on privacy may have an intangible social cost (Slemrod, 2019), one where the tax administration's institutional integrity weakens as a consequence of the eroding trust connection with the taxpayer.

The current challenge facing the Brazilian tax authorities seems to be how to change the course of big data projects that have already been implemented for a more trustworthy relationship with taxpayers. Building trust, from an institution integrity perspective, will require that the Brazilian tax authority pursues its legitimate purpose through a clear focus on reducing taxpayer burdens and fostering voluntary compliance whilst keeping pace with ever-evolving technology.

2.3 Promoting Tax Institutional Integrity in the Brazilian Context

The Slippery Slope framework suggests a balance between the taxpayers' perception of the tax administration's potential for enforcement and punishment (power of authority), and a general consensus that the tax authority is working towards the common good (trust in authority) (Kirchler, Hoelzl and Wahl, 2008). In a broad sense, these concepts are related and complemented with the two other perspectives of the behavioural approach. The first is that voluntary compliance is intrinsically related to the taxpayer's tax morale as well as their sense of cooperation, which can be enhanced through simplified procedures and the availability of tax services (Frey and Torgler, 2007). This is paramount of the service paradigm, which induces tax authority to address taxpayer willingness to comply, reducing the compliance costs (Gangl *et al.*, 2013). Second, this theory maintains that how taxpayers perceive institutions is equally relevant to their decision to pay or evade taxes (Bratihwaite, 2003)(Castro and Scartascini, 2015). Their perceptions will be influenced by their level of the confidence in the government's public spending, as well as its accountability, stability and ability to control corruption (Touchton, Wampler and Peixoto, 2019)(Cummings *et al.*, 2004).

For different theories and in different circumstances, the level of trust in a tax authority appears to be the common ground for seeking voluntary tax compliance. It is the

12 https://www.nytimes.com/2017/05/09/magazine/how-privacy-became-a-commodity-for-the-rich-and-powerful.html

reciprocal trust between taxpayers and tax authorities that builds an environment of mutual cooperation, generating long-term benefits for the tax system as a whole (OECD, 2014). The Institution-first concept of public integrity touches various aspects of tax compliance theories. According to this concept, tax administrations should value taxpayer trust whether it pursues to collect revenue with its all and best abilities, generating an overall awareness that the tax authority exercises its legitimate power properly, with transparency, accountability, efficiency and a deep heart motivation (Kirby, 2018).

In Brazil, there is some indication and empirical evidence of the benefits of building institutional trust. Academic studies have proven that fostering a cooperative environment and enabling citizen participation in government have a positive effect on tax compliance in Brazil (Pereira and Silva, 2020)(Prichard *et al.*, 2019)(Touchton, Wampler and Peixoto, 2019). For instance, municipalities that adopted participatory budgeting "collect 39% more locally-generated taxes than similar municipalities without these programs" (Touchton, Wampler and Peixoto, 2019). In those municipalities, citizens were encouraged to get involved in tax assessment as well as in oversight specific public spending (Prichard *et al.*, 2019). The possible explanation for improving tax compliance is that increasing transparency by public participation on budget expands the "likelihood that citizens and civil society organizations can hold their governments accountable" (Touchton, Wampler and Peixoto, 2019). Scholars also have found empirically that reducing corruption leads to a more positive impression of the government's legitimacy and responsiveness, which also favour tax compliance (Timmons and Garfias, 2015). Finally, da Silva, Guerreiro e Flores (2019) have proven that in Brazil "the existence of trust-based interactions between taxpayers and public administration that leads to voluntary compliance".

Which strategy for building trust works in each environment? This is a key question for policymakers (Prichard *et al.*, 2019). The state of São Paulo in 2018 ratified complimentary Law number 1.320 to encourage a trustworthy relationship between taxpayers and tax authorities through the Tax Compliance Stimulation Programme (TCSP - "Nos Conformes") (da Silva, Guerreiro and Flores, 2019). The Program establishes benefits and stimulus for voluntary tax compliance, aiming to develop a "culture of transparency and compliance" among public and private sectors (Mota Filho, Mota and Lanz, 2019). A theoretical paper has examined the TCSP legislative process. It concluded that the State government was able, in a short time, to build crucial coalitions with corporates, political institutions, civil society organisations and public servants' unions in order to get the legislation approved by the Legislative Assembly (Mota Filho, Mota and Lanz, 2019).

The cited Law number 1.320 demonstrates an appetite for approaching tax compliance differently from toughening enforcement. The TCSP is underpinned by principles of tax governance, namely simplification of the state tax system, as well as predictability and certainty due to the neutral application of the tax law framework. The main goals of the Programme are to enable and encourage self-regularisation, reduce tax compliance costs, expand the communication channels between authority and taxpayer, bolster the tax administration structure and human capacity, and to supply new and update the already existed technological systems. There is also scope for tax authorities to adopt academic and research-based recommendations on the use of technology to promote tax compliance.

The self-regularisation is supported through data analysis (Análise Informatizada de Dados – AID) of taxpayer information which the tax authority gathers and processes automatically. The procedure consists in to notify the taxpayer about the found any inaccuracies found in their tax filings and given the opportunity to adjust their filings, in a given period, without any penalty. Of course, this does not apply to situations where there is already proof of fraud. The Programme establishes a taxpayer rating, which is made from their financial information and level of compliance, from "very high level of compliance(A)" to "very low level of compliance(E)" (Sapienza Filho and Bifano, 2017). The central idea behind the classification system is to reduce taxpayer compliance costs, whether or not their reputational analysis ends in a "good grade". Depending on their rating, the taxpayer will gain access to progressive rewards, which vary from effortless access to their AID (data analysis) to being allowed to compensate previous tax credits to pay their current duties. Moreover, the tax administration provides free consultancy service, runs tax education campaigns, and provides regular update programmes for public servants.

The system inaugurated by the Programme underlines the notion that a thriving environment of cooperation, where both parts are interested in succeeding, can engender positive behaviour change. The integrity of the tax institution is enforced through well-defined principles and transparent procedures. The Programme also recognises and safeguards against inequalities by, for instance, establishing different criteria for small and medium-sized enterprises. Furthermore, there are specific rules regarding personal data access, for example, the tax administration is required to correct any mistakes they have made, and taxpayers can prohibit their tax rating from being published online.

Despite some important examples, there is no single solution to champion voluntary compliance, and Brazilian policymakers know little about the factors which impact on Brazilian taxpayers' behaviour and compliance (Touchton, Wampler and Peixoto, 2019). The prevailing enforcement approach has not resolved the tax-gap, and moreover, an environment of excessive power combined with a low operational capacity promotes a negative environment, generating taxpayer resistance and decreasing their level of trust, "as seems to be the case in Brazil" (da Silva, Guerreiro and Flores, 2019)(Mendoza, Wielhouwer and Kirchler, 2017). Hence, the power of Brazil's tax authority must be legitimated through transparency, competence, the supportive treatment of taxpayers and on sound, well-designed activities (Kirchler, Hoelzl and Wahl, 2008).

An important study (da Silva, Guerreiro and Flores, 2019) that systematically applied the Slippery Slope framework in Brazil has demonstrated that "as taxpayers' trust gradually increases", their relationship with tax authorities can shift from the "criminal paradigm" to strengthened voluntary compliance. It is the necessary evidence that Brazilian taxpayers want to collaborate with the administration "as they verify greater trust in the government" (da Silva, Guerreiro and Flores, 2019). The authors have affirmed that "this result brings an indication of robustness to the hypothesis that high taxpayer trust in government leads to more voluntary tax compliance according to the Brazilian taxpayers' answers". In concluding, they set forth the idea that "in a prominent voluntary compliance environment, there is no statistical significance for the factor power as well as the interaction between trust and power. This result indicates that trust leads to voluntary compliance for Brazilian taxpayers" (da Silva, Guerreiro and Flores, 2019).

2.3.1 The Institution-First Conception Applied in the Brazilian Context

Brazil's tax authority meets the first criteria of the Institution-first concept of public integrity (Kirby, 2018), in that its purpose is to collect revenue. Moreover, the legitimacy of its purpose is granted by the Brazilian Constitution and the power derived from a democratically elected government. However, the pursuit of its legitimate purpose through its best abilities in a context of limited resources is a challenge for Brazil's tax authorities. The constraints progressively imposed on tax authority budgets, especially on that of the Federal Revenue Office[13], have imposed the demand for innovative alternatives through investments on sophisticated technology infrastructure, big data and data analysis. However, the core of Brazilian tax policy and the relationship between the administration and taxpayers have either not been assessed or not changed at the same pace. The result is a well-structured tax administration focussed on enforcement, yet one that is incapable of managing the low level of taxpayer trust (Casey and Castro, no date).

The next step should be to build up the legitimacy of the tax administration. It could be done through the use of existing digital services and big data access to encouraging "a higher level of government-citizen interactions" which could result in "a more effective role in promoting trust in the government and the government's reputation" (Wang et al., 2020). The simplification of tax procedures and the availability of tax services are intrinsically related with voluntary tax compliance (Frey and Torgler, 2007), and it is "important to legitimate pursuit of purpose" (Kemularia, 2019).

The simplification of the tax legislation and procedures works as an important tool to reduce complexity and the knowledge gap. It means that simplifying the tax laws can increase 'taxpayers' literacy', which is taken as a way to increase trust in tax authority (Kirchler, Hoelzl and Wahl, 2008). Yet diminishing the system complexities serves as a discouragement to tax evasion because there will be fewer advantages for non-compliant behaviour (Baer and Le Borgne, 2008). Prepopulate tax returns with

13 https://www.prnewswire.com/news-releases/sindireceita-adverte-que-receita-federal-comeca-2020-com-orcamento-e-quadro-de-servidores-defasados-840813915.html

third party information, reducing the filing burden for taxpayers, is mention as an example of procedures' simplification (Krishna, Fleming and Assefa, 2017)(Gale and Holtzblatt, 2005).

The flipside is the trade-off between the needed reforms and the instability and uncertainty that frequent changes could generate. Kemularia (2019), analysing the tax reforms in Georgia, points out that changes in the tax law should include popular participation, consultation process of the stakeholders, clear communication of the changes, and focus on economic and social objectives. Brazil's tax authority could draw some lessons from Georgia tax reforms, held between 2003 and 2012, such as the simplification of the tax code and elimination of ambiguities to improve compliance and prevent corruption. In addition, retroactive and transition provisions should be included only for a specific policy "to introduce tax incentives for investment to encourage spending during an economic downturn" (Kemularia, 2019). The author concludes that simplification can help tax authority to achieve its main goal of collecting the most revenue with the best of its resources.

Likewise, one of the tax authority commitments could be to ensure that taxation is blind to social groups or class. Notwithstanding, Brazil's tax administration could act more aggressively towards groups who manage their data less conscientiously. Although it is not the objective of the tax authority to educate the Brazilian people on digital literacy or provide access to technological tools, it cannot pretend that every citizen has equal access to education or knowledge with which to manage their personal data. Hence, data representation is a key point that tax authorities need to address. They also must understand how big data can drive knowledge, policy objectives and financial forecasting. After all, raw data has less value than the knowledge created by their analysis and predictions (Schroeder, 2016). Algorithms and machine learning are tools to transform large datasets into palatable information for policymaking (Varian, 2014). The generated knowledge aims to reach a defined objective, such as influencing behaviour or controlling society's responses (Schroeder, 2018). It is context-related, especially restrained to a specific population, and it needs to be taken into perspective (Schroeder, 2018). Various modern tools can verify data integrity (Varian, 2014), and may reveal how the events were measured and analysed and which conclusions the policymaker can expect. Despite the tools, it does raise concerns regarding the creation and amplification of bias.

Impartial enforcement implies an equal intensity of enforcement for different groups in society. If the tax authority is perceived as fair and impartial, taxpayers most likely accept or might actively be in favour of tax enforcement. The representativeness is, then, the crucial element to uncovering implicit bias and what the representation includes or leaves out. The idea, for example, that the wealthier can handle better with their personal information in the era of big data raises questions related to the validity, powerful and bias involved in the data source and within its analytical mechanisms, and undermine the legitimacy of pursuit of tax administration in its impartiality dimension. Nevertheless, demonstrating this representativeness publicly, or showing the problem and promising to address it, should increase trust in the tax authority.

So, it sounds interesting, as a suggestion, that the legitimacy of pursuit of the tax administration calibrates the intensity of the enforcement into the Brazilian context. This could be assessed through various statistic comparative analyses between the big data analytics used by tax authority with the active economic elements of the demographic census of the population, such personal income to name one[14]. This process will determine whether the results of tax analysis truly mirror the economic information about the Brazilian population, or whether they are contaminated with bias or impartiality resulting from an unreliable database. It is essential to note that economic census data will yield limited knowledge, and must be interpreted in conjunction with other available official economic statistics. For one, the data is not current, as the last official Brazilian census was conducted in 2010, and the next census has been postponed until 2021. In addition, these data are only a static snapshot of the population, which was stratified by their informed income, which should be compared and proved by other official sources.

Furthermore, it is vital to note there are differences between the availability of data regarding legally informed by taxpayers and those which are collected via new technologies and made available on the internet. At present, there is no clear regulatory framework for managing public data or data collected from the public. This creates an insecure environment for both data owners as well as those who manipulate it as a result of legal uncertainties. The tax authority must strike a balance between the public benefit gained from sensitive data analysis, and the need to protect and educate the public regarding the use of their personal data (Goldstein and Gilbert, 2019). This can enhance the institution's integrity and reduce unpredictability in tax policy outcomes.

A survey conducted by the PWC consultancy in 2017 (*How consumers see cybersecurity and privacy risks and what to do about it*, 2017) about the interconnection of data security, privacy, regulation and the consumers' level of trust in companies revealed that "just 25% of respondents believe most companies handle their sensitive personal data responsibly, and only 15% think companies will use that data to improve their lives". The situation could be worse for public institutions, considering that individuals are willing to share personal information with corporates because they believe they will get something in return (Varian, 2014). The same survey showed that 72% believe companies are better equipped than government to protect their data", and "70% believe that government is ineffective in ensuring fair use of their data". Similarly, Mendoza, Wielhouwer and Kirchler (2017) notice that the World Bank publicised two measures to gauge the trust in government, which are the "perception of the extent to which (i) government decisions are effectively

14 https://www.ibge.gov.br/estatisticas/sociais/populacao/9662-censo-demografico-2010.html?edicao=9672&t=resultados

implemented, and (ii) government policy is transparent". This means that if tax authorities do not use the data they access responsibly in a manner which gives taxpayers the perception of protection and trust, it may lead "nowhere in their efforts to harness the value of that data"[15] to improve voluntary compliance.

Transparency is a worthwhile and necessary endeavour (Trautman, 2017) provided it reinforces the robustness of the legitimacy of the tax administration. As in the previously mentioned example of the participatory budget, transparency offers citizens the opportunity to observe the internal procedures and participate in the decision-making process. Therefore, tax authorities must disclose which personal information they collect and provide a procedure for individuals correcting mistakes and/or authorizing its use. There must be precise information regarding, which databases are accessed and for which purpose and individuals must be granted the right to correct any possible mistakes or to request the removal of certain personal information. Moreover, taxpayers must be informed about how their data is used and for what purpose, for instance, to improve revenue collection or for other secondary gains, such as institutional efficiency (Gillis and Stephanny, 2014). There is a risk, alleged by tax authorities, that if the data and its algorithms were disclosed and made transparent, it would become easy for taxpayers to game the system and, in turn, weaken tax law enforcement (Houser and Sanders, 2017). This is not an insignificant concern; however, tougher enforcement cannot be the remedy.

So an applicable recommendation might be that tax authority should develop and promote a comprehensive data policy which clarifies the collection, use and sharing of data, based on principles of transparency and accountability. Accountability, also an expression of the robustness of tax administration integrity, must be greater given the amount of data and personal information that is available to the tax authority. This could be accomplished through the publication of transparent and easy-to-understand policy guidelines which outline personal data privacy protections as well as measures to prevent data misuse by the tax administration.

The debate on these issues is complex, and this working paper does not purport to dig into all the related theoretical and practical discussions. However, another recommendation could be noteworthy. Brazil's tax authority should take a proactive approach to adherence to Brazil's data privacy regulation, the General Law of Data Protection (or Lei Geral de Proteção de Dados) which comes into effect on the 3rd of May 2021, as it may provide citizens "greater digital agency"[16] to better understand and manage their personal data.

Conclusion

Paying taxes is a legal duty for citizens (Kirchler, Hoelzl and Wahl, 2008). Theories try to explain taxpayers' motivations to comply. Traditionally, enforcement supports tax

15 https://www.pwc.com/us/en/services/consulting/library/consumer-intelligence-series/cybersecurity-protect-me.html
16 https://hbr.org/2020/01/why-companies-make-it-so-hard-for-users-to-control-their-data

administration policies, based on the penalties available to prevent or to punish tax evasion and the likelihood of detection. The service-based approach symbolized an evolution, dedicated to facilitating taxpayers in fulfilling their obligations and thus reducing compliance costs. More recently, legitimacy, fairness and trust have been recognised as relevant to influencing compliance behaviour. The Slippery Slope framework suggests a balance between taxpayer perception of the tax authority's potential for enforcement and punishment (power of authority) and a general consensus that the tax authority is working towards the common good (trust in authority) (Kirchler, Hoelzl and Wahl, 2008).

This study collaborates on the literature due to its focus on Brazil's tax environment, and the use of modern technologies to build up trust in the tax authority. It analyses the relationship between the use of big data by the Brazilian tax authority and institutional trust, which no other academical paper has done previously. There is empirical evidence in Brazil that "trust is associated with voluntary compliance, and the higher the trust is in government, the more voluntary that the compliance is". On the other hand, "the variable power of authorities was associated with higher enforced compliance, indicating that, in the presence of great power, individuals comply with tax obligations as a response to this context; in other words, they pay taxes not voluntarily but forcibly" (da Silva, Guerreiro and Flores, 2019). Although enforcement has been the core of the well-structured Brazilian tax administration, the country faces a higher tax burden and an ever-rising amount of tax evasion (da Silva, Guerreiro and Flores, 2019). The tax authority in Brazil seems to be incapable of managing the low level of taxpayer trust (Casey and Castro, no date). In the Brazilian context, the challenge is to move from an enforced approach to a trustworthy environment, reinforcing tax administration integrity.

Different technologies have been tested to narrow the tax-gap, reduce tax evasion and enhance compliance. More recently, those technological tools have been suggested as a means to develop trust in governments. First, automation has made possible a number of taxpayer services. Second, prepopulated tax returns, for instance, are increasing the impartiality and transparency of the system whilst also making them easier to understand (Jacobs, 2017). Third, tax authorities have been investing in big data, artificial intelligence and algorithms design (Wang *et al.*, 2020). Notwithstanding its wide-utilisation on enforcement, big data can be used to promote more trustworthy tax institutions. Technology and information may help tax administration to be more transparent, impartial, accurate and efficient in its procedures.

While big data may create opportunities for better policymaking, there is a key trade-off between privacy rights and transparency, and the amount and variety of data governments can collect, process and use in tax policies. Big data and analytical algorithms are already improving tax compliance and increase tax recovery, so it is vital that tax authorities analyse the knowledge generated and its consequences within legal standards of accuracy, and be aware of the creation and amplification of bias.

In conclusion, it is notable for summarising policy recommendations as followed:

5. The legitimacy of pursuit of the tax administration man calibrates the intensity of the enforcement into the Brazilian context. This could be achieved through various comparative statistical analyses between big data analytics used by the tax authority and active economic, demographic data, such as personal income. This process will determine whether the results of tax analysis truly mirror the economic data on the Brazilian population, or whether they are distorted by bias or impartiality from an unreliable database.
6. Brazil's tax authority should adopt and promote proactive policies on data use and data sharing based on the principles of transparency and accountability. This could be accomplished through the publication of transparent and easy-to-understand policy guidelines which outline personal data privacy protections as well as measures to prevent data misuse by the tax administration.
7. Brazil's tax authority should take a positive approach to adhere to Brazil's data privacy regulation, the General Law of Data Protection (or Lei Geral de Proteção de Dados) which comes into effect on the 3rd of May 2021, as it may provide citizens "greater digital agency" to better understand and manage their personal data.
8. Brazil's tax authority must disclose the extent to which these recommendations are actually met to feature that it fulfils its commitments. This should be done by a regular and publicly available report that includes the results of the analysis suggested in item 1, and an assessment of the policies suggested in item 2 and the adherence to data privacy regulation, item 3.

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