Corporate Income
Tax Gap
2015 to 2019

Special Secretariat of the Federal Revenue Service of Brazil
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Tax Gap Project

MINISTER OF FINANCE

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1. Introduction

This report presents the preliminary results of the first estimation of the CIT tax gap conducted in Brazil, based on data available in the database of the Brazilian Federal Revenue Service (RFB) and the Brazilian Institute of Geography and Statistics (IBGE), with the collaboration of the International Monetary Fund (IMF). The studies presented here cover the years from 2015 to 2019 and refer to the three main corporate tax regimes: Real Profit, Presumptive Profit and Simples Nacional, this last specific for small companies.

The construction of this work was initially motivated by the TADAT evaluation – Tax Administration Diagnostic Assessment Tool, conducted in 2020 by a team of experts from the IMF, World Bank and BID in the Brazilian federal tax administration system. Among the points of improvement identified in this evaluation was the explicit need to have a comprehensive program of research and studies of the tax gap. Thus, this report, in addition to the Brazilian VAT Tax Gap Report and the others, constitutes not only the implementation of the studies carried out by the tax gap team, but also an inaugural milestone for the implementation of a permanent policy for monitoring tax gaps within the RFB. It is also worth mentioning that the delivery of this report is an important subsidy for enabling the level of the RFB in the TADAT diagnosis, in relation to the monitoring of the tax gap.

The work was structured in several methodological strands: The first is based on a custom top-down methodology, built from adaptations of existing methods, such as the IMF's RA-GAP. The second strand is based on the econometric method of stochastic production frontier, applied in this study to estimate gaps for small companies. Estimates were also made using a bottom-up approach that relies on data from audits performed. For large taxpayers, an estimate was obtained with a specific method developed by the Coordination of Biggest Taxpayers at the RFB. Finally, a specific work was performed for the tax policy gaps, whose objective is to estimate the losses resulting from the existing tax waivers in the special regimes of the Presumptive Profit and Simples Nacional, as well as any tax avoidance contained in these tax systems. The top-down method customized for this study also uses data from the System of National Accounts, produced by the IBGE, as well as the IMF's RA-GAP and other top-down methods existing in other countries. However, the comparison of the results obtained in the present study with those of other countries should be interpreted with caution, due to differences between these methods.

On this occasion, the tax gap project team expresses its sincere gratitude to all those who collaborated directly or indirectly to carry out this work: Mr. Minister of Finance, Fernando Haddad, Mr. Secretary of the Federal Revenue Service of Brazil, Robson Sakiyama Barreirinhas, Ms. Undersecretary-General, Adriana Gomes Rêgo, Mr. Head of the Center for Tax and Customs Studies, Claudemir Rodrigues Malaquias, the Brazilian Institute of Geography and Statistics (IBGE), the Institute of Applied Economic Research (IPEA) and the International Monetary Fund (IMF), as well as all other colleagues from the Brazilian Federal Revenue Service who contributed to this project.

2. / Highlighted results of CIT tax gap

- From 2015 to 2019, the average assessment gap of CIT (R$ 56.4 billion) corresponded to 19% of the average potential collection of these taxes in the current system (R$ 297 billion), while the average collection gap (R$ 54 billion) represented 18.1% of the average collection potential for the period, totaling a compliance gap (collection + assessment) of 37.1% (R$ 110.4 billion). This gap corresponds to approximately 1.5% of the average Brazilian GDP in the same period. These results are based on the mean value estimated by two different approaches (top-down and bottom-up).

- Among large companies, the average CIT assessment gap in the period was R$ 30.7 billion, corresponding to 52.1% of the average potential collection of these companies.

- The average tax policy gap in the period (R$204 billion) represented 40.7% of the standard potential revenue, that is, possible to obtain (R$501 billion) in a "standard" tax system, without any type of waiver, special regimes, or tax benefits and in an environment of total compliance. If compared to the effective collection of the period (R$ 187 billion), the policy gap represents 109% of this amount. The high value is due not only to favored taxation, characteristic of the special regimes of Simples Nacional and Presumptive Profit, but also to the frequent existence of abusive tax planning involving such regimes.

CIT tax gap - 2015 to 2019
BRL millions
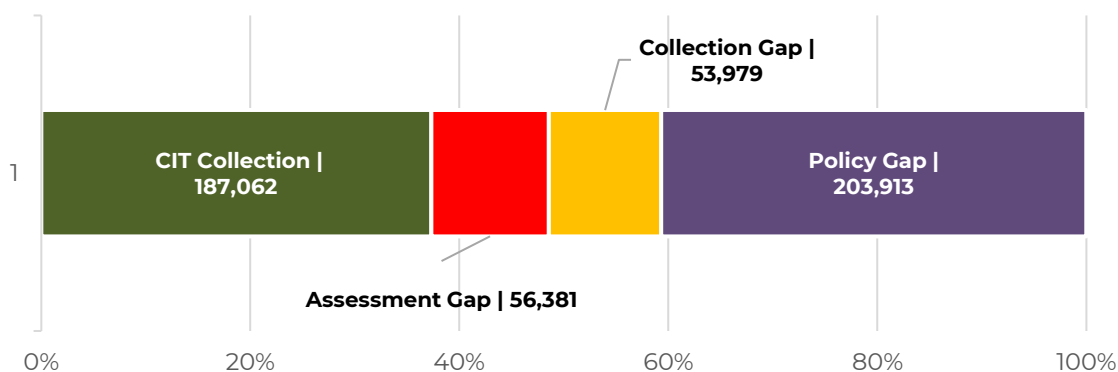
- The average profit rate of the Real Profit companies in the period studied (2015 to 2019) was around 1.9%, for a total revenue of R$ 8.46 trillion, while in the Presumptive Profit the average profitability was 30.4% and the aggregate revenue of R$ 1.32 trillion. This disparity corroborates the magnitude of the policy gap in the Presumptive Profit, since the intensive migration of the most profitable companies to this special tax regime increases the amount of tax losses associated with the favored taxation there existent. It is worth noting that the calculation of the policy gap was based on a direct comparison between the taxation under the rules of each special regime and an approximation to that which would be applicable under the rules of the general regime (Real Profit).

- In 2019, the revenue assessment gap from Simples Nacional companies represented BRL 568 billion, corresponding to 32% of the potential revenue of this regime. The

assessment tax gap under Simples Nacional was BRL 13.7 billion, corresponding to 51% of the potential collection of this tax under the referred regime.

- The magnitude of the revenue assessment gap from Simples Nacional shows the existence of a high level of revenue underreporting among small companies, possibly motivated by a highly concentrated taxation (taxation calculated over revenue instead of profit), the higher level of informality in sales and the lack of access to sophisticated tax planning, typical of larger companies.

- By sector, the revenue assessment gap from Simples Nacional is more significant in the trade sector (45% of the total gap) and services (28% of the total), in absolute values. This is explained by the substantial number of companies that make up these sectors, representing more than 50% of the total companies under this regime. On the other hand, the manufacturing, and utilities industries (such as water, electricity, and sewage) have the two largest average revenue gaps per company, respectively BRL 267,000 and BRL 258,000.

- To estimate the gross revenue and tax gaps from Simples Nacional companies, the Stochastic Production Frontier method was used in an innovative way, which allowed the estimation of gaps with high detail (to the company level), enabling not only the estimation of tax gaps but also the possibility of use in case selection strategies. Such method was recently mentioned in the IMF's technical report about bottom-up methods for estimating tax gaps.

The following panel summarizes the results obtained in the present study, referring to the average values for the studied period (2015 to 2019). For each gap classification there is a corresponding indication of the tax regime.

The results obtained for these estimations will be detailed in the specific sections of this report, as well as the methodology used in the studies.

Amount due and unpaid (in litigation or in collection)

Amount not known by the tax administration due to underreporting, evasion, or informality

Amount not taxed due to tax avoidance, characteristics of the tax regime or the granting of tax waivers

Assessment gap	56381
Real Profit and Presumptive Profit	48483
Simples Nacional	7898

Collection gap	53979
Real Profit	28876
Presumptive Profit	24001
Simples Nacional	1102

Actual collection	187062
Real Profit	122050
Presumptive Profit	53647
Simples Nacional	11365

Policy gap	203913
Real Profit	24573
Presumptive Profit	107224
Simples Nacional	72116

Values in BRL millions

Amount actually collected by tax administration

3. Characteristics of CIT in Brazil

The CIT in Brazil is based on the existence of three major tax regimes: Real Profit, Presumptive Profit and Simples Nacional, for small companies.

The Real Profit is the general rule for companies, and can be calculated quarterly or annually, in the latter case including the payment of monthly advances (estimates). Usually chosen by medium and large companies, as well as by those with a lower profitability rate, Real Profit concentrates almost 80% of the total revenue of companies.

The Presumptive Profit and Simples Nacional are special regimes of optional adhesion by companies. The former being more prevalent in medium-sized companies, while Simples Nacional concentrates most of the micro and small companies. Although the two regimes have similarities in the fact that the tax is calculated based on gross revenue and not on actual profit, it should be noted that Simples Nacional is more restrictive than the Presumptive Profit, both in relation to the limits of annual gross revenue, as well as for the set of activities allowed for adhesion. As will be seen throughout the report, such characteristics make the Presumptive Profit a regime especially prone to shelter companies with higher profitability, since such companies are commonly subject to an effective taxation lower than that which would be due if they were under the Real Profit.

The following table summarizes the main characteristics of each scheme:

CIT main tax regimes for Brazilian companies			
Characteristics	Real Profit	Presumptive Profit	Simples Nacional [3]
Tax base origin	Financial profit	Gross revenue	Gross revenue
Tax base origin	Real profit (adjusted from financial)	Presumptive profit (1.6; 8; 16 or 32% from gross revenue)	Gross revenue
Statutory rate [2]	24-34%	24-34%	1%
Annual revenue limit (BRL, per company)	No limit	BRL 78 million	BRL 4.8 millions
Total revenue under regime [1]	BRL 12,370,769 million	BRL 2,079,098 million	BRL 1,154,814 million
% Share of total revenue	79.3%	13.3%	7.4%
Active companies [1]	169,813	869,628	3,505,207
% Share of active companies	3.7%	19.1%	77.1%

[1] Year 2019 | [2] non-financial sector tax rate | [3] excluding MEI (Individual Micro Entrepreneur)

4. Scope of work

This preliminary study targeted the non-financial corporations. This universe of taxpayers usually composes the standard delimitation scheme adopted by gap estimation methods that use data from the National Accounts. Thus, financial entities and members of the government in general, as well as families and non-profit organizations working at the service of families, are excluded from the scope of the study. Such division is compatible with the institutional sectorization of the System of National Accounts from IBGE.

Institutional Sectors of the IBGE System of National Accounts

- **66%** from economic output – BRL 8.45 tri
- **46%** from **GDP** – BRL 3.4 tri
- **61%** from **GOS** – BRL 1.48 tri
- **57%** from **labor costs** – BRL 1.84 tri

Non financial companies	Financial companies	Government	Households	Non profit institutions serving households
1.476.990	269.191	115.684	563.551	4.925

Receita Federal
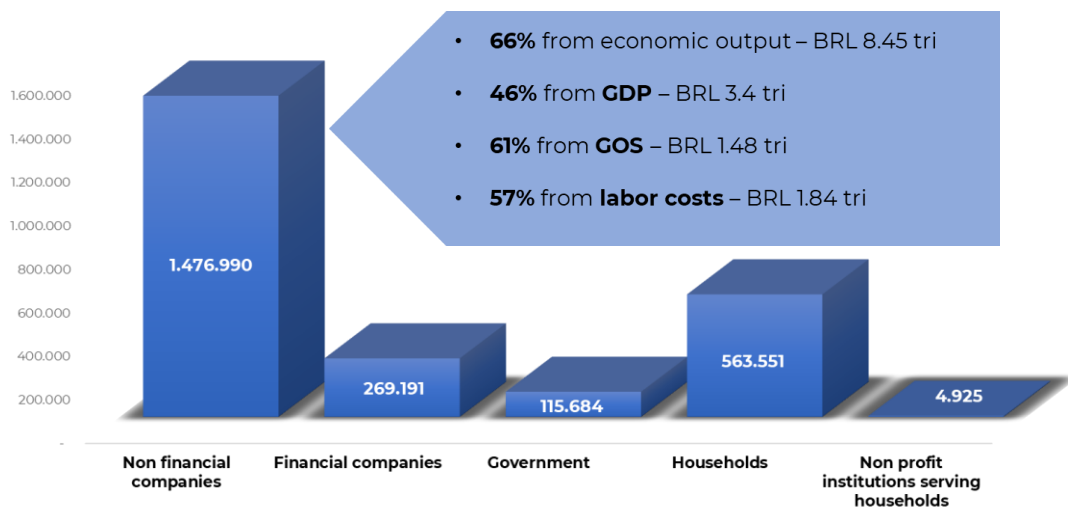
5. / Concepts and methodological aspects

i. Assessment Gap
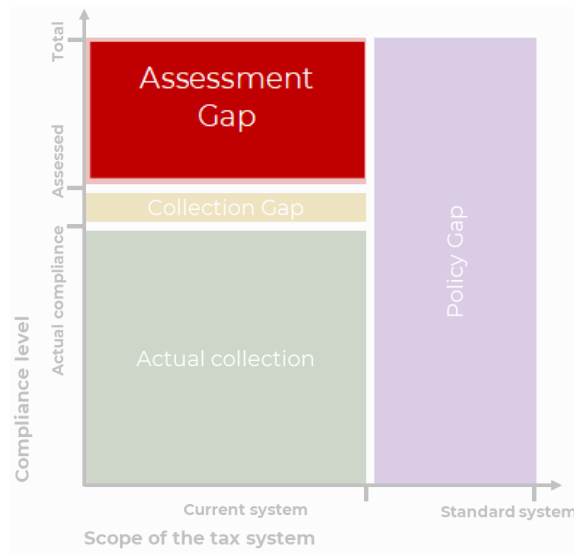
The assessment gap corresponds to the difference in the amount of taxes that would be due according to current tax system and the value of taxes effectively calculated by taxpayers plus those originated from the tax administration (e.g., auditing), net of refunds or reimbursements due, in the accrual regime. This gap originates from the portion of the economy not known or not reached by the tax authorities.

To determine the CIT assessment gap, two approaches were applied: Top Down, which compares data from the National Accounting System (IBGE) and the Tax Accounting System (RFB), and bottom-up, which uses data from tax audits to estimate the gap for the entire taxpayer population.

ii. *Policy Gap*
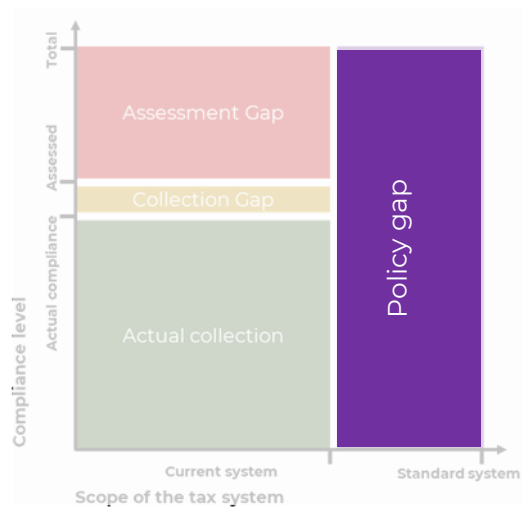
The policy gap represents the difference between the potential revenue in a "standard" tax system and the potential revenue in the current tax system. This gap originates from non-taxation, tax waivers and benefits, tax avoidance and special taxation regimes such as Presumptive Profit and Simples Nacional. In the study, the standard tax system adopted was the Real Profit, which is the general rule for CIT in Brazil

A further section of this report explains tax waivers for Real Profit companies, obtained from a report built by Cetad (Center for Tax and Customs Studies of the RFB). Despite this, in the conception of the main study the tax policy gaps were calculated only for the Presumptive Profit and Simples Nacional regimes, establishing a comparison with the general rule (Real Profit). That is, it was sought to determine what would be the difference in CIT collection in the hypothesis of a non-existence of such regimes and a universal taxation of these companies by the rules of Real Profit.

iii. Collection Gap
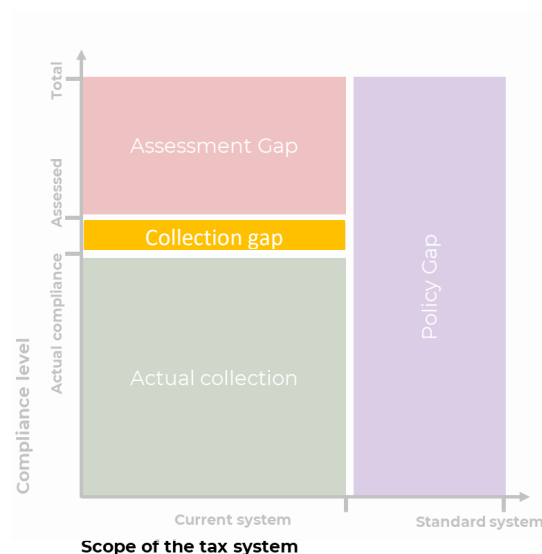
Collection gap, synthetically, is the difference between the amount of taxes calculated (by the taxpayer and the tax administration) net of refunds due and withholdings and the amount collected by the taxpayer plus compensation and withholding. In other words, the collection gap constitutes the portion of the debts that tax authorities already know but has not yet been effectively collected. The credits that make up the collection gap are mostly those in litigation and administrative dispute.

iv. Compliance Gap

Quite simply, one can define the compliance gap as the sum of the collection gap and the assessment gap. Thus, such gap represents the totality of the tax credit that can be converted into income by the tax administration, regardless of whether it has been constituted or not.

v. Top-down gap estimation method

A top-down method usually estimates the tax gap by comparing statistical data from the System of National Accounts and data from the tax administration. To this end, the statistical data is used, and specific adjustments are made in order to obtain a theoretical calculation basis for the (potential) tax. That potential base is compared with the declared tax base and their differences give rise to the gap.

Due to the complexity of the Brazilian tax system and its three CIT tax regimes, it was necessary to develop, in order to carry out this study, a simplified method for estimating the tax gap, based on the customization of existing top-down methods.

The method applied starts from the highest level of the National Accounts (production of the economy) to arrive at the Gross Operating Surplus (GOS) of non-financial companies (scope of

work), an important macroeconomic aggregate that represents the value added by economic activity after the removal of labor remuneration. Furthermore, the GOS usually has a strong correlation with the CIT tax base.

The National Accounting already includes in its tables the values for GOS, as well as details of the aggregates used in the step-by-step calculation. However, in the accounting universe of companies there is no full correspondence of concepts with National Accounting and, therefore, it is necessary to use proxies, that is, approximations, in order to obtain an economic aggregate as close as possible to the GOS, based on the use of accounting and tax data available in the RFB for the three regimes. For didactic purposes, the result obtained by this approximation of the GOS, built from the tax data and the business accounting, was called fiscal GOS.

By directly comparing the GOS recorded in the National Accounts and the GOS obtained by the corporate and tax accounting it is possible to obtain the GOS assessment gap presented in this report.

vi. Stochastic frontier method for estimating the gap from Simples Nacional

The estimation of the tax gap from Simples Nacional companies was done not only by the top-down method already mentioned, but also by an innovative approach, based on econometrics/statistics. The decision to do so resulted of the persistent difficulty in obtaining reliable data to determine the GOS and tax gap of companies in this regime by conventional methods, added to the easiness of access to disaggregated databases (such as the electronic invoice data).

The method of Stochastic Production Frontier was originally developed to estimate the production possibilities of companies from a set of inputs such as capital and labor, using production functions. Thus, a classical production frontier model establishes the theoretical limits of the production capacity of firms from such inputs.

The customization of a stochastic frontier model to a tax approach in Simples Nacional was based on the use of tax information as inputs of a production function whose product was the revenue from the company. Thus, the econometric model was able to construct a frontier for revenue generation (close to which the most compliant firms would be situated) and, consequently, to estimate the degree of incompliance for firms, as a function of the gap between their declared revenue and the corresponding boundary.

vii. Custom method for estimating the gap of large companies

The Coordination of Monitoring of Largest Taxpayers – Comac, part of the structure of the Federal Revenue Service of Brazil, has been estimating the tax gap of large companies using its own methodology developed by the team.

The method consists of calculating an effective tax rate for low-risk taxpayers in each sector of activity, who are considered fully compliant for the purposes of calculating the gap and, therefore, the reference group for comparisons. Subsequently, the effective tax rate is calculated for the other companies in each of the sectors and a comparison is made with the effective tax

rate of the reference group (compliant companies) in that respective sector, estimating the expected collection for each company and its difference in relation to the reference group.

The total tax gap for each sector is obtained by adding the differences found between the expected collection for companies in that sector and that which would be possible to obtain with the effective tax rate of the reference group.

viii. Bottom-up method using audit data

The estimation of the tax gap was also performed using a bottom-up approach based on tax audit data and the theory of extreme values, as proposed by Pope and Bloomquist (2014). This method is widely used by other countries, such as: United States, Canada, and United Kingdom, and is usually applied to obtain a lower range for the tax gap, in addition to other methods, thus enabling a comprehensive view of the tax gaps. It is also common to use this method to estimate gaps from large companies, whose particularities make the use of other methodologies more expensive.

The method uses data from tax audits performed and, through a linear regression, allows extrapolating the result found in the sample to the population of taxpayers, enabling the estimation of the tax gap.

6. / Overall results

Initially, is appropriate to position Brazil in relation to initiatives of CIT gap estimation from other countries. The study of corporate income tax gaps is more complex to implement than those of VAT tax gaps. For this reason, the number of countries that regularly estimate and publish the results of their analyses is lower.

The following table lists methods and aggregate results for some well-known and available studies.

* Amounts in billions in each country's local currency

Country	Year	Method	CIT gap (billions)	GDP (billions)	Compliance Gap as % of GDP	Compliance gap in % of potential tax	CIT statutory Rate
USA	2011-2013	Bottom-up	32.0	16,785	0.19%	14.30%	35%
UK	2015	Bottom-up	4.5	2,044	0.22%	6.50%	20%
Canada	2014	Bottom-up	10.4	1,926	0.54%	n/d	15%
Italy	2014	Top-down + bottom-up	10.0	1,703	0.59%	34.10%	27.5%
Slovakia	2014	IMF Top-down	n/d	n/d	1.10%	30.00%	22%
Brazil	2017	Bottom-up	100.8	6,585	1.53%	35.20%	34%
Brazil	2015-2019	Top-down + frontier	109.1	6,649	1.64%	36.90%	34%
Mexico	2014	IMF Top-down	274.2	17,138	1.60%	44.10%	30%
South Africa	2015-2017	IMF Top-down	n/d	n/d	2.00%	45.40%	28%
Colombia	2012	Top-down	15.9	691	2.30%	34.40%	30%
Costa Rica	2015	IMF Top-down	n/d	n/d	2.70%	59.60%	27.7%

It is noteworthy a peculiar characteristic of the bottom-up estimations, which is the achievement of smaller gaps than those resulting from top-down methods. This could be mainly due to the predominant use of information from the tax administration, notably audits, which usually implies the possibility of not capturing the full magnitude of the tax gap.

As this study is the first conducted for CIT in Brazil, it was chosen to estimate the gap using the two main approaches (top-down and bottom-up), aiming for a comprehensive view of these gaps, as further detailed throughout this report.
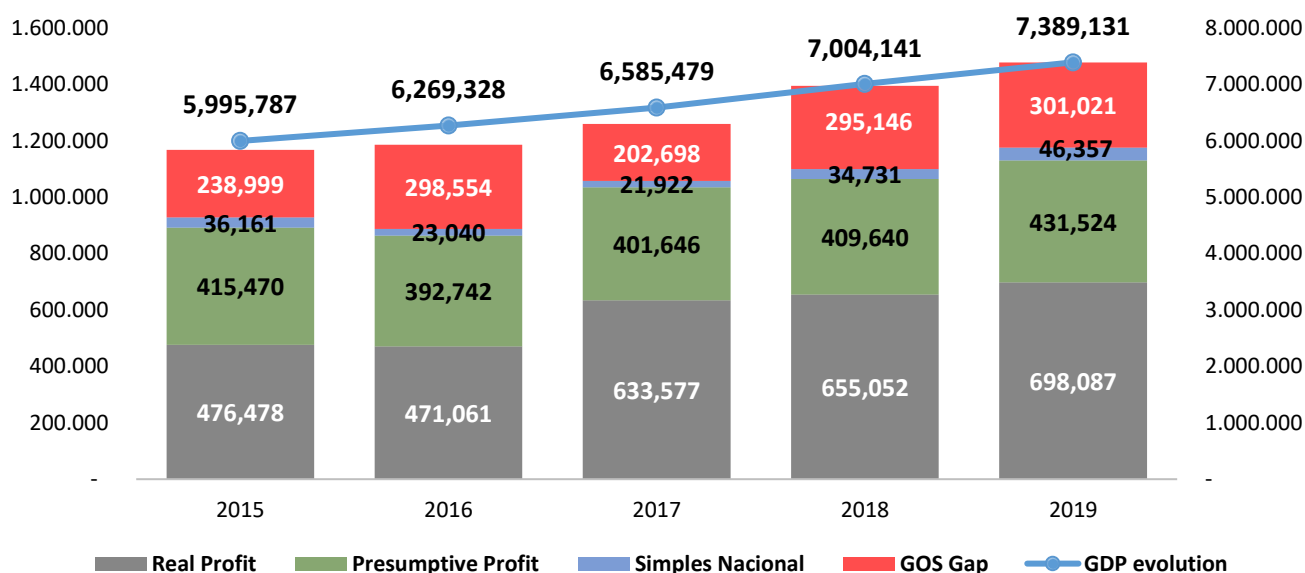
i. Assessment Gap

a) Gross Operating Surplus Gap - GOS

The following series show the evolution of the GOS gap over the studied period, as well as the surplus values calculated by the IBGE and the fiscal GOS calculated with tax data.

There is a stable evolution of the gap in absolute values, following the growth of GDP itself at current prices. In 2017 there was a substantial reduction in the gap, however caused by a non-recurring event. This is a reversal of an accounting provision made by a large company in the industrial sector, in the amount of 72 BRL billions, whose entry affects the calculation performed.

Fiscal GOS and GOS gap evolution

In BRL millions

	2015	2016	2017	2018	2019
GDP evolution	5,995,787	6,269,328	6,585,479	7,004,141	7,389,131
GOS Gap	238,999	298,554	202,698	295,146	301,021
Simples Nacional	36,161	23,040	21,922	34,731	46,357
Presumptive Profit	415,470	392,742	401,646	409,640	431,524
Real Profit	476,478	471,061	633,577	655,052	698,087

Legend: Real Profit, Presumptive Profit, Simples Nacional, GOS Gap, GDP evolution

As will be described in more detail in the methodology section, at this time there is not enough information available on the GOS gap to accurately determine its composition of tax regimes. Thus, assuming three extreme hypotheses, in which the composition of the GOS gap would be 100% originated from a single tax regime, it would be possible to evaluate the theoretical values of the tax gap under each scenario, as shown below:

CIT tax gap estimated under each tax regime
in BRL millions
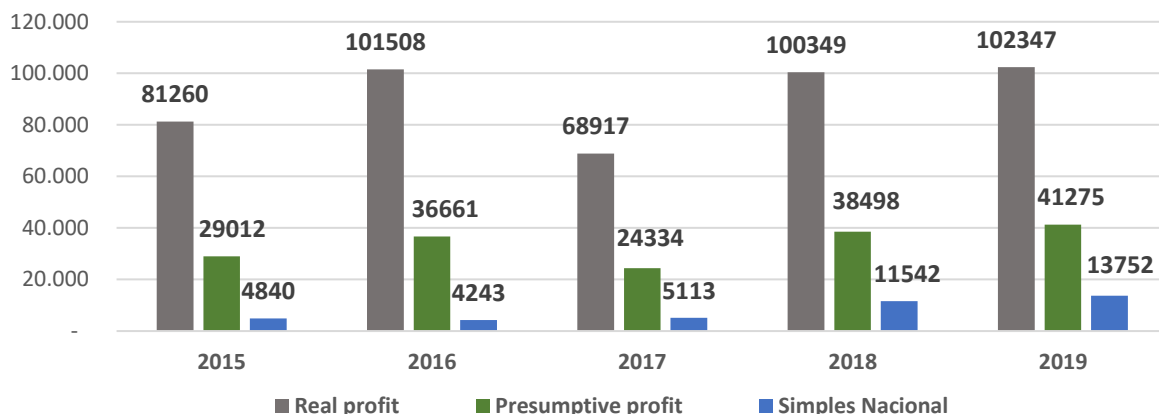
Such hypotheses, however, are a mere exercise of viewing a possible range for the tax gap, considering that these hypotheses are unlikely, and a mixed composition of different regimes for the GOS gap is more plausible. Thus, a weighting was performed, based on a sectoral division of the taxation regimes and their respective VAT gap, calculated in the VAT tax gap results report. From this weighting, the most probable value for the tax gap was estimated, considering a probable distribution of the GOS gap between different taxation regimes:

Estimated composition of GOS gap
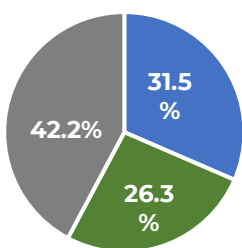
Estimated composition of GOS gap
Values in BRL millions
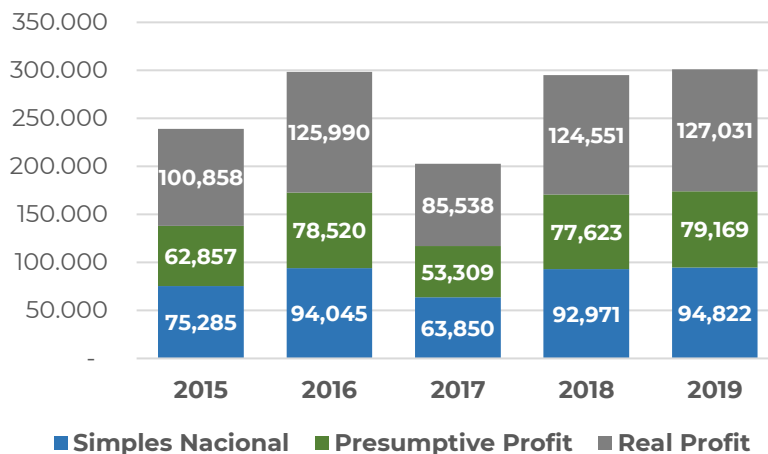
After estimating composition of the GOS gap, it is then possible to estimate and consolidate the tax gap itself, based on the application of the effective rates over the corresponding portion of each tax regime within the GOS gap, as presented below:

CIT assessment gap - top-down method
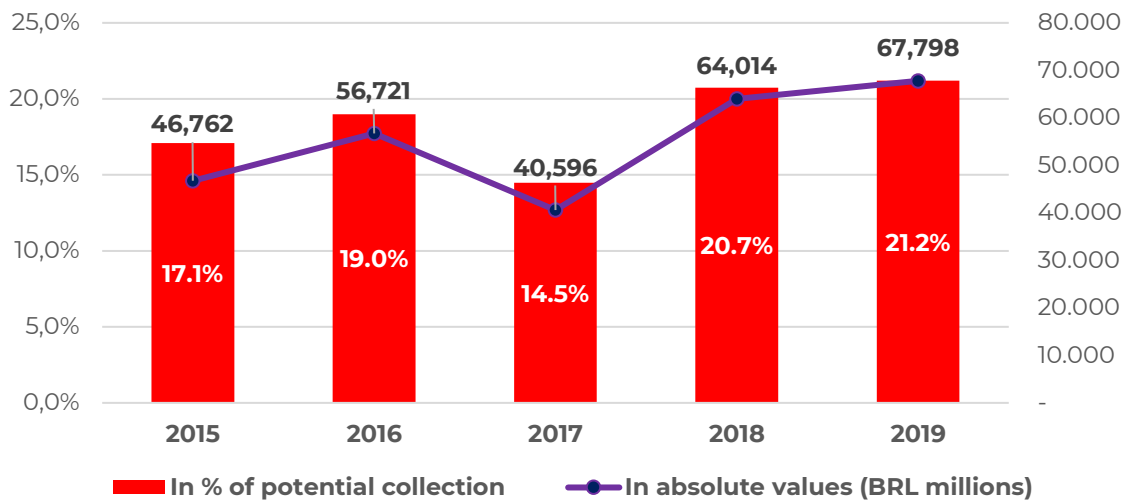
The following series detail the components of the compliance gap, already described as the sum of assessment and collection gaps.

Compliance gap and its components
In absolute values (BRL millions)

CIT compliance gap - top-down method

In % of potential collection ——— **In absolute values (BRL millions)**
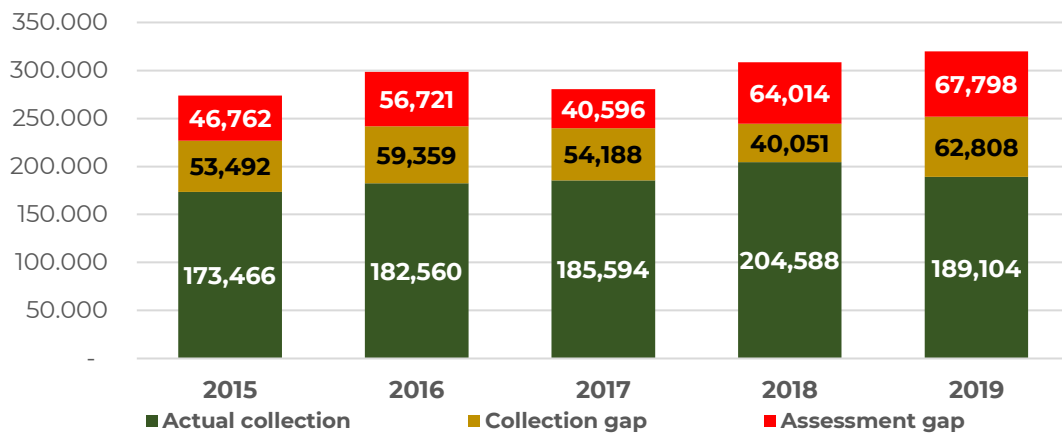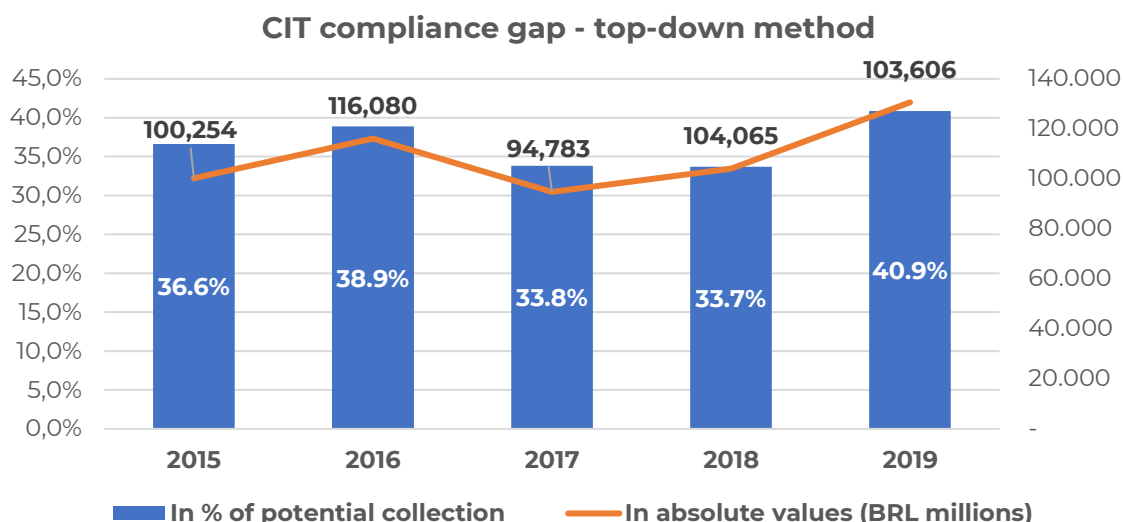
It is noteworthy the relationship between the CIT compliance gap and the VAT compliance gap. In 2019, the compliance gap of CIT reached 40.9% of the potential collection of this tax, while in the VAT this amount was 20% of the potential collection.

The profit, that constitutes CIT tax base, is residual in nature, that is, it results from the activity of companies after removing most of its costs and expenses. The VAT tax base, in turn, is based mainly on the added value, or even on the revenue itself, when dealing with the cumulative or single-phase regime. Thus, taxation on consumption is based on a broader basis than profit, so any omissions of revenues or increase in costs tend to generate more impact on profit than on revenue or value added. Let's consider the following example, which illustrates the behavior of such gaps:

	A	B	B/A
	Full compliance	**10% underreporting**	**Gap**
Revenue	**100**	**90**	**10%**
(-) Purchases	-70	-70	
Value added (VAT tax base)	**30**	**20**	**33%**
(-) Other expenses	-5	-5	
(-) Labor costs	-10	-10	
Profit (CIT tax base)	**15**	**5**	**67%**

In this hypothetical example, an underreporting of 10% in the revenue of a company is enough to reduce the VAT tax base by 33% and the CIT tax base by 67%.

b) CIT gap estimations using bottom-up method

As part of an initial learning process about the tax gap, this study sought to make estimates using more than one method. Such a path is common in the exploratory phase, when one seeks to identify the best practices and the most feasible way of studying the gaps in order to seek, in a second moment, the continuity of the periodic estimates with the chosen systematics.

In this sense, the results demonstrated here are based on a bottom-up estimation method and aim to complement, confront, or even reinforce the other results presented in this report, obtained by other methods.

Compliance and assessment gap - EV
in % of potential collection
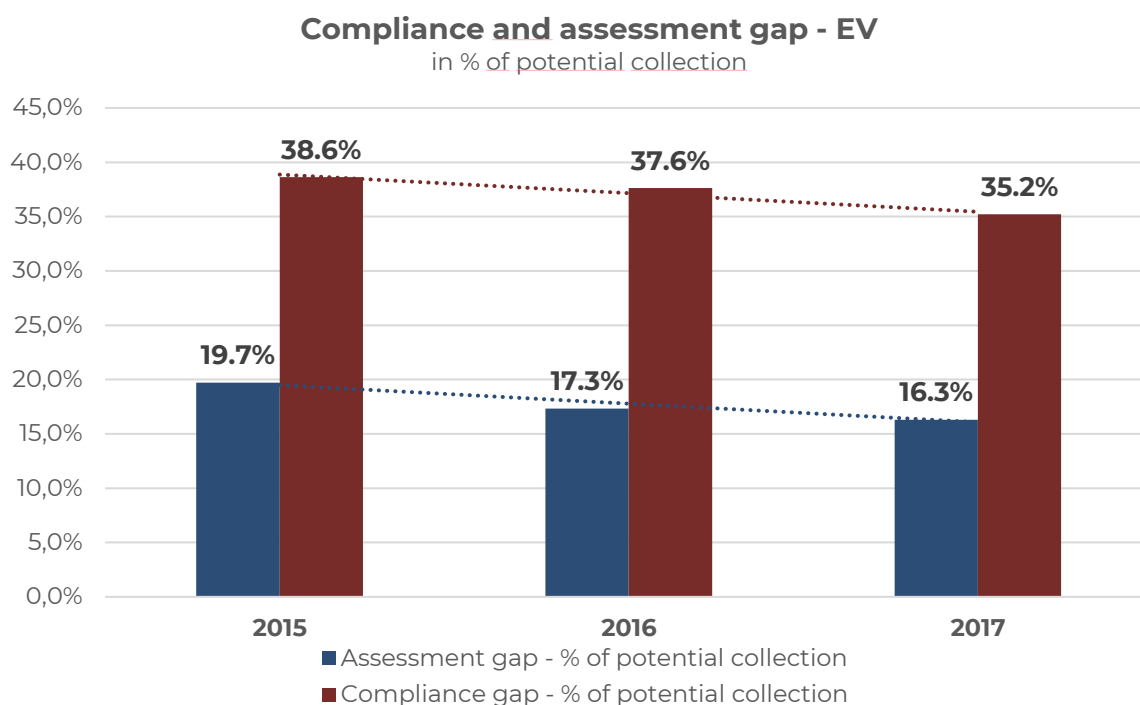
The above series show the evolution of the general assessment and compliance gaps according to the bottom-up estimation method of Extreme Values. The method was initially applied for estimating the period from 2012 to 2017, but in order to ensure comparability with the estimates made by the other methods (which cover the period from 2015 to 2019), it was decided to present the bottom-up results for the period from 2015 to 2017.

CIT assessment gap - method comparision
BRL millions
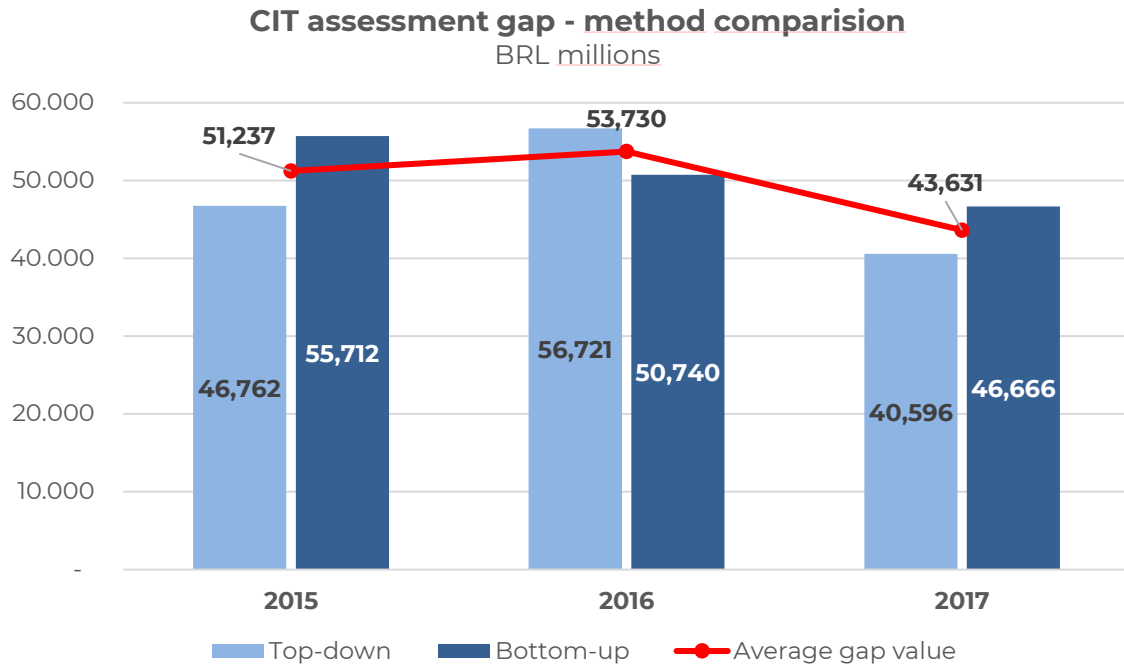
In the series above, we compare the two methods used to estimate the global gap, that is, for all company sizes. There was a small increase between 2015 and 2016 for the gap by the top-down method, followed by a more significant drop in 2017 (already identified as atypical), while for the bottom-up method, the downward trajectory already shown in the previous graph was noted.

Gaps estimated by top-down methods are usually reported as larger than those estimated by bottom-up methods, but this is not a rule. Especially in the case of this study, in which a top-down methodology was used, the relative proximity between the results obtained by the two methods points to a convergence of results. In other words, one perceives an apparent confirmation of one method by the other.

To simplify and generate greater clarity in the assimilation of values, an average of the two methods was calculated. As a result, it is considered that the average values reported above can be the most feasible approximation for the effective tax gap.

CIT assessment gap - method comparision
in % of potential collection

| | Bottom-up | Top-down | Average gap value |
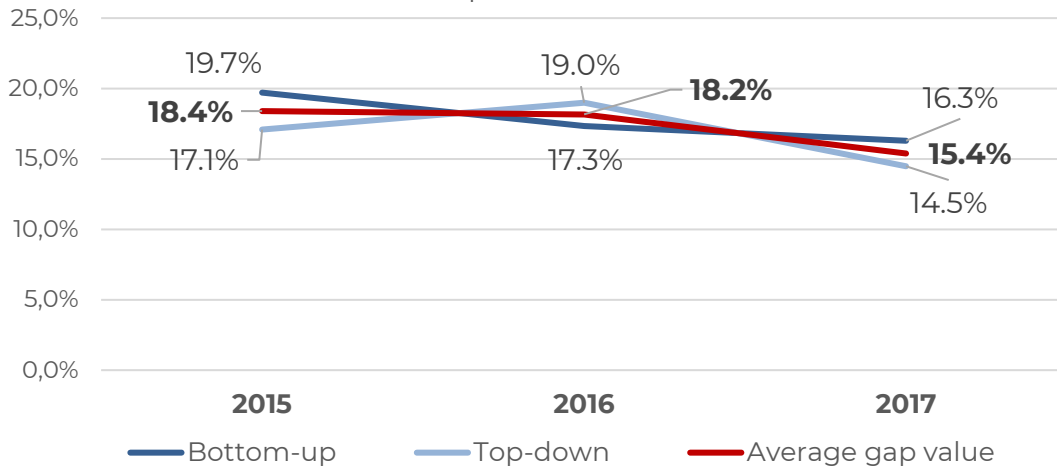
The bottom-up method also allows identification of the share from the gap that has already been captured by the audit activity, since the estimation data is derived from the procedures performed.

% from gap captured by auditing procedures

Year	Audit results	Assessment gap
2017	44%	56%
2016	51%	49%
2015	49%	51%
2014	46%	54%
2013	72%	28%
2012	58%	42%

% from gap captured by auditing procedures
average 2012-2017

Audit results 53% — Assessment gap 47%

a) CIT tax gap of large companies using the Comac method

CIT tax gap of large companies
Evolution of absolute values and % from potential
2015 to 2019
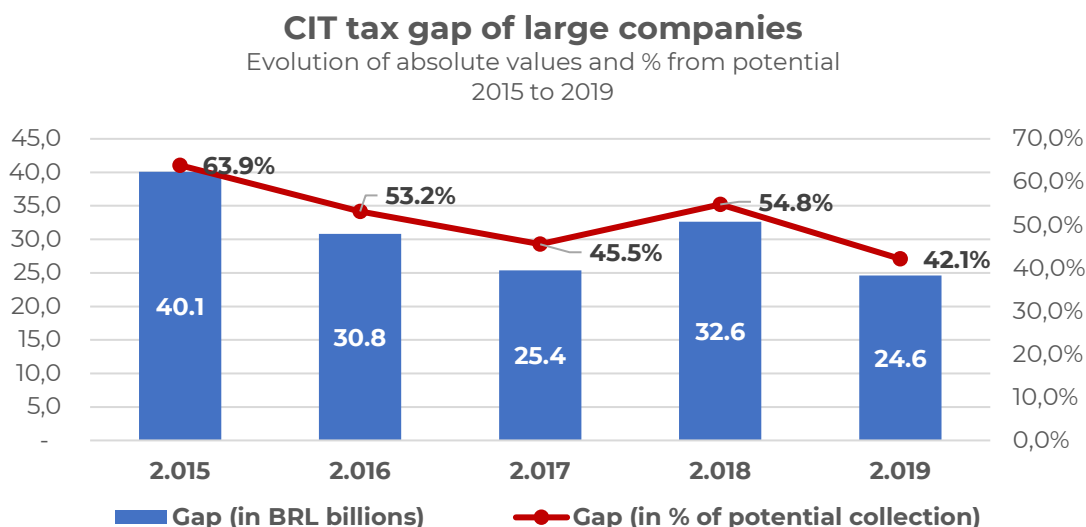
From the above series, we can highlight the continuous decrease in the tax gap of large companies over the period from 2015 to 2017. 2019 also stands out as the one with the smallest gap in relative terms and absolute values. In a first analysis, the behavior of the gap in large companies seems to point to the effectiveness of the actions to monitor and promote tax compliance carried out by Comac.

CIT assessment gap for large companies
method comparison - BRL millions
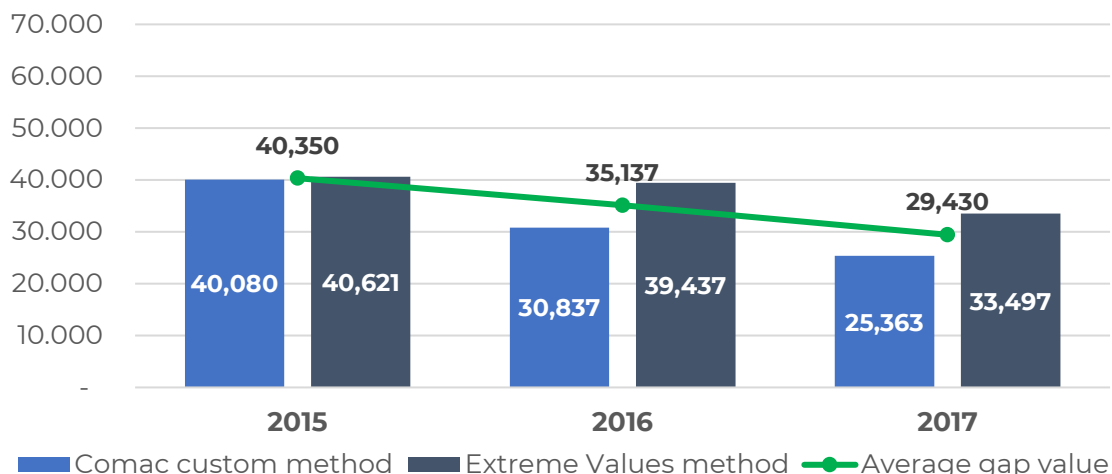
Above we have a comparison of the gap from large companies through the bottom-up (extreme values) and Comac methods. It is noted that the value was almost coincident for 2015 with higher estimates for the years 2016 and 2017 by the bottom-up method, but in both methods, there is a downward trend over time. Considered that the two methods are substantially different in their application and data sources, the results were considered consistent in comparative terms.

It is important to highlight that a higher gap for the extreme values method is in line with expectations. The Comac estimation method estimates the gap in a differential way in relation to a reference group, considered fully compliant, therefore, the existence of any noncompliance within the reference group tends to be missed by the method, what could lead to lower estimates than that from bottom-up method.

To better assimilate the gaps from large companies, the average of the two methods (green line) was calculated, which possibly represents the most probable value of the gap.

b) Gross Revenue Gap of Simples Nacional

The results of the Simples Nacional gaps, obtained by the frontier method already mentioned, shows the existence of a high gross revenue gap. The series below, referring to year 2019, exposes a revenue gap corresponding to 32% of potential revenue. Hypothetically, it would be equivalent to stating that one out of every 3 companies in the Simples Nacional does not declare any activity to the tax administration.

Empirically, there are elements to corroborate the existence of such a gap, to the extent that the population under this tax regime, composed of small businesses, tends to operate with a higher level of informality. It should also be considered that the concentration of the taxation on revenues, instead of profit, leads to concentration of tax evasion in the revenue information, leaving the increase of costs and expenses without practical utility as a tool for tax evasion.

Added to this, companies from Simples Nacional tend to operate at the end of the production chain, that is, with a predominance of individual and small customers as final consumers, which favors the underreporting of revenues earned, especially because there is no relevant generation of non-cumulative tax credits for the purchaser of goods and services.

Finally, it is also possible to state that such companies have a very reduced legal assistance structure, when they have one, which makes a tax avoidance strategy difficult to implement, thus leaving simple underreporting as the tax evasion method of choice.
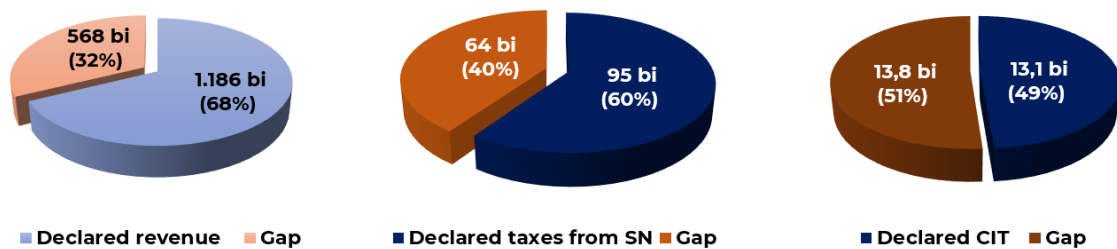
GROSS REVENUE	All taxes from Simples Nacional	CIT tax from Simples Nacional
% of potential revenue (BRL billions)	% of potential tax (BRL billions)	% from potential CIT (BRL billions)
Year 2019	Year 2019	Year 2019

Revenue gap evolution for Simples Nacional
In BRL billions and % from potential revenue

Legend: Revenue gap (% potential) — Revenue gap (BRL billions)
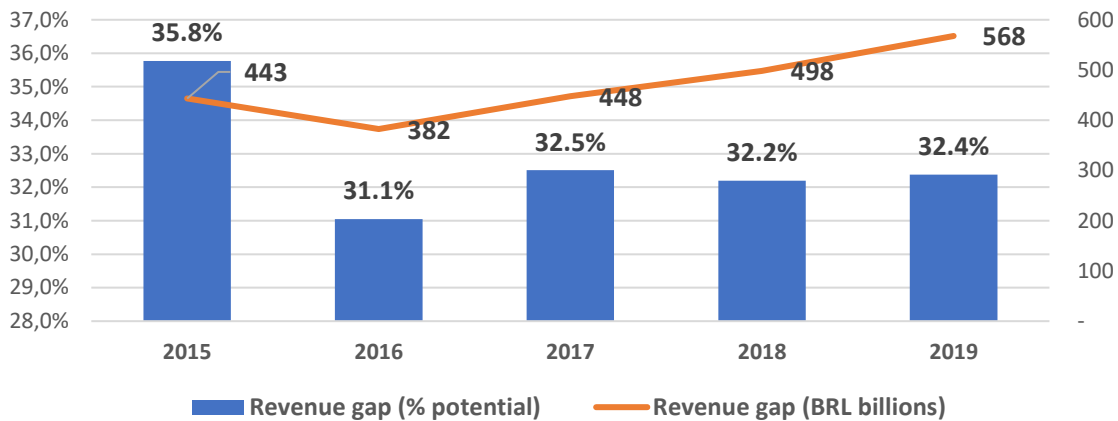
Some relevant aspects show up in the series above. The first is a significant reduction in the gap between 2015 and 2016, followed by stability thereafter, with minimal percentage changes until 2019. The second point is the upward trend in absolute values for this gap, a situation expected due to the natural growth of companies. It should also be noted that in 2018 the revenue gap increases by 50 billion compared to the previous year, with a new increase of 70 billion between 2018 and 2019, but maintaining the percentage of potential revenue. This is essentially due to the increase of the upper limit for the regime in 2018, what makes room for the accommodation of higher revenues, in the following years, by companies subject to this special tax regime. It is concluded, therefore, that there is stability in the percentage of the gap from Simples Nacional in the last 3 years analyzed, with an absolute value increment caused mostly by the expansion of revenues.

CIT gap evolution for Simples Nacional
In BRL billions and % from potential collection

Legend: CIT tax gap (% potential) — CIT tax gap (BRL billions)
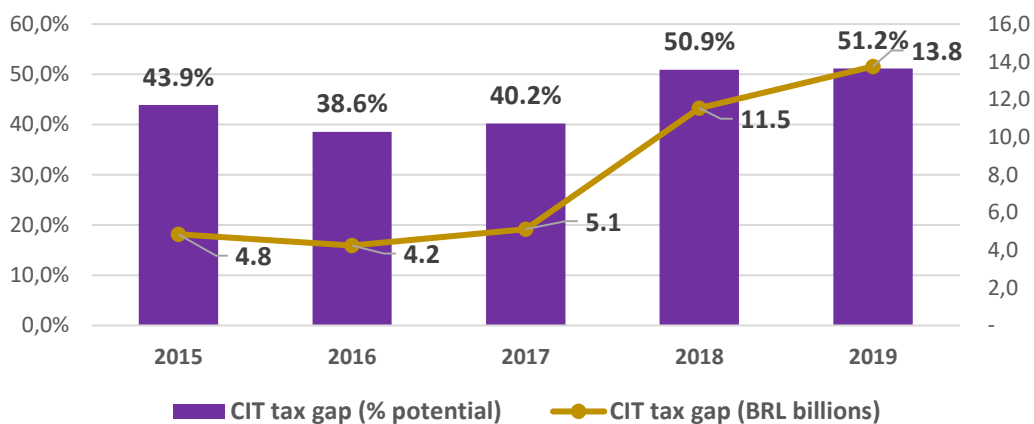
The same considerations apply to the CIT tax gap, as the chart above again shows an increase in absolute values of the CIT gap, as a result of the expansion of the limits that occurred in 2018.

It is noteworthy that the CIT gap, in 2018, increased nearly 10 percentage points, even with a stability in the percentual gap of gross revenue. At first glance, this variation could be unexpected, but it can be explained by a relevant change in the ratio of different taxes of Simples Nacional occurred in 2018, when Complementary Law No. 155/2016 came into force, a fact that increased the share of CIT in the basket of taxes from Simples Nacional.

c) General comparison of estimation methods

The following series bring a consolidation of the estimations performed under each method, globally and also stratified by company size, demonstrating the contribution of each segment of companies to the total gap and the interaction of results among the methods applied.

In the series of columns, CIT assessment gap of large companies corresponds to the average of the gap obtained by the method from Comac and Extreme Values. The gap of medium-sized companies was obtained by the method of Extreme Values and that of Simples Nacional by stochastic production frontier.

In the series of lines, it is showed the CIT assessment gap for all companies, estimated by the top-down, Extreme Values and the average of these.

CIT assessment gap - all method comparison
In BRL millions
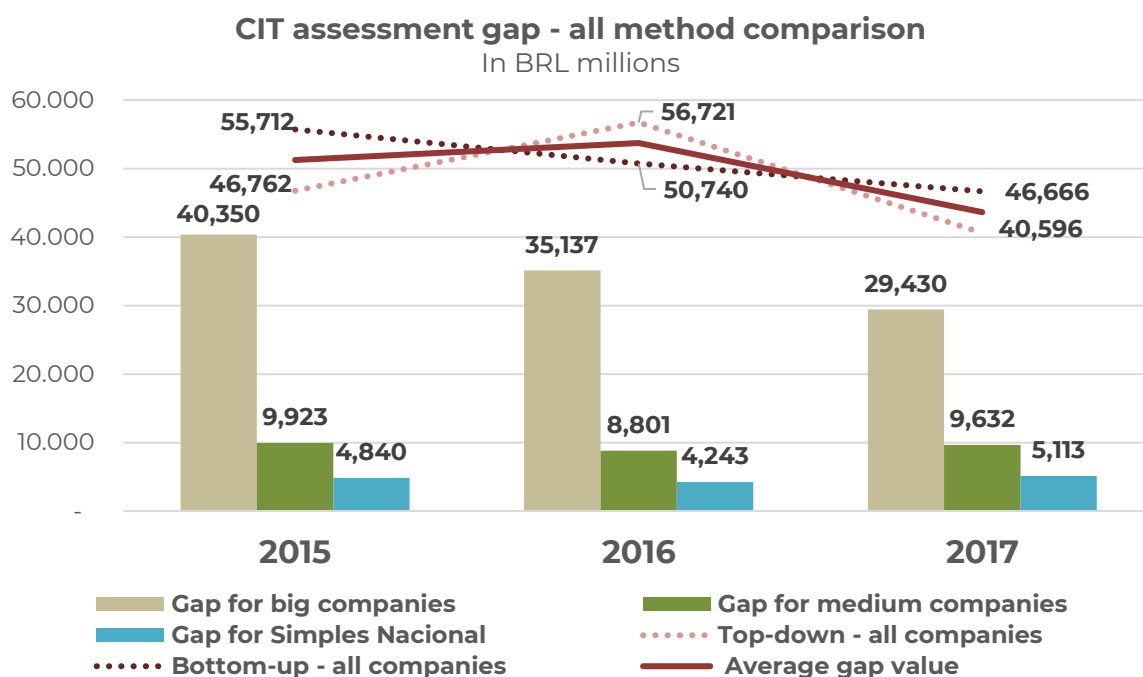
d) Gap of tax adjustments to accounting profit – Real Profit

In the Real Profit, the determination of the CIT tax base has as its starting point the financial accounting profit, calculated in accordance with Law No. 6,404, of 1976 (Brazilian Corporate Law); or in accordance with the accounting standards issued by the Central Bank of Brazil, in the case of legal entities subject to the regulation of this agency. Such profit, in turn, must be adjusted by additions, exclusions and compensations provided for in the tax legislation, thus arriving at those tax bases.

Thus, the assessment gap related to the companies of the Real Profit does not only cover the unknown portion of the economic activity, whose results were already presented, but also includes differences resulting from those tax adjustments (additions, exclusions, and compensations), most of which are, or should be, temporary. Such differences, of course, have direct impact on effective taxation.

In order to analyze, albeit in an exploratory way, this aspect, i.e., the effect of fiscal adjustments on effective taxation, the present study was expanded. Regarding the years 2016 to 2021, the information provided, by electronic accounting bookkeeping, by non-financial and financial legal entities that presented accounting profit (before taxation) and tax profit, where such results have been greater than or equal to BRL 1,000.00, were analyzed. Under these criteria, the sample object of the study was as follows:

	2016	2017	2018	2019	2020	2021
DELIVERED ECF – REAL PROFIT (http://sped.rfb.gov.br/arquivo/show/6028)	157,794	165,680	174,069	185,738	197,913	209,310
SAMPLE (%)	65,772 (41.68%)	70,359 (42.47%)	73,455 (41.96%)	77,918 (41.95%)	83,300 (42.09%)	92,184 (44.04%)

To measure the effective taxation, the effective tax rate was considered as a proxy, which was calculated as follows:

$$Effective\ tax\ rate = \frac{Due\ CIT}{Adjusted\ Accounting\ Profit}$$

Where:

Due CIT = Taxes due net of tax benefits/incentives; and

Adjusted Accounting Profit = Accounting profit before taxation, net of the effects arising from equity interests (e.g. income from profits/dividends arising from investments evaluated by the cost method, investment results evaluated by the equity method, realization of capital gains or losses, realization of goodwill)

The following table groups the companies according to the type of accounting and tax result (profit or loss).

Receita Federal

Category	Accounting Result	Fiscal Result	Quantity	Accounting Profit before taxation	Taxable Profit or Loss	% Reduction in relation to Accounting Profit
				A	E	F=1-E/A
Non-Financial	Accounting Profit	Real Profit	72,389	561,865,967,074.77	384,167,724,886.80	31.63%
		Tax Loss	4,784	107,348,439,511.47	- 40,536,283,374.98	137.76%
	Accounting Loss	Real Profit	2,303	- 39,158,669,909.88	21,711,011,083.56	155.44%
		Tax Loss	78,752	- 299,476,312,475.45	- 226,583,577,764.45	24.34%
Financial	Accounting Profit	Real Profit	5,563	394,728,375,658.44	166,852,232,502.11	57.73%
		Tax Loss	2,252	145,514,262,640.95	- 11,876,384,733.83	108.16%
	Accounting Loss	Real Profit	389	- 15,764,577,120.58	2,612,377,395.75	116.57%
		Tax Loss	6,193	- 160,358,624,105.81	- 22,304,206,601.77	86.09%

Non-financial companies are subject to a nominal CIT tax rate of 34%, while financial companies, throughout the period analyzed, were subject to a nominal rate that varied between 40% and 45% – the rate applicable to banks was taken as a reference. However, a first finding of the study was that the average effective tax rates, for the years 2016 to 2021, were 24.32% and 36.90%, respectively. This shows a smaller difference of 9.68% for non-financial companies and 8.1% for financial companies.

Going into a little more detail, the graphs below show the effective tax rates for each of those years.

Financial Companies
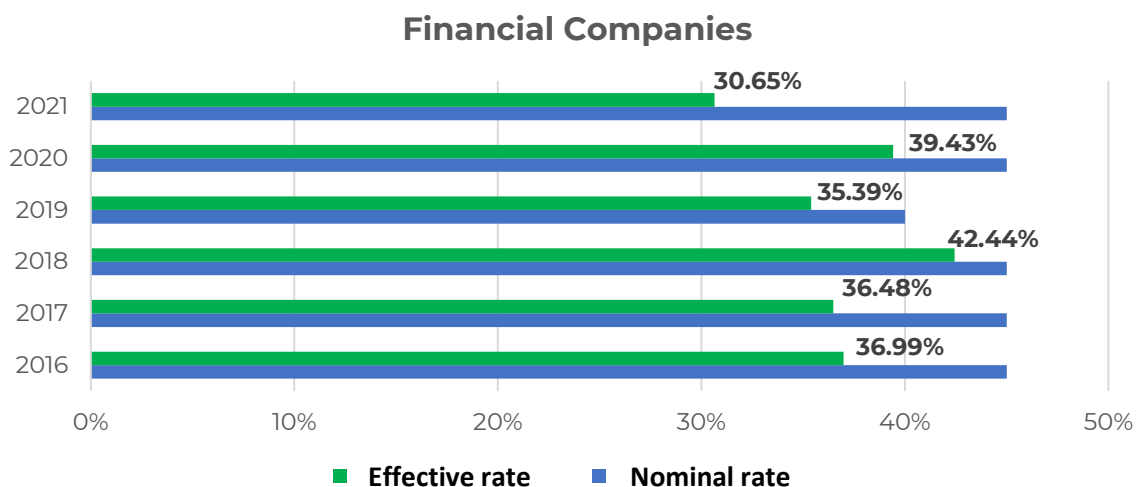
Non-financial companies
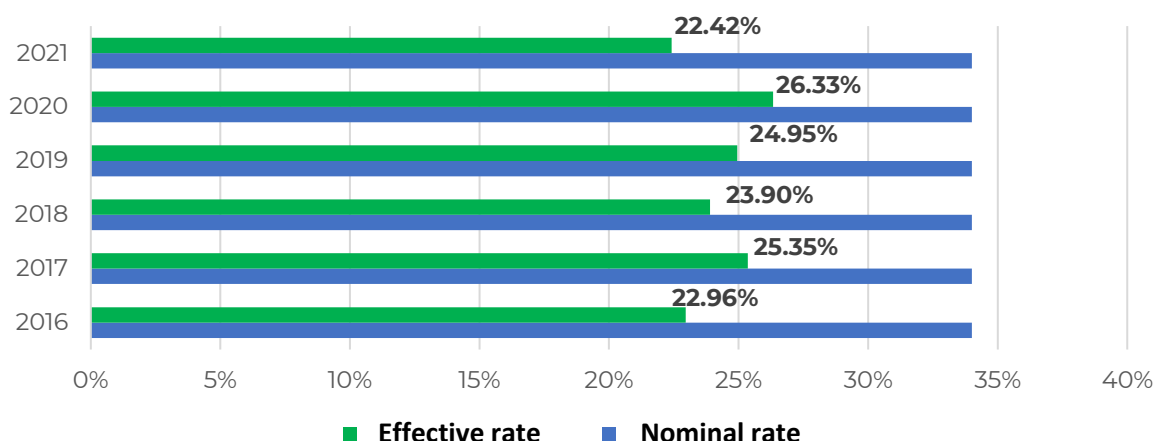
As can be seen, the results indicate that the annual effective tax rates were persistently lower than the nominal tax rates, especially for the non-financial rates, whose reduction was more significant.

These differences are basically due to the tax adjustments made (additions, exclusions, and compensations) and the tax benefits/incentives enjoyed. The graphs below illustrate this statement for the year 2019.
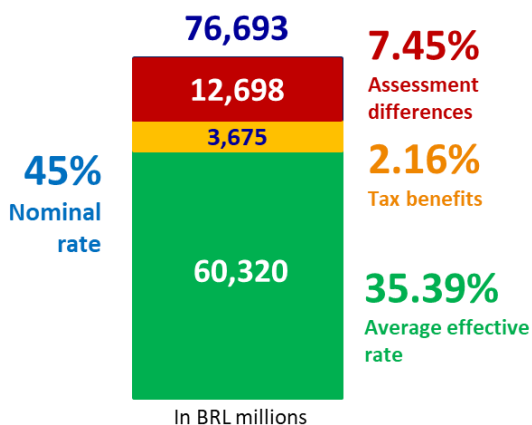
The impact of tax adjustments on the effective tax rate, in the tax year 2019, was 4.92% for non-financial companies and 2.45% for financial companies. As stated at the outset, such reduction can be considered as a portion of the assessment gap.

Most tax adjustments generate temporary differences, so that amounts that are added (excluded) in the current period will be deleted (added) in subsequent periods, that is, the differences are reversed over time. The analysis of this flow from a perspective of continuity of legal entities represents a challenge, since there are numerous variables that affect this behavior, such as the level of investment, the level of activity, inflation, etc.

Nevertheless, it is expected that the behavior of differences over time will exhibit, to a greater or lesser extent, the effect of reversals. In this sense, the Adjusted Accounting Profit and the taxable profit (Real Profit) were compared, the results of which are shown in the following graphs, in which the percentages shown in the body of the graphs are based on the Adjusted Accounting Profit.

Average Effective Tax rate	36.99%	36.48%	42.44%	35.39%	39.43%	30.65%

Financial Entities
Additions x deductions in relation to accounting profit
(without effect from subsidiaries investiments)

In BRL millions
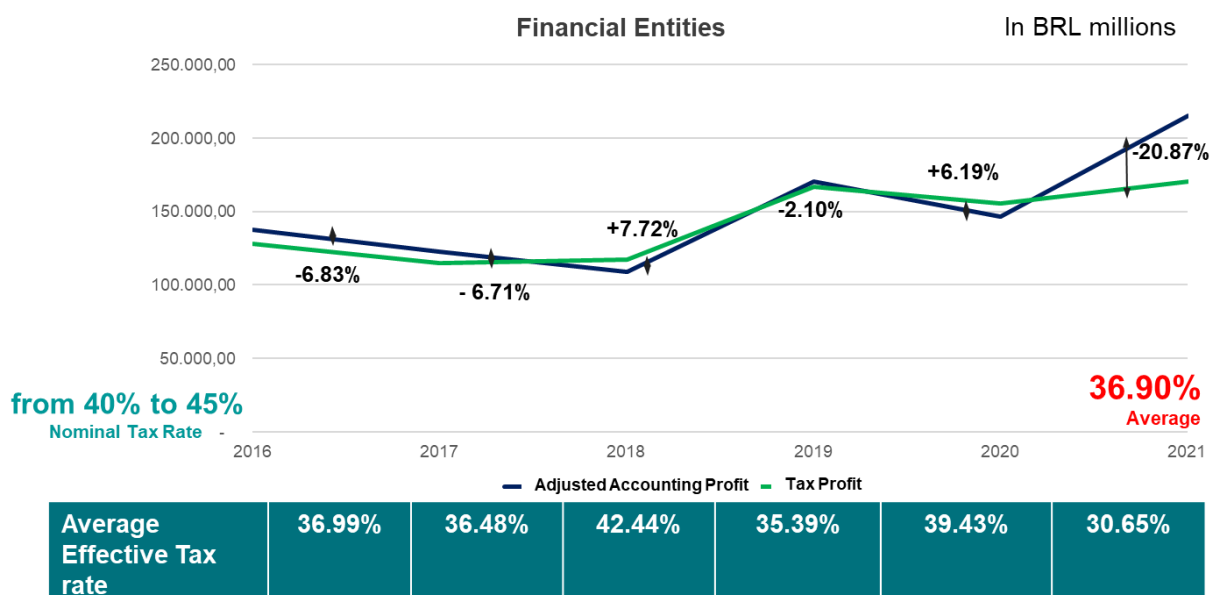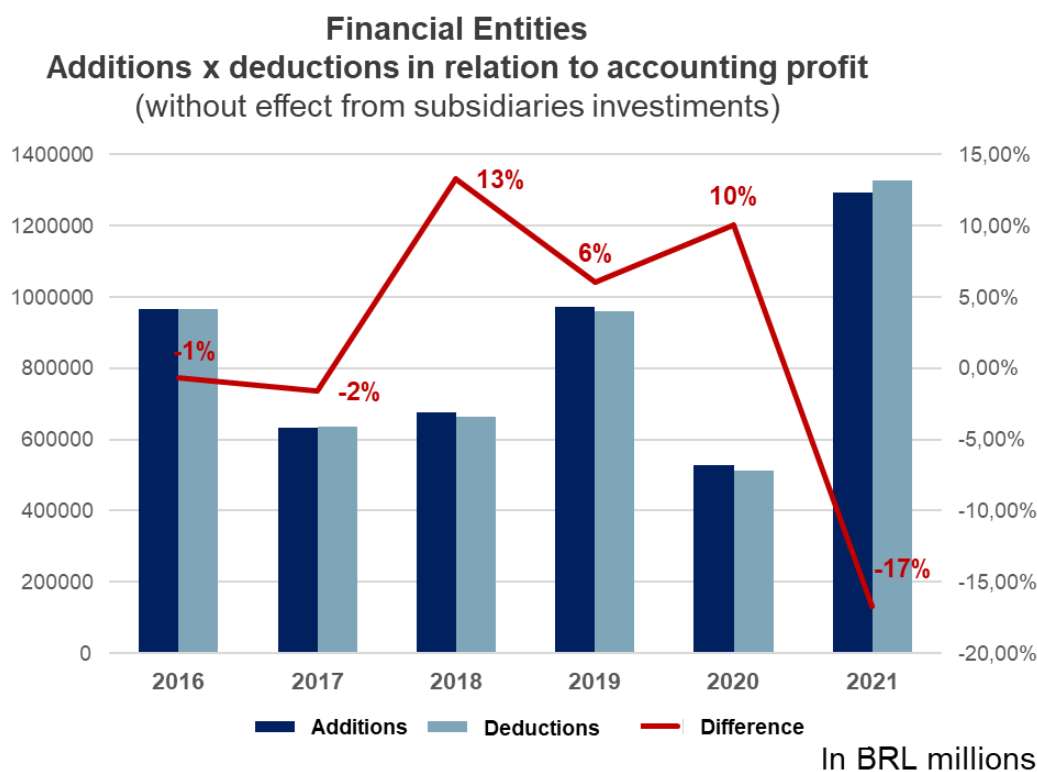
The behavior of the difference between profits in financial companies shows a pattern within the expected. It is possible to observe that, in almost all years, the difference between Adjusted Accounting Profit and Taxable Profit are mostly small (between 2016 and 2020, they vary between -6.83% and +7.72%) and, in addition, the reductions observed for the years 2016, 2017 and 2019 are partially reversed in the years 2018 and 2020.

For financial companies, the most significant additions and exclusions refer to market value adjustments (positive and negative adjustments), mentioned in article 35 of Law No. 10,637/2002, and non-deductible provisions (incorporation, reversion, and use). Such adjustments corresponded, in all years, to more than 70% of the total additions and more than 50% of the total exclusions, representing, in 2021, 87.33% of the additions and 70.04% of the exclusions. In all years, the amount of these additions was higher than the number of exclusions.

In addition, it is possible to comment on the atypical difference observed in 2021. This year was marked by inflation of 10.06%, more than double that experienced in the last 4 years (2017 to 2020) and more than 50% of that seen in 2016 (6.29%). It is possible that this inflationary scenario influenced the total value of fiscal adjustments made, so much so that, in 2021, the highest volume in the series was observed.

In addition, if we consider the most relevant adjustments (adjustments to market value and provisions/reversals), 2021 was the year with the smallest difference between the corresponding additions and exclusions. To give an idea, the net effect of these additions and exclusions, from 2016 to 2020, was between BRL 42.83 billion (2020) and BRL 132.50 billion (2019), while in 2021, it was only BRL 12.15 billion, which shows that there was an increase in the total exclusions. In addition, it is worth noting that, also in 2021, these additions and exclusions proved to be more representative, as mentioned.

Non-financial Entities
In BRL millions

34%
Nominal Tax Rate

24.32%
Average

Average Effective Tax Rate	22.96%	25.35%	23.90%	24.95%	26.33%	22.42%

Non-financial Entities
Additions x deductions in relation to accounting profit
(without effect from subsidiaries investiments)

In BRL millions
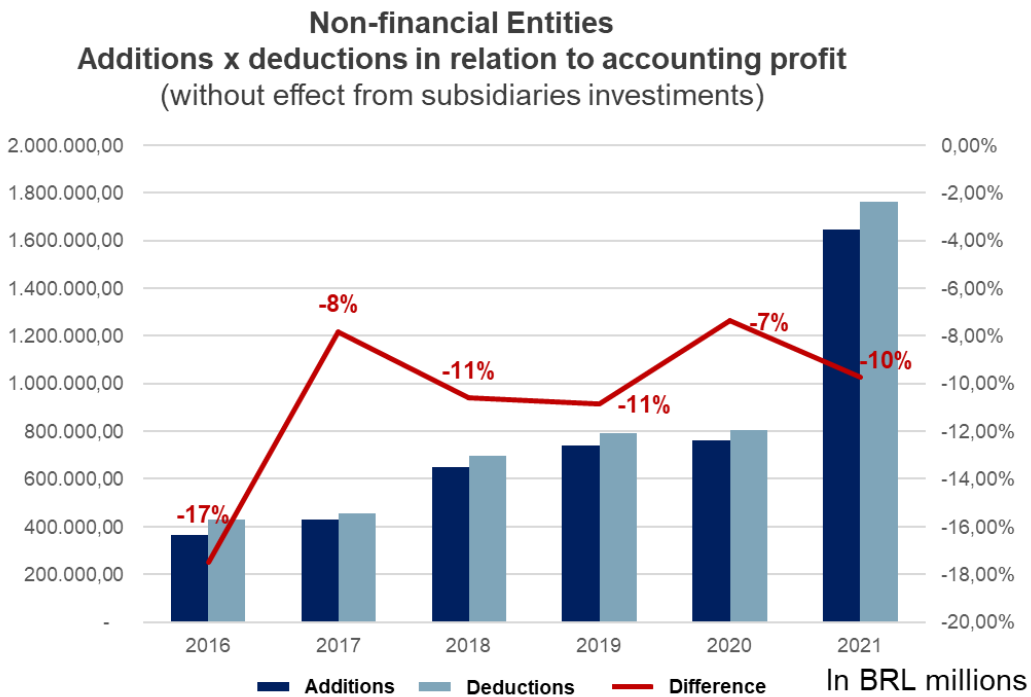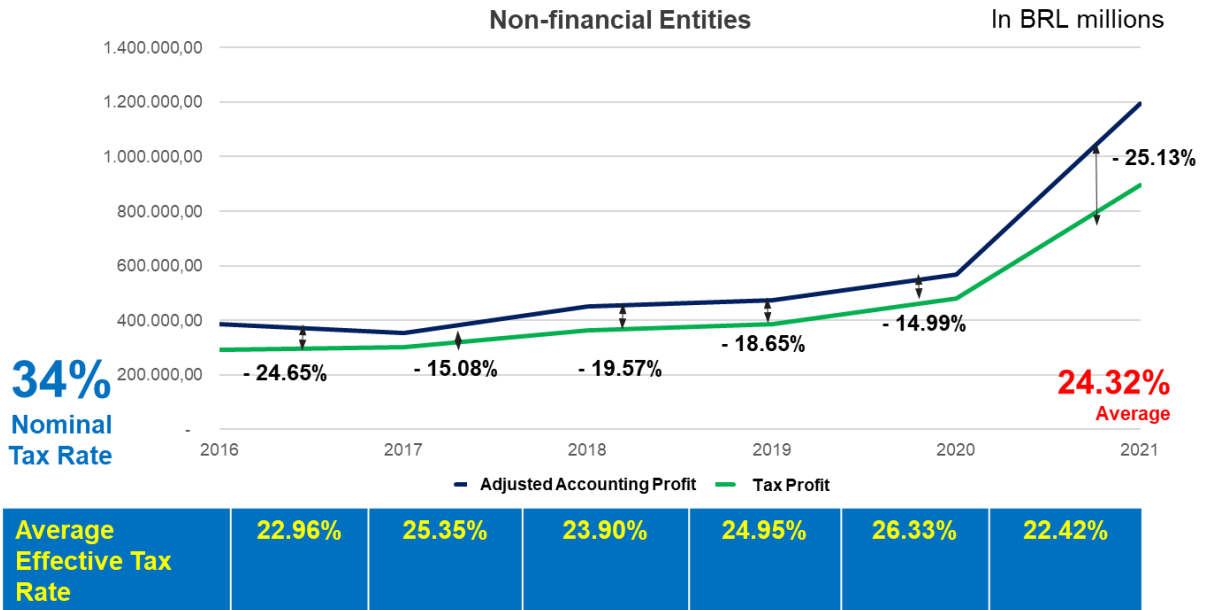
The behavior of the difference for the non-financial ones shows a persistent reduction over time, that is, for all years, the Taxable Profit is systematically lower than the Adjusted Accounting Profit, which indicates that the amount of the exclusions made is always higher than the amount of the additions.

For these companies, the additions and exclusions related to non-deductible provisions (constitution, reversal, and use), in all years, are the most relevant of all tax adjustments, what, with the exception of 2019, generated a positive net effect on Taxable Profit, i.e., there are more additions (more provisions being constituted than reversed or used). It is somewhat an

unexpected pattern, since the negative differences between accounting and tax profits do not come from the most relevant adjustments.

Other relevant adjustments correspond to additions and exclusions involving exchange rate variations and those designated as "other". There are also other adjustments among the more representative, but do not appear in all years, such as additions or exclusions related to leases, fair value, non-deductible costs/expenses, and interest on equity.

The preliminary results presented here, resulting from the expansion of the tax gap study, bring to light relevant points that deserve to be considered in the analysis of corporate income taxation in Brazil and in the proposal of future improvements. It is clear that it is necessary to take a closer look at effective taxation, for that, it is not possible to take only the nominal rate as a reference, but rather, aspects related to the determination of the tax bases must also be considered.

ii. Policy Gap

a) Presumptive Profit

FÓRMULA		2015	2016	2017	2018	2019
A	**Tax base** declared on the Presumptive Profit regimen (Gross revenue x % of presumption)	176,853	166,919	168,142	181,707	199,252
B	**CIT due** over the declared tax base	50,433	48,227	48,218	53,432	59,170
C=B/A	**Effective** tax rate	28.5%	28.9%	28.7%	29.4%	29.7%
D	**RPETB – Real Profit Equivalent Tax Base**	489,966	480,967	466,251	472,878	537,093
E	**CIT due** over the **RPETB – Real Profit Equivalent Tax Base**	159,401	156,398	151,439	153,259	175,100
F=E/D	**Effective** tax rate	32.5%	32.5%	32.5%	32.4%	32.6%
G = E - B	**Policy gap (value)**	**108,968**	**108,171**	**103,221**	**99,828**	**115,930**
G/E	Policy gap (% from potential tax)	68.4%	69.2%	68.2%	65.1%	66.2%

The tax policy gap for companies in the Presumptive Profit is calculated by directly comparing the CIT amount that would be due under the referred regime (line B in the table) and an approximation of the amount that would be due if such companies were subject to the general CIT rule, that is, Real Profit (line E).

Due to data limitations in the Presumptive Profit tax accounting, it is not possible to calculate the true Real Profit for such companies. Thus, an approximation was calculated and nominated,

for didactic purposes, RPETB – Real Profit Equivalent Tax Base (line D). In the methodology item of this report there is a description of the steps taken for calculating the tax policy gap presented in the study.

b) Simples Nacional

FÓRMULA		2015	2016	2017	2018	2019
A	**Tax base** declared on *Simples Nacional*	795,606	849,222	929,447	1,049,323	1,185,955
B	**CIT due** over declared tax base	6,192	6,758	7,614	11,127	13,118
C=B/A	**Effective** tax rate	0.78%	0.80%	0.82%	1.06%	1.11%
D	**RPETB – Real Profit Equivalent Tax Base**	230,687	236,809	260,115	298,664	338,216
E	**CIT due** over the **RPETB – Real Profit Equivalent Tax Base**	68,222	70,075	77,239	88,986	100,867
F=E/D	**Effective** tax rate	29.6%	29.6%	29.7%	29.8%	29.8%
G = E - B	**Policy gap (value)**	**62,030**	**63,317**	**69,625**	**77,859**	**87,749**
G / E	Policy gap (% from potential tax)	90.9%	90.4%	90.1%	87.5%	87.0%

The calculation of the tax policy gap for Simples Nacional companies follows the same steps as that carried out for Presumptive Profit, with the difference that the set of tax forms of Simples Nacional companies is even more synthetic than those of Presumptive Profit, thus missing essential information for an accounting profit calculation. Consequently, the RPETB of Simples Nacional was obtained from the adjusted fiscal GOS, during the stochastic frontier study.

It is interesting to notice that in the Presumptive Profit there is a concentration of companies with the highest profitability rate, which is not only the result of a natural choice for a more beneficial regime, but also of the existence of tax planning structures that shift the profit of companies under this taxation regime.

The following diagram provides statistics on the companies studied in the three tax regimes and shows the difference in average profitability between these.

		Real Profit	Presumptive Profit	Simples Nacional
A	Number of companies	147,402	837,728	2,543,725
B	Total revenue of companies (BRL million)	8,460,935	1,324,500	961,911
C = B/A	Average revenue per company (BRL million)	57.40	1.58	0.38
D	Net income - BRL million	164,228	403,207	32,442
E = D/A	Average profit per company (BRL million)	1.11	0.48	0.01
% E/C	**Net Profit / Revenue - Average Per Company**	**1.9%**	**30.4%**	**3.4%**

iii. Collection Gap

This section covers the results from the collection gap calculation, segregated in the three main CIT tax regimes.

In BRL millions	2015	2016	2017	2018	2019
Collection Gap	**53492**	**59359**	**54188**	**40051**	**62808**
Real Profit	34179	37228	31753	15738	25483
Presumptive Profit	19827	22458	21429	22348	33942
Simples Nacional	-513	-327	1005	1964	3383
	2015	**2016**	**2017**	**2018**	**2019**
Actual collection	**173466**	**182560**	**185594**	**204588**	**189104**
Real Profit	110930	117512	119127	134707	127976
Presumptive Profit	51903	54168	54981	57816	49368
Simples Nacional	10634	10881	11486	12065	11760

* Values in BRL millions
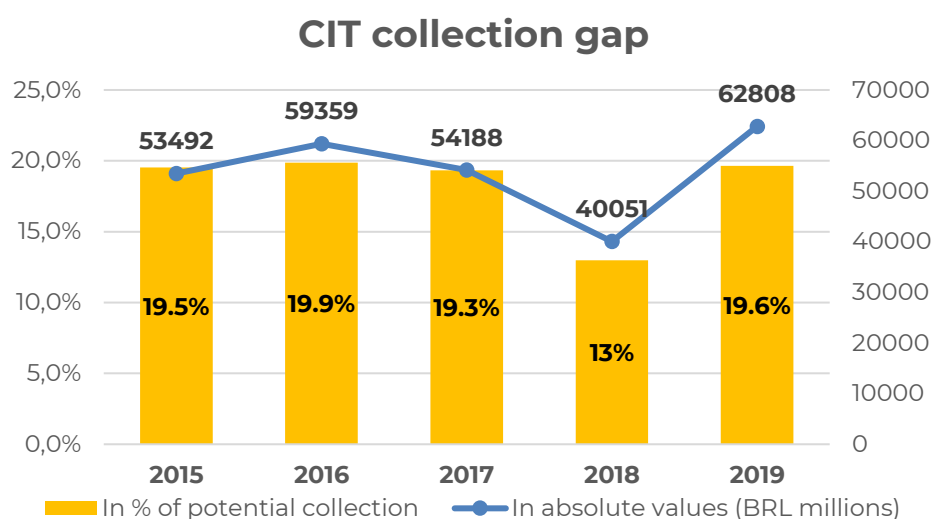
Some results are relevant and worth mentioning:

- The 13.8% increase in the effective collection from the companies of Real Profit, when comparing 2018 to 2017, what reduced the collection gap for this regime by about 50% in this period. This increase can be partially explained by extraordinary factors, such as the opening of the PERT-PRT (Special Tax Regularization Program) and the change in the rules for offsetting the monthly CIT anticipations from companies of Annual Real Profit, established by Law No. 13,670/2018;

- A substantial decrease in the collections from companies of the Presumptive Profit in 2019, compared to previous periods, what increased the gap by approximately 50% in the same period;

- The existence of slightly negative gaps for companies under Simples Nacional in years 2015 and 2016, what can be explained by the low adherence of these taxpayers to the

filling of PGDAS (Simples Nacional monthly tax form) in these years. In other words, if there is no declaration, the amount of taxes declared is reduced, from which the effective collection is subtracted to calculate the gap.

Administrative dispute by tax type
in BRL billions

Tax type	Value
PIT	15.2
Other	23.5
Penalties	23.6
Withholded CIT	37.1
Excises	38.9
Labor taxes	61.2
VAT	106.2
CIT	349
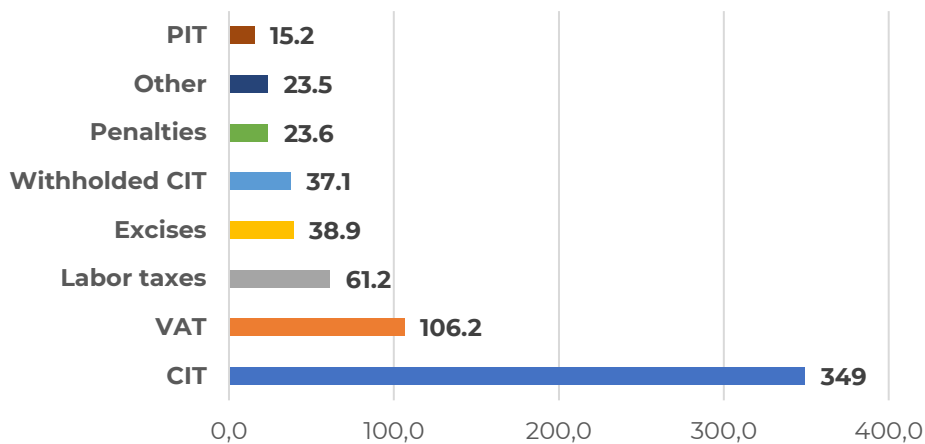
The series above show the amounts that are currently under administrative dispute, segmented by tax. It can be seen the large proportion of CIT in litigation, concentrating around 53% of the total amount. On the other hand, the CIT corresponds to approximately 20% of the amount collected of these tax types. Therefore, there is a greater propensity to litigate in the CIT, when compared to the propensity to pay. It is important to explain that CIT in Brazil is composed by two tax types, IRPJ and CSLL, so these numbers are referring to both taxes.

Collection gap evolution
BRL millions

Year	Actual collection	Collection Gap
2015	173,466	53,492
2016	182,560	59,359
2017	185,594	54,188
2018	204,588	40,051
2019	189,104	62,808
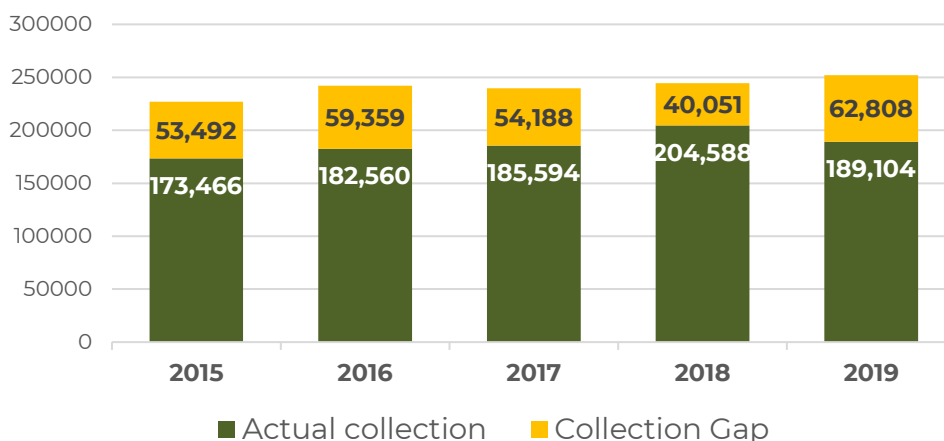
Collection gap variation
Presumptive Profit companies

- Presumptive p. gap / Total gap
- Presumptive p. gap / Effective collection
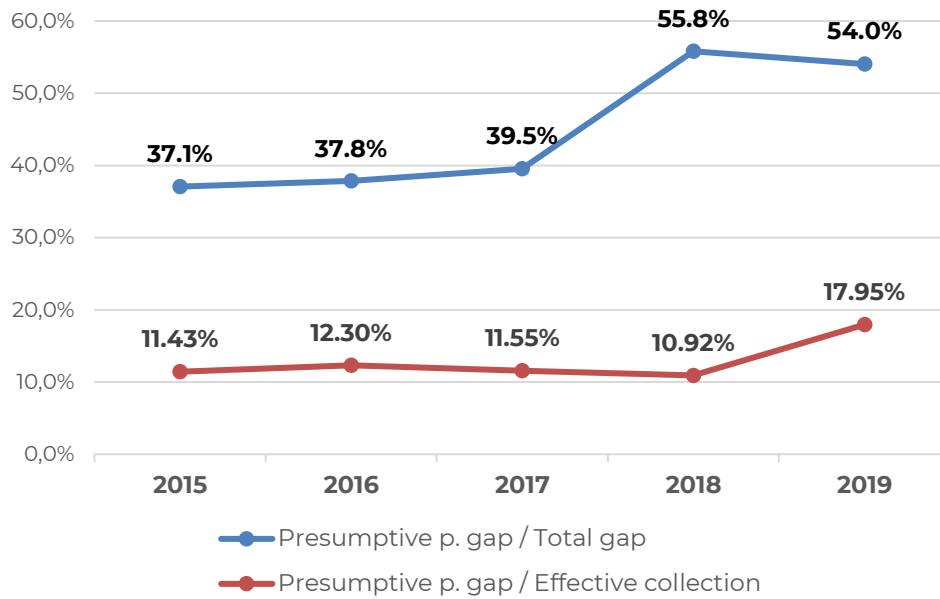
Collection gap variation
* In BRL millions

- Collection Gap
- Collection Gap Real Profit
- Collection Gap Presumptive Profit
- Collection Gap Simples Nacional
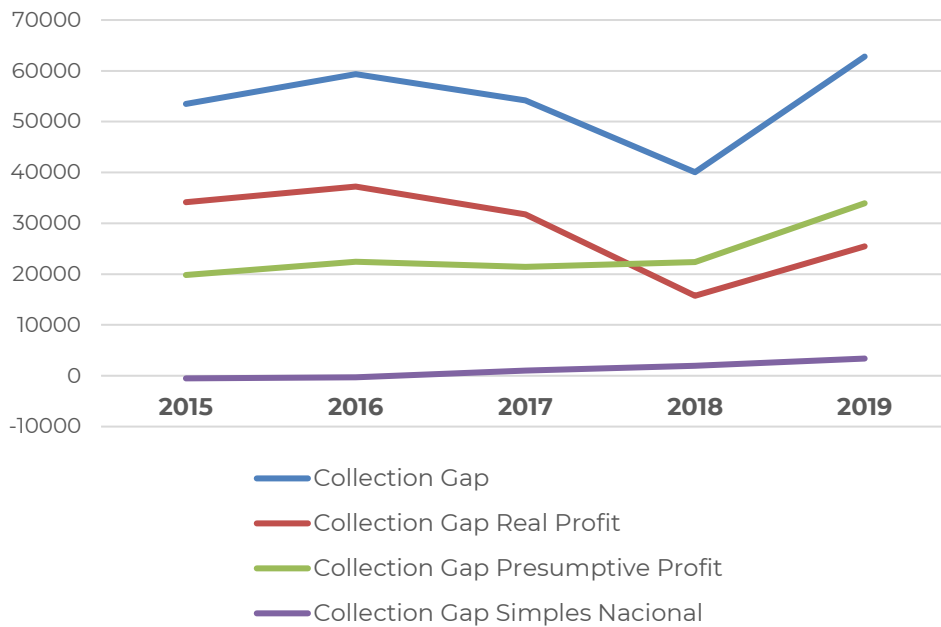
7. Sectoral Results

i. Sectoral gaps from Simples Nacional

The stochastic frontier method used for estimation of gaps from the Simples Nacional allowed to obtain sectoral cutouts, which will be presented below.

Sectoral revenue gap from Simples Nacional
Share of each sector in the total - 2015 to 2019 average

Manufacturing 13.14%
Transport, storage and mail 5.56%
Construction 4.19%
Information and communication 2.75%
Other 1.69%
Other services 26.27%
Commerce 46.40%
Farm activities 0.58%
Real estate 0.53%
Utilities 0.36%
Extractive industries 0.22%
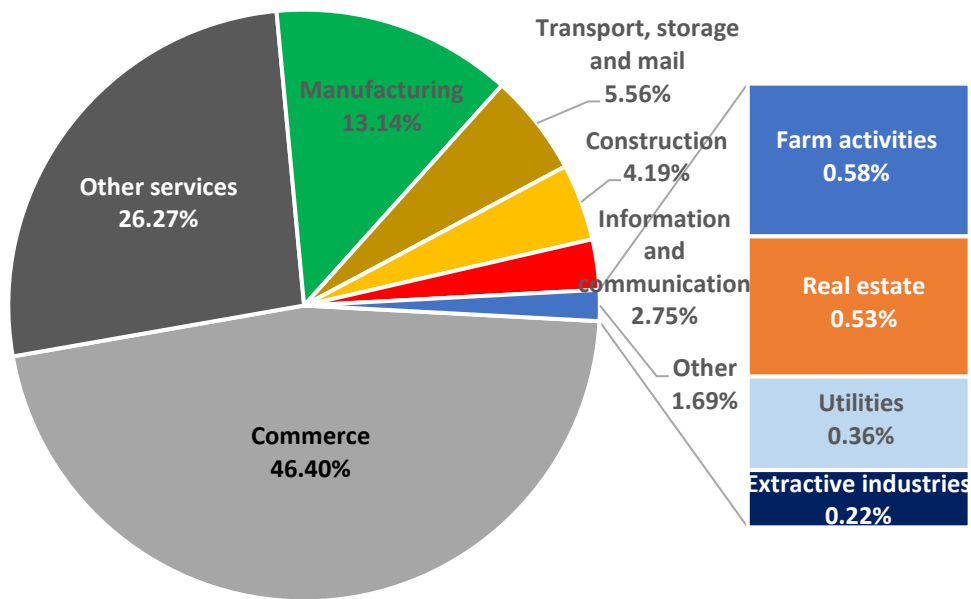
The chart above shows the sectoral composition of the revenue gap, as a percentage. Commerce is responsible for almost half of the gap under Simples Nacional, followed by the services sector as the second largest in value, what can be explained by the large number of commercial and service companies that are under the aforementioned tax regime.

Sectoral revenue gap from Simples Nacional
In % from potential revenue of each sector - 2015 to 2019

Sector	%
Commerce	31.3%
Manufacturing	32.2%
Extractive industries	33.5%
Information and communication	33.8%
Other services	33.8%
Real state	34%
Construction	36.6%
Utilities	37.3%
Transport, storage and mail	37.6%
Farm activities	38.1%
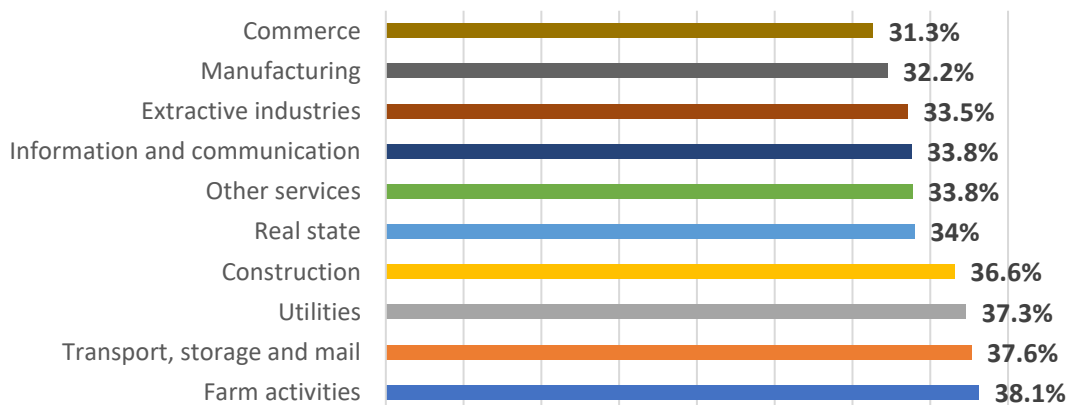
The above series show the estimation of the percentage gross revenue gap of each sector, that is, calculated in relation to the potential revenue of the respective sector. It can be seen that farm activities appears as the sector with the largest percentage gap, but the amount is significant in all sectors, remaining above 30% of potential revenue in all of them.

Sectoral revenue gap from Simples Nacional
Average gap per company in BRL

Sector	Value (BRL)
Real state	110,912
Other services	163,928
Information and communication	179,022
Commerce	192,734
Construction	199,716
Transport, storage and mail	203,145
Farm activities	217,368
Extractive industries	239,505
Utilities	257,903
Manufacturing	267,166
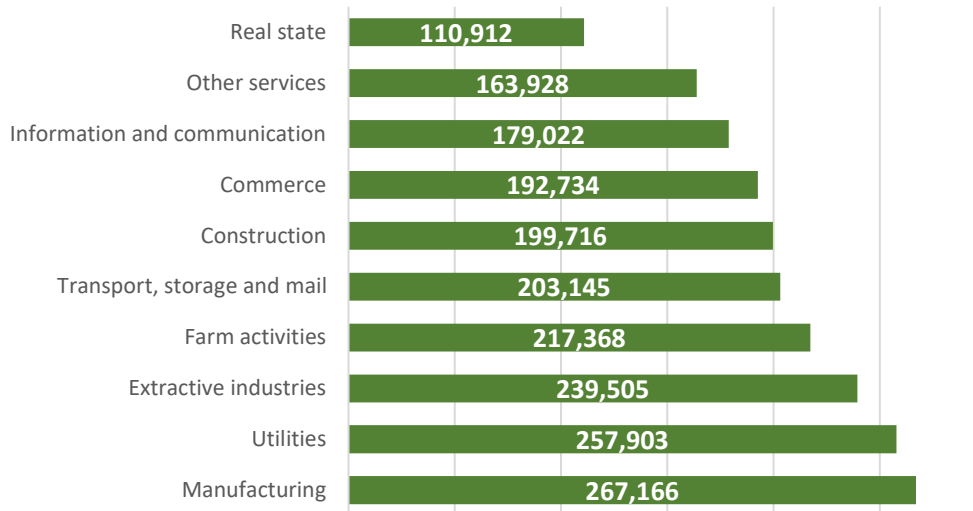
The chart above shows the average gross revenue gap per company for each sector. It should be noted that the manufacturing industries sector, although responsible for only 13.14% of the total gap, has the largest average gap per company, what is explained by their larger size compared to companies from other sectors under Simples Nacional.

It can also be seen that utilities sector (electricity, gas, water, sewage, etc.) has the second largest average gap, possibly because it concentrates companies with a size above the average of the regime. However, it is noted that this sector as a whole represents less than 1% of the total gap.

The combined analysis of the two cuts suggests that possible approaches to encourage compliance should be diversified, with a predominance of a focused approach (audits) for companies in the manufacturing industry sector, whose average gap is high but concentrated in fewer companies. On the other hand, the commercial sector, that concentrates half of the gap but whose average gap per company is smaller due to the great dispersion, is eligible to a massive, lower-cost, and wide-reaching approach. The real estate sector has the lowest average gap per company, combined with a very low participation in the total gap, which suggests an approach based on incentives for auto-compliance or unidirectional interactions such as "nudges".

Sectoral CIT tax gap evolution from Simples Nacional

In % of potential collection - 2015 to 2019

Extractive industries
- 54,3%
- 52,3%
- 37,9%
- 36,0%
- 35,6%

Real state
- 51,4%
- 51,7%
- 39,8%
- 38,6%
- 44,9%

Farm activities
- 57,1%
- 57,3%
- 41,0%
- 39,8%
- 48,3%

Utilities
- 56,6%
- 56,7%
- 43,9%
- 41,3%
- 54,6%

Information and communication
- 59,4%
- 60,4%
- 41,7%
- 40,8%
- 44,6%

Transport, storage and mail
- 62,7%
- 62,2%
- 43,0%
- 41,3%
- 49,6%

Construction
- 52,0%
- 51,0%
- 47,8%
- 46,4%
- 47,9%

Manufacturing
- 55,3%
- 54,7%
- 37,9%
- 36,3%
- 41,4%

Other services
- 52,0%
- 52,4%
- 43,9%
- 42,0%
- 46,3%

Commerce
- 47,4%
- 46,7%
- 38,2%
- 36,7%
- 43,9%

Legend: ■ 2019 ■ 2018 ■ 2017 ■ 2016 ■ 2015

The results obtained by application of the stochastic frontier method also allowed the analysis of individual behaviors from companies in relation to the variables studied. For example, the analysis of companies in relation to their proximity or not to the exclusion limit of Simples Nacional (the criterion used was to obtain revenue of 90% or higher in relation to the limit of the regime) showed the existence of numerous outliers, entities whose distance from the border was substantially greater than in the rest of the population, demonstrating a high degree of potential non-compliance.
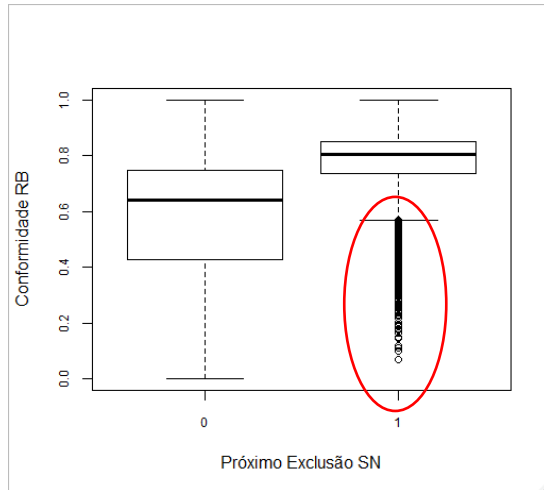
ii. *Sectoral gaps from large companies (Comac)*

CIT tax gap for large companies
Share of each sector - 2015 to 2019
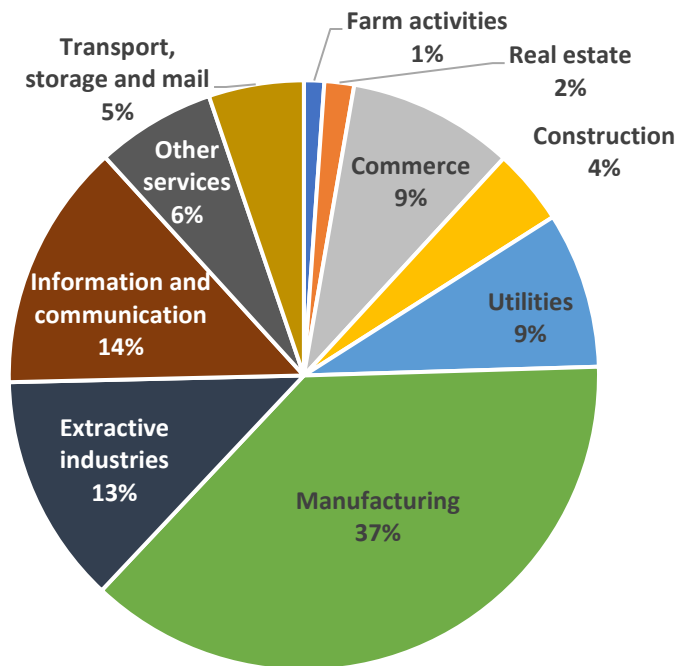
The series above, obtained from the study performed by Comac on large companies, demonstrates an expected behavior, with a large participation of the industrial sector in the composition of the total gap, due to the size of this sector.

Sectoral tax gap from large companies
expressed as % from potential collection

In the series above it is possible to see, in opposition to what occurs with the companies from Simples Nacional, a great variation in the gap between the sectors, with emphasis on the Construction, Information & Communication and Real Estate activities, which appear respectively with 77.1%, 74.9% and 73.1% of tax gap in relation to the expected potential collection. However, these three sectors together account for only 7% of the total gap of large companies.
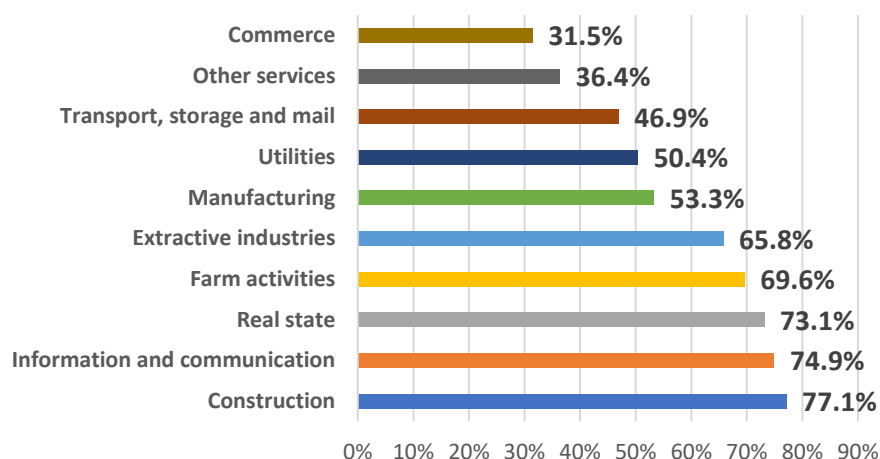
Possibly the biggest challenge among large companies is the fight against the tax gap in the manufacturing sector, which accounts for 37% of the total gap and appears in the series above with a 53.3% gap as a percentage of potential revenue.

If considered, from a risk management perspective, the product of impact (participation in the total gap) x probability (percentage gap of the sector), the manufacturing sector represents the most representative:

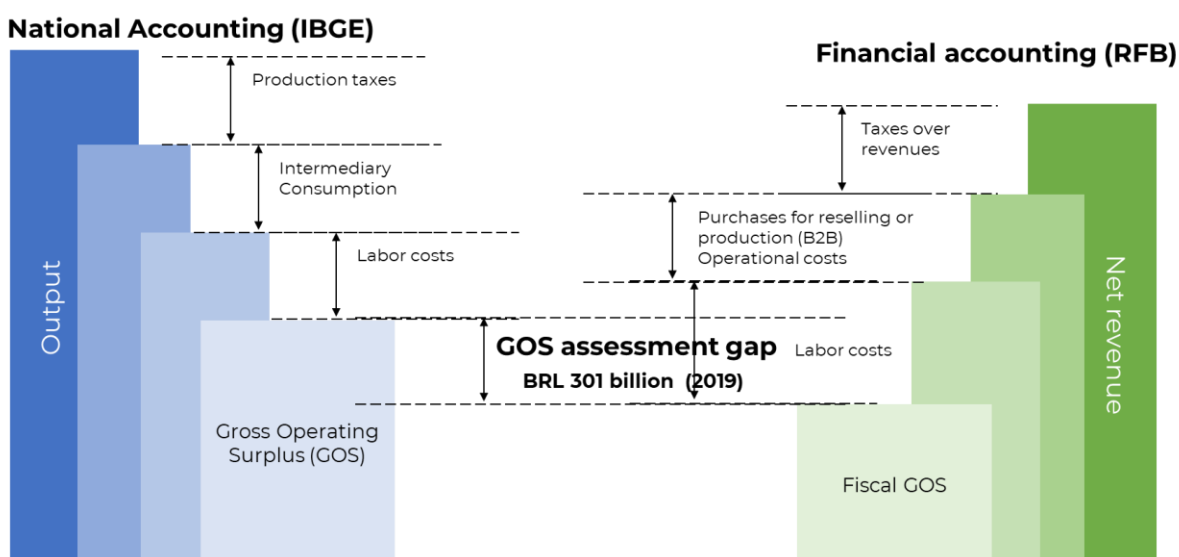| Sector	Probability	Impact	Risk
Manufacturing	0.533	0.375	0.200
Information and communication	0.749	0.136	0.102
Extractive industries	0.658	0.126	0.083
Utilities	0.504	0.085	0.043
Construction	0.771	0.041	0.032
Commerce	0.315	0.091	0.029
Transport, storage and mail	0.469	0.052	0.024
Other Services	0.364	0.065	0.024
Real estate	0.731	0.016	0.012
Farm activities	0.696	0.011	0.008

8. Methodology

i. Custom Top down

As previously mentioned, during this work it was necessary to develop a simplified method of estimation that could use the available information from the IBGE and that would allow to cover the three taxation regimes and their differences, resulting, therefore, in the methodology that will be detailed below.

The method applied starts from the highest level of the National Accounts (production of the economy) to arrive at the Gross Operating Surplus (GOS) of non-financial companies (scope of work), an important macroeconomic aggregate that represents the value added by economic activity after the removal of labor remuneration. Furthermore, the GOS usually has a strong correlation with the CIT tax base.

The National Accounting already includes in its tables the values for GOS, as well as details of the aggregates used in the step-by-step calculation. However, in the accounting universe of companies there is no full correspondence of concepts with National Accounting and, therefore, it is necessary to use proxies, that is, approximations, in order to obtain an economic aggregate as close as possible to the GOS, based on the use of accounting and tax data available in the RFB for the three regimes. For didactic purposes, the result obtained by this approximation of the GOS, built from the tax data and the business accounting, was called fiscal GOS.

By directly comparing the GOS recorded in the National Accounts and the GOS obtained by the corporate and tax accounting it is possible to obtain the GOS assessment gap.

The following figure details the composition of the fiscal GOS estimated, among the different tax regimes:
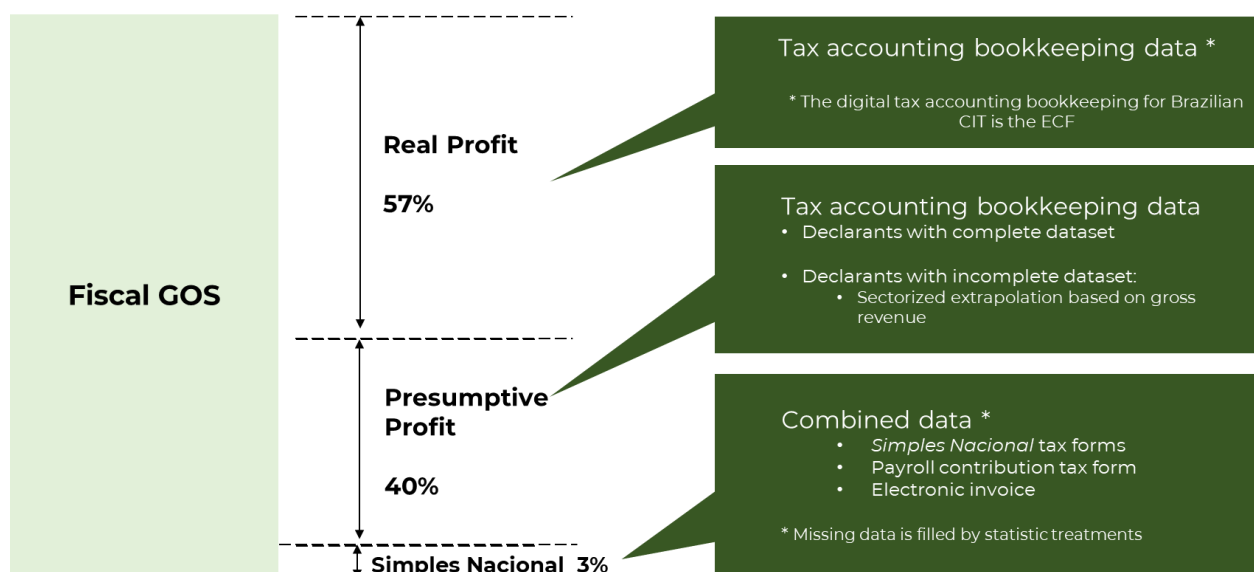
a) Breakdown of fiscal GOS attainment process

The fiscal GOS is obtained from existing tax data, however each tax regime has its own set of information that can be used in this estimation.

For the Real Profit, information is extracted from specific areas of digital tax account bookkeeping (ECF), mostly the accounts of the Income Statement for the Fiscal Year – P&L. Through selection of specific accounts is possible to obtain results that are compatible with GOS from National Accounts.

For a better approximation, it is also necessary to adjust the FISIM – Financial Intermediation Services Indirectly Measured. FISIM is a concept of National Accounts, and it is based on the difference between the remuneration paid or received by companies in relation to a basic interest rate.

This need is due to the fact that entries in business accounting involving the receipt and payment of interest occur at the market rate, however, for the National Accounts, the effects of FISIM are removed from the calculation, so in the GOS from National Accounts, the interest is appropriated at the base rate and not at market rates.

The adjustment consists of adding to the financial revenues the amount of FISIM received and removing from the financial expenses the FISIM paid, thus making the calculation criteria compatible with the existing one in the National Accounts.

Example:

For a financial expense of 10,000, considering the market interest at the rate of 5% (500) and the interest at the basic rate of 1% (100), there is a FISIM of (500 – 100) 400 for the expense. The adjustment consists of adding to the GOS (therefore taking from the expense) the amount of 400, resulting in 9,600 of adjusted expense.

Once the necessary adjustments have been made, the final equation for the fiscal GOS takes the following form:

$$\text{Fiscal GOS} = (RB - DEV - TRB - CMV - PDO - REM + FISIM\_rec - FISIM\_paid)$$

Where:

RB – Gross Revenue
DEV – Returns and cancellations
TRB – Taxes on gross revenue (PIS, COFINS, ISS and ICMS**)**
CMV - Cost of goods and/or services sold | cost of self-manufactured products
PDO – Operating expenses (according to IBGE mapping)
REM – Labor Costs (ECF)
FISIM_rec – FISIM received by companies
FISIM_paid – FISIM paid by companies

For the Presumptive Profit companies, it was also used information from the P&L, found in the ECF. However, not all companies from this regime are obligated to declare this information. In the analyzed period, the rate of declaration of these statements varied from 58% to 86% of the total number of Presumptive Profit companies, so, to include the non-declarant companies in the study it was performed an extrapolation of the GOS found in the group of declarants, based on the proportion of gross revenue calculated for each year and operational sector, between declarants and non-declarants, as shown below:

$$GOS\ total\ (i,j) = \frac{total\ gross\ revenue\ (i,j)}{gross\ revenue\ declarants\ (i,j)}\ x\ GOS\ declarants\ (i,j)$$

Being:

i = year
j = operational sector

b) Estimation of GOS gap composition

The GOS assessment gap results from the difference between the GOS from National Accounts and fiscal GOS. However, there is no qualitative information about the gap itself since it is a portion of the economic activity unknown by the tax administration. Thus, the impossibility of segregating the data from the National Accounts by tax regime prevented a direct calculation of this gap distribution among these.

Initially, it would be possible to assume a hypothesis that the composition of GOS gap could be the same of the known part (the fiscal GOS), nevertheless, during the study this hypothesis was abandoned since the evidence have pointed in the opposite side. For instance, the gap estimation made for Simples Nacional companies through stochastic frontier method revealed that the magnitude of the gross revenue gap for this regime indicates a much higher GOS gap than would be attributable to Simples Nacional in case it was adopted the 3% of share that it has in the known fiscal GOS.

Therefore, as an alternative to obtaining the GOS gap composition, it was performed a calculation of a weighting for each regime, based on the sectoral gaps calculated in the previous study of the VAT tax gap [1], so considering the gap and the weight of each sector in the composition of each tax regime, as follows:

$$p\_SN = \sum_{i=1}^{n} revenue(i) \; x \; gap\_VAT(i) = 31.5\% \; *$$

$$p\_LP = \sum_{i=1}^{n} revenue(i) \; x \; gap\_VAT(i) = 26.3\% \; *$$

$$p\_LR = \sum_{i=1}^{n} revenue(i) \; x \; gap\_VAT(i) = 42.2\% \; *$$

Where:

i = operational sector
p_X = the relative weight of the tax regime X

* Result already represented as % of the total

This approach adopted the premise that composition of tax regimes for CIT gap is similar to the composition found in the VAT gap, since the assessment gap is a result of the compliance behavior of the companies, that is, the hypothesis assumed is that the companies with the lowest level of compliance for the group of taxes on consumption will have, on average, similar behavior for the income tax group.
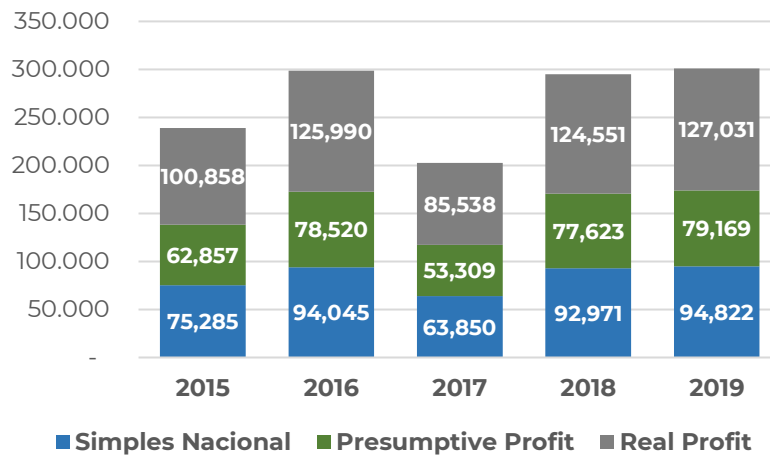
From obtaining the relative weights of each tax regime in the probable composition of the GOS gap, such factors were applied to the total value of the gap found, year by year, thus determining the GOS portion corresponding to each regime.

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[1] The Results Report for the VAT tax gap is available in:
https://www.gov.br/receitafederal/pt-br/centrais-de-conteudo/publicacoes/estudos

Estimated composition of GOS gap

Values in BRL millions

	2015	2016	2017	2018	2019
Real Profit	100,858	125,990	85,538	124,551	127,031
Presumptive Profit	62,857	78,520	53,309	77,623	79,169
Simples Nacional	75,285	94,045	63,850	92,971	94,822

■ Simples Nacional   ■ Presumptive Profit   ■ Real Profit

After determining the estimated composition of the gap, the CIT gap estimation was performed. For Real Profit companies, the CIT gap was obtained directly by applying the statutory rates on the portion of the GOS gap corresponding to such regime.

$$gap_{tax\_real\_profit} = (25\% + 9\%) \; x \; (gapGOS \; x \; p\_LR)$$

In relation to the Presumptive Profit regime, the estimation of the CIT gap was initially carried out with the determination of the relationship between the tax base for this regime and the GOS, since the taxation of the Presumptive Profit does not occur by the application of tax rates directly on the effective accounting profit of the companies, but on a tax base calculated from variable presumption coefficients, incident over gross revenue.

Thus, a coefficient was determined to relate the tax base declared by the companies of the Presumptive Profit and the calculated fiscal GOS:

$$coef_{LP} = \frac{tax\_base\_LP}{GOS\_fiscal\_LP} = 0.462 \; *$$

* Year 2019

The coefficient found was applied on the share of the GOS gap corresponding to the Presumptive Profit, thus obtaining what would be the probable tax base gap of such regime inside the GOS gap:

$$gap_{tax\_base\_LP} = coef_{LP} \; x \; (gapGOS \; x \; p\_LP)$$

Receita Federal

Finally, over the tax base gap from the Presumptive Profit it was applied the statutory tax rate to obtain the tax gap. In this regime, unlike what occurs in Real Profit, the average size of companies is substantially smaller and because of this the effective tax rate of CIT is lower than the statutory (25% + 9%), being, on average, around 29% (see item of policy gap for Presumptive Profit). This is due to the relevant number of companies whose substantial portion of their profit is below the limit of the additional 10% CIT tax rate. Thus, by applying the effective rate to the tax base gap we reach the tax gap for Presumptive Profit regime:

$$gap_{tax\_LP} = effective\_rate \; x \; gap_{tax\_base\_LP}$$

Regarding the Simples Nacional, the share of this regime inside the GOS gap was also estimated, but this number was not used since the stochastic frontier method resulted, in theory, more accurate. Thus, by methodological choice and for the purpose of composing the total CIT gap, the result derived from the stochastic frontier method was adopted as the value of tax gap for Simples Nacional.

ii. Stochastic Production Frontier Method (for Simples Nacional)

The estimation of fiscal GOS and respective assessment gap from companies under Simples Nacional presented great challenges since the accounting information provided by such taxpayers is very simplified and does not allow a direct calculation of profit or operating margin from the statements provided.

The PGDAS and Defis, the main tax forms of Simples Nacional do not contain information on profits, except in the case of the latter when companies distribute dividends above the legal allowed limit. The information on expenses and costs is only briefly reported in the Defis and its detail sheets, but less than 50% of companies fill in these fields correctly. Information on compensation of employees is not detailed in such statements, making it difficult to calculate the fiscal GOS using the same method applied in the other tax regimes.

The persistent difficulty in obtaining reliable data to determine the GOS and tax gap from Simples Nacional companies by usual methods, added to the easiness of access to disaggregated databases (such as electronic invoice registers), directed the study towards applying a statistic method known in the economics/econometrics literature as stochastic production frontier (SPF).

The SPF method was originally developed to estimate production possibilities of companies from a set of inputs (such as capital and labor) using classic production functions such as Cobb-Douglas. Regarding this work, it can be considered innovative in terms of scope and level of detail, since it encompassed the business activity of the entire population of companies of Simples Nacional (3 million active companies per year, on average). This allowed, for example, to obtain sectoral or regional estimates down even to company level.

A classical SPF model establishes the limits of production capacity of a set of companies, starting from a set of inputs. For instance, a model applying a Cobb–Douglas function will have its logarithmic form of the function with the following structure:

$$\ln y_i = \beta_0 + \sum_{j=1}^{k} \beta_j \ln x_{i,j} + (v_i - u_i)$$

Where Y_i is the output of unit i, obtained from a set of inputs ($x_{i,j}$) and the coefficients β_i (which will be estimated in the calculation). u_i and v_i, in turn, correspond to the two types of errors (residuals) from the regression performed.

The component v_i is the idiosyncratic error and captures the random shocks of the external environment (extrinsic) on the company and that influence its level of production (e.g., strikes, natural phenomena, etc.). Such error, by premise, must have an identical and bidirectional distribution with zero average, and must also be independent of the u_i component. This one, in turn, is the error attributable to the technical inefficiency of the company (intrinsic factor), has non-negative values, and as a rule is modeled by a half normal, truncated normal, gamma or exponential distribution.

The process of optimizing a SPF model essentially comprises two aspects:

1) Maximization of the explanatory power of the model, obtained when the variables chosen for the modeling are supported by economic theory and have statistical significance.

2) Obtention of an adequate distribution for the two regression residuals (idiosyncratic and technical inefficiency, respectively v_i and u_i), with a high level of independence between these two components and good adherence to the distribution used in the model).

The adaptation of a SPF model to a tax approach under Simples Nacional is based on the use of tax information as inputs for a production function whose product is the revenue from the company activity. Thus, the model is able to construct a frontier for revenue generation (close to which the most compliant companies would be located) and, consequently, estimate the degree of inefficiency for these companies, as a function of the distance between their declared revenue and the corresponding frontier.

Note that, for the specific case of the custom model, the inefficiency factor (function of the u_i component) becomes a measure of the company compliance. In other words, the distance between declared revenue and the potential revenue at the border can be interpreted as an estimate of the revenue tax gap.

	Classic model	**Custom model**
Input variables	• Capital • Labor	• Purchases • Labor costs • Bank account activity
Output variable	• Production level	• Gross revenue
Regressions errors	• Idiosyncratic • Inefficiency	• Idiosyncratic • **Revenue gap**

The SPF tax model resultant from this study was improved sequentially, based on an initial set of fiscal inputs that was gradually modified and evaluated until obtention of a satisfactory model, with acceptable statistical parameters. The current set of inputs used in the model includes the following information:

- Purchases Net of Returns (from Electronic Invoice)

- Labor compensation and number of employees (GFIP)

- Bank flow (as declared by financial institutions)

- Payments made by credit card

- Information if the company has filled out the Defis establishment form

- Purchases and expenses reported in the Defis establishment form

- Fixed capital (assets of the corporate structure and share capital of the company)

- Time of existence in years

In addition to the input variables, the model also used discriminant (categorical) variables, in order to adjust the model to the different particularities of the company population. They are:

- Activity sector (10 categories)

- Geographic region

- Indicator if the company is close to the Simples Nacional revenue limit (declared revenue up to 10% below the limit)

- Indication of whether the company is located in an area with a high density of companies

Some of these variables were used not only in the frontier modelling, but also as explanatory variables for the errors: u_i and v_i, aiming to explain the factors behind the occurrence of idiosyncratic errors and the error resulting from inefficiency/noncompliance.

Finally, the information on the declared revenue was used, as a dependent variable, to allow the construction of the limits from the model (the frontier).

A graphical representation of a SPF model allows to better understand how these variables relate to the outcome determination, as shown in the following example:
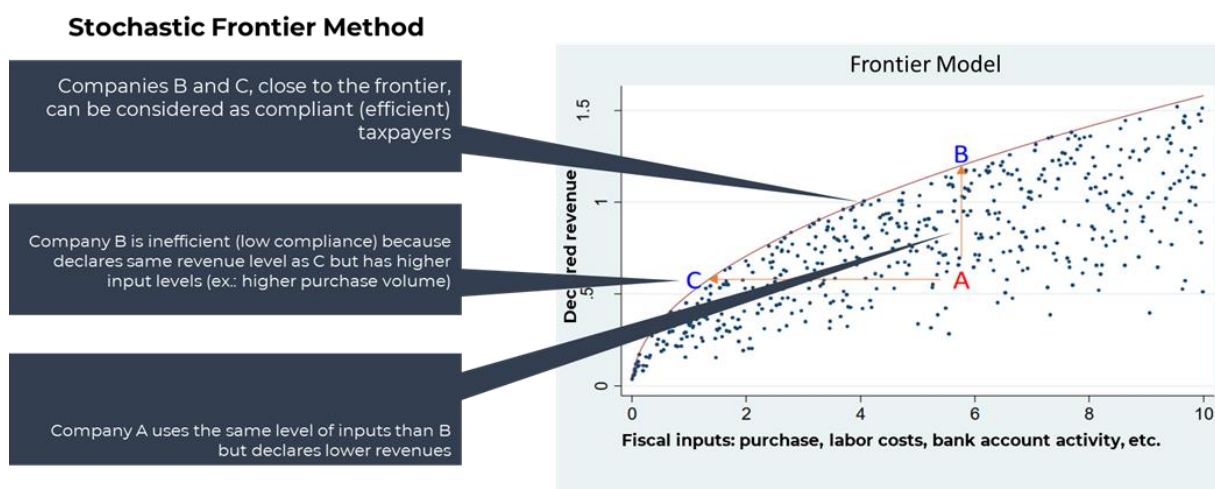
The frontier is built upon the "efficient" companies, that is, those with greater proportion of declared revenue, when compared to their fiscal inputs. Such companies, in theory, have greater tax compliance because are close to the limit of the revenue/input ratio within the observed population. In the example given, companies B and C would be in this situation, while company A, far from the border, would have a lower compliance / efficiency, since it declares the same level of gross revenue than company C, but uses a greater amount of tax inputs. Similarly, company A is inefficient compared to B, as both use the same level of inputs, but company B reports a higher level of revenue.

As mentioned earlier, the technical inefficiency from the company, in the custom SPF model, corresponds to a revenue assessment gap since it represents the difference between the gross revenue that would be expected for that company, given a certain level of inputs, and the revenue actually declared.

Taking again the example, by the level of inputs used by the company A it is expected that its revenue would be the same as B, which is located at the boundary, however the value actually declared is lower. The level difference between A and B's revenue represents a revenue assessment gap from A.
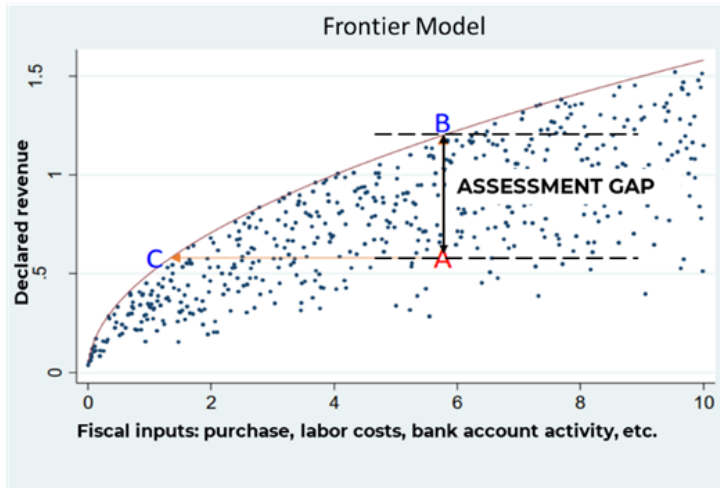
The following diagram summarizes the development main stages of the model built in this study:

Steps for estimating the gap by stochastic frontier method

| 1 Dataset extraction from the entire population on the RFB data lake | 2 Sample extraction for frontier calculation (companies with better quality data) | 3 Outlier treatment and absent data filling on the remaining dataset | 4 Declared fiscal GOS calculation (optional – for estimation of policy gap) | 5 Gap calculation for all the population using the frontier constructed on step 2 | 6 Result treatment and presentation |

SQL | R language | Stata | Power BI

The first step taken was extracting the information defined for use in the model, using queries in SQL - Structured Query Language in the data lake environment. Information was extracted from all the active companies in the years studied and that were included in Simples Nacional database, excluding those from the financial sector and government, since they are outside the scope of work.

A sample was extracted from the population, composed of companies with better information quality, that is, that filled out the detailed form in Defis and that had non-zero information for the other inputs of the model, thus composing a complete and coherent dataset. Frontier modeling uses logarithmic transformation and for this reason it is necessary to use a non-null dataset with positive values. In the 5 years studied, the average number of companies used to build the initial samples varied between 200,000 and 500,000.

About the remaining set of companies that were not selected as part of the sample, treatments were made to remove outliers, as well as some statistically default values were imputed to fill in missing information in the dataset.

During the study it was assumed as a methodological premise that it is unlikely the inexistence of information on purchases, expenses or even compensation of employees for companies that sustain regular activity, therefore, in the absence of such information, an imputation was made on a statistical basis, using the percentile of 10% extracted from the set of companies that had such information.

With this, the data set was complemented with minimal interference in the behavior of the model and, at the same time, allowed the use of the information from these companies in the estimations. Otherwise, the removal of these companies from the final group of observations would imply a much lower model accuracy, since only 7% to 17% of the population of companies could have been used in the estimation of the gaps. Also, such limitation could possibly imply in the need for extrapolation, something that would bring an undesirable distortion to the result.

Thus, for this imputation, subsets of companies (clusters) were created based mainly on the characteristics of region and operational sector, both for the companies inside the sample and for the companies that were outside the sample. Once the clusters were separated, the value corresponding to the 10% percentile in the group of companies inside the sample was obtained for each cluster and for each input variable of the model. These values were then applied to the group of companies out of the sample and belonging to the corresponding cluster, whenever zero or missing information was detected.

After the stage of complementation of data, it was also possible to calculate the fiscal GOS for all companies, based on the information of declared revenue, purchases, expenses and remuneration, in a similar way to the calculation made for the companies of the Presumptive and Real Profit, although in a simplified way, since the data originates from several sources and not from a bookkeeping. It should also be noted that the fiscal GOS calculated in this context did not allow the performing of FISIM adjustments, since the information of financial revenues and expenses was unreliable. The fiscal GOS calculated in this step was used to estimate the policy gap for the companies under Simples Nacional.

After constructing the stochastic frontier, the revenue assessment gaps were estimated, followed by the estimation of Simples Nacional composite contribution gap and the gap for the individual taxes that compose it (e.g., CIT), through the application of the statutory rates, revenue bands and specific activities provided for in the regime legislation.

It is important to notice that the SPF method, due to its characteristics, does not fit into traditional classifications of methods for calculating tax gap, such as top down or bottom up. In fact, such a model combines existing advantages from both methods. Bottom-up studies usually deliver a higher detail level, but often run into sample size limitations (e.g., audit data). Bottom-up studies also use to generate results that are overly sensitive to small distortions in the samples, as they project the tax gap using heavy extrapolations from a small amount of data, magnifying the occurrence of errors. The bias usually found in samples originated from selection or auditing is also a problem in some situations.

On the other hand, top-down studies are easy to implement, gather data from the entire population and do not have the problems pointed out in bottom-up methods, but the level of detail possible to obtain is lower, since they use aggregated data from the National Accounts. It is also useless to apply usual top-down approaches in countries which use tax data to build National Accounting data, since in these situations the datasets have the same origin, thus resulting in zero gaps.

The work performed using the SPF method allowed the estimation of the tax gap using data from the entire population of companies, without the sampling issues aforementioned, while delivering a high detail level in terms of cutouts, allowing the view of assessment gap down to each company level. It also allowed obtaining such results without the use of National Accounting data, what increases the possibilities of deployment on different countries.

iii. Bottom-up method – extreme values

The process of estimating the gaps in this study was essentially exploratory and with a focus on knowing and applying the methods already existing in other countries, as well as to develop methodologies in the RFB to respond to the identified needs.

Among these methods, the Extreme Values (EV) method is probably one of the most applied by tax administrations, in view of its simplicity of use and the limitations existent in some countries for applying top-down methods. The EV method is classified in the literature as a bottom-up methodology, as it uses data from the own tax administration, in this case, data from audits performed.

Some countries estimate the tax gap by top-down methods, but in certain cases the National Accounts data are derived from the own tax administration. In such situations it is not feasible to use a top-down method since the comparison between tax data and economic data would lead to gaps very close to zero, due to the endogeneity of economic and tax information. Among the countries that use the EV method in their estimations are the United States, the United Kingdom, and Canada. [2]

Certain countries use bottom-up methods based on Random Auditing Programs (RAP) data, but this strategy is not always present in tax administrations. Random procedures have a high cost and uncertain return, as taxpayers audited under this modality do not always have any type of noncompliance. In addition, random audits are difficult to apply to large taxpayers, which have great tax heterogeneity and complexity. In cases where information from random audits is available, gap estimation tends to be greatly facilitated, since a sample of randomly audited taxpayers is quite representative of the respective population. In such situations, it is possible to perform direct extrapolations of the gaps found in the sample to estimate the total gap from the whole population.

The most common situation in tax administrations is the existence of data from risk-based audits, i.e., procedures performed based on a selection of taxpayers chosen by non-random criterion, guided by rules, risk analysis or even tax relevance of the potential entry. In such cases, the sample of audited companies is biased and not representative of the corresponding population, as it concentrates the taxpayers with the highest risk and/or relevance, which

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[2] One of the main reference studies regarding extreme values method was performed by experts from IRS (USA) and ATO (Australia): Bloomquist, K., Hamilton, S., Pope, J. (2014). "Estimating Corporation Income Tax Under Reporting Using Extreme Values from Operational Audit Data". Fiscal Studies, vol. 35, no. 4, pp. 401-419

prevents the direct extrapolation of the results found in the sample to infer the gap in the entire population. In such a context, the method of EV has special applicability.

The main theoretical premise that underlies the EV method is that some numerical datasets, such as the size or revenue of companies, are usually subject to statistical distributions similar to those of Pareto or Zipf. Such distributions are characterized by linearity when presented on a logarithmic scale.

Similarly, and as already noted by some authors, the distribution of results of audits performed under a risk analysis criterion (non-random) also tends to follow distributions similar to those of Pareto or Zipf, especially in its upper tail, composed of the first observations (the largest entries made in audits). Thus, considering that in such distributions there is a linearity when presented on a logarithmic scale, it is possible, through a linear regression by ordinary least squares (OLS), to obtain a first-degree equation (linear), capable of explaining the outcome of audits and, therefore, be used as a tool to infer the gaps of a population of unaudited taxpayers.

The following figures show the behavior of a descending and logarithmic distribution of audit outcomes. For didactic purposes, the two samples are cut in observation number 300.

Distribution of audit outcomes for year 2015
LINEAR scale
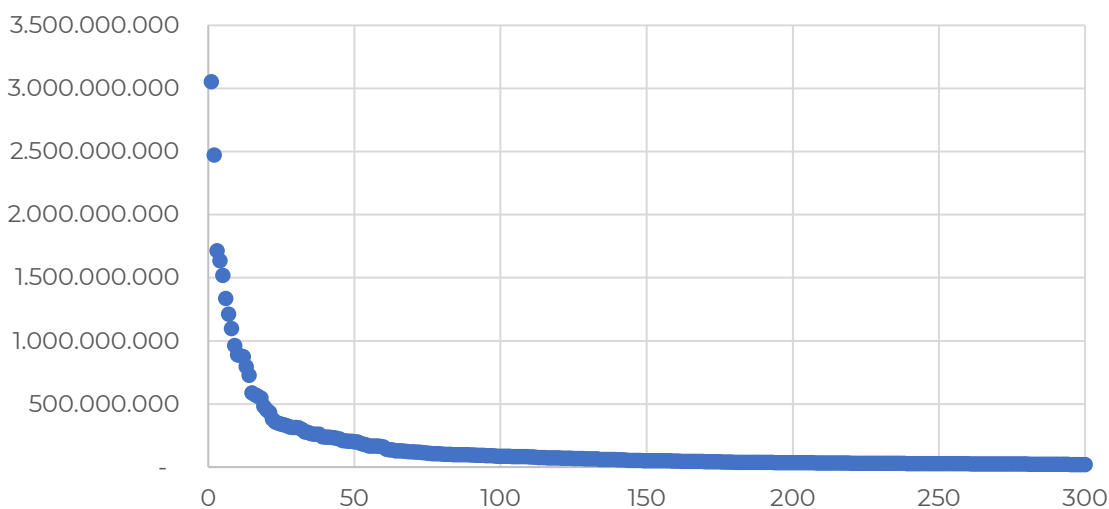
Distribution of audit outcomes for year 2015
LOGARITHMIC scale
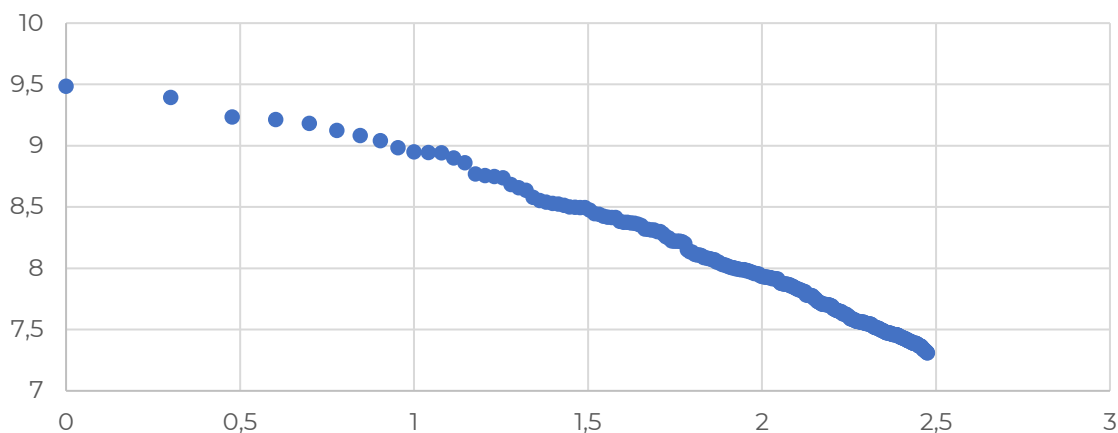
The work done in this report using EV method was based in the following steps:

- Extraction of audit data (annual samples for global gap and multi-annual sample for sectoral gap). The selection included all cases with positive CIT adjustments and excluded cases involving government and financial companies. It was considered only the main tax adjustments, without interest or penalties;

- Classification of cases in descending order of adjustment and conversion to log-10;

- Cutoff of the lower tail from distribution, determined by recursive calculation, aiming to obtain the highest squared R possible for the resulting sample;

- Regression (OLS) to find the coefficients from the linear equation;

- Estimation of potential CIT adjustments for all the population using the equation found earlier and, consequently, the tax gap;

It is important to notice, when applying such method, the existence of heavy tails in these distributions. It is common that the upper part of the data behaves similarly to a Pareto distribution, but the lower part usually resembles an exponential or log-normal distribution. In such cases, it should be considered the possibility of cutting off the lower tail, i.e., disregard the data from a certain position, so that could be possible to obtain a good quality of adjustment in the regression.

Distribution of audit outcomes for year 2015
LOGARITHMIC scale

y = -2.0733x + 12.398
R² = 0.8422

- "Heavy" tail
- Linear distribution breakout
- Poor fit (low R squared)
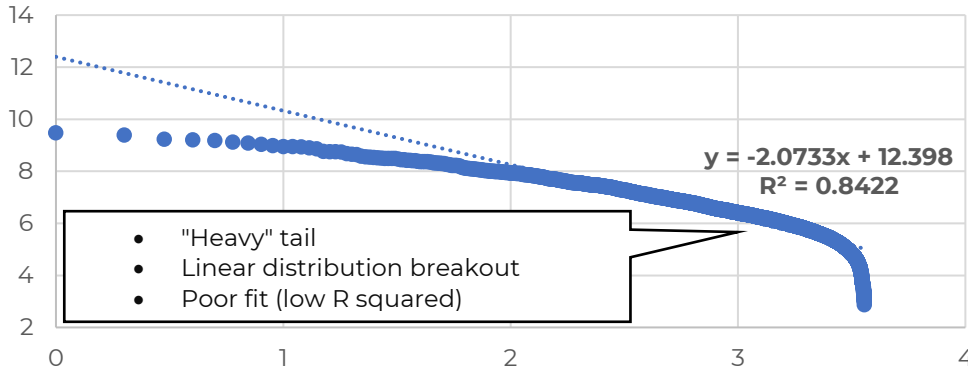
In the work performed, the method chosen for tail cutoff was the maximization of the R squared, a parameter that represents the explanatory power of the distribution by a model. For this, a Python script was used to simulate the tail cutoff in all positions from the sample, calculating the R squared for each of these points. It was then selected the cutoff point that resulted in the highest value of R squared, thus performing the regression over the resulting sample.

Distribution of audit outcomes for year 2015
LOGARITHMIC scale

y = -1.0665x + 10.025
R² = 0.9838

Better fit (high R squared)
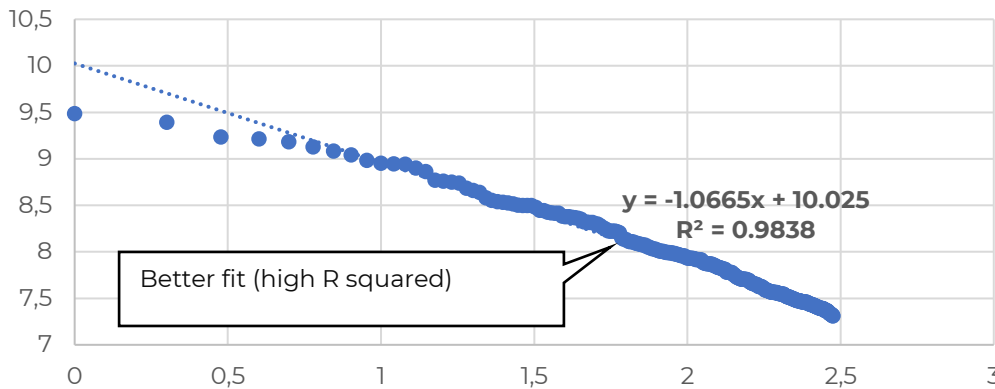
Once the equation coefficients have been obtained, it is then possible to predict the expected adjustment for unaudited taxpayers. The following equation is used to accumulate the expected results of the audits, which sum corresponds to the total amount that would be adjusted if all the population were audited based on the same selection criteria. From this value, the amounts actually adjusted in the audits performed are subtracted, leaving the tax gap.

$$U = 10^c \times \sum_{1}^{M} x^a$$

$$\text{Tax gap} = U - L$$

Where:

U = Sum of expected adjustments for the entire company population
M = Size of the corresponding population
x = Position of company in the descending ranking of adjustments
a = Slope coefficient of the equation
c = Intercept of the equation
L = Total adjustments made in audited companies

The EV method is most commonly used to estimate gaps of large companies, but some countries such as the US and the UK also make estimates for medium taxpayers using this method. In the work developed in Brazil, estimates by EV were conducted for large and medium-sized companies.

For segregation of the gap between medium and large companies it was used a similar approach to that of the United Kingdom to determine the share corresponding to each segment. The procedure is based on doing a single linear regression (sample with medium and large companies) and a subsequent separation of the gap from each segment. In the case of the study performed, the segregation was based on the proportion of values adjusted in the audits of each segment. As an example, considering that in a given year 85% of the adjustments came from large companies and 15% from medium-sized, after running the regression model the total gap found is divided in the 85/15 ratio, assigning each portion to the corresponding segment of companies.

In regard to the Brazilian study, such approach delivered better results in the tests, when compared to the US approach, based on the performance of separate regressions for medium and large companies. This is because in many cases excessive segmentation in the audit data results in too small samples, which are more sensitive to the presence of outliers or do not allow a good fit of the equation due to insufficient observations in the dataset.

Something noteworthy in EV method is its temporal limit to older tax years. This is because, in order to obtain consistent results, it is necessary to exhaust the audit cycle for each specific tax year under analysis, otherwise an estimate would be lower than the expected value due to the existence of audit procedures still in progress or even not initiated. When applying EV method in this study the estimations were initially built for years 2012 to 2017, however it was sought to use only the results from 2015 to 2017 to allow comparability with the other methods from this study, which covers the window from 2015 to 2019. As mentioned, due to the temporal limit of EV method it was not possible to estimate gaps for 2018 and 2019 using this approach, since there are still many audits not concluded.

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iv. *Methodology from Comac division (for Large Companies)*

The Coordination of Monitoring of Largest Taxpayers – Comac, part of the structure of the RFB, has been estimating the tax gap from large companies, understood as Differentiated and Special companies, using a custom methodology developed by the team.

The Comac continuously monitors and follows up on large companies, aiming to identify tax distortions and manage compliance risks through a systemic view of these taxpayers. This model is inspired by OECD studies that aim to improve tax compliance through risk management.

For this, the Comac uses a methodology of sectoral portfolios, which allows maximizing the effectiveness and efficiency of monitoring by grouping large companies into sectoral portfolios that concentrate taxpayers with similar characteristics or even economic sector. Such groups are further designated for follow-up by a specific tax auditor or team, allowing them to obtain a high level of expertise and in-depth knowledge about the taxpayers of each portfolio.

To achieve these goals, the Comac developed its own approach for determining the tax gap of such taxpayers, which, in general terms, is based on the following steps:

- Calculation of a reference tax rate for each set of large taxpayers, considering the monitoring portfolio to which they belong and the tax year under study, also excluding taxpayers who presented zero corporate profit. The reference tax rate is the average of the rates calculated by dividing the CIT declared and the amount of corporate profit calculated in the digital bookkeeping. For calculation of the reference tax rate, outliers are excluded, thus defined as those whose individual rates were more than 2 (two) standard deviations from the average of the group (portfolio/tax year). This system is initially applied to the set of taxpayers with A compliance score, i.e., considered fully compliant (low risk);

- Once the reference tax rate is calculated, it is compared with the individual tax rate of each taxpayer in the portfolio/tax year group;

- Companies that have an individual tax rate lower than the reference tax rate are considered non-compliant and the difference between the reference rate and the one found is used to estimate the gap;

- The value of the tax gap for that taxpayer is estimated by multiplying the difference in rates described above by the value of the corporate profit declared by the taxpayer in the respective year;

- The sum of the gaps calculated for each taxpayer corresponds to the total tax gap of the large companies under analysis.

v. *Methodology for estimation of policy gap*

a) Presumptive Profit

The policy gap for companies of Presumptive Profit is calculated by directly comparing the CIT amount that would be due under said regime and an approximation of the amount that would be due if such companies were subject to Real Profit, which is the general rule for CIT in Brazil.

However, due to detail limitations of the Presumptive Profit tax bookkeeping, it was not possible to directly calculate a CIT tax base for such companies under Real Profit rules. Thus, an approximation of this tax base was calculated. For methodological purposes, this approximation was called RPETB – Real Profit Equivalent Tax Base. The RPETB is calculated individually for each company and is obtained from the financial accounting profit reported in the bookkeeping, adjusted by carried-over losses from previous years until the limit of 30% of the accounting profit from the current year, according to the algorithm below:

a) $AR(t) < 0$: $RPETB(t) = 0$, $BLBC = BLBC + AR(t)$

b) $AR(t) > 0$ and $BLBC = 0$: $RPETB(t) = AR(t)$

c) $AR(t) > 0$ and $BLBC > 0$: $RPETB(t) = AR(t) - BLBC$ (up to 30% of $AR(t)$), $BLBC = BLBC -$ compensated carried-over loss at year t

Where:

t = year of study,
AR = Accounting Result,
BLBC = Balance of Loss to Be Compensated and
RPETB = Real Profit Equivalent Tax Base

After calculating the RPETB we apply the statutory CIT tax rate of 24% (IRPJ = 15% and CSLL = 9%), as well as the additional IRPJ of 10% for the tax base exceeding BRL 240,000 in the year.

b) Simples Nacional

The estimation of the policy gap for the companies under Simples Nacional follows the same method conducted for the Presumptive Profit, with the difference that the set of tax forms for Simples Nacional companies is even more synthetic than those, being absent, therefore, essential information for an estimation of financial accounting profit. Thus, the RPETB for this regime was obtained from the fiscal GOS, this one an aggregate conceptually close to the gross margin of the companies and that was obtained from the stochastic frontier study.

Thus, RPETB starts from fiscal GOS with the subsequent compensation of carried-over losses (negative GOS) from previous periods, considering the existence of losses to compensate inside the study window, as follows:

a) $GOSf(t) < 0$: $RPETB(t) = 0$, $BLBC = BLBC + GOSf(t)$

b) $GOSf(t) > 0$ and $BLBC = 0$: $RPETB(t) = GOSf(t)$

c) $GOSf(t) > 0$ and $BLBC > 0$: $RPETB(t) = GOSf(t) - BLBC$ (up to 30% $GOSf(t)$), $BLBC = BLBC -$ compensated carried-over loss at year t

Where:

t = year of study,
GOSf = fiscal GOS,
BLBC = Balance of Loss to Be Compensated and
RPETB = Real Profit Equivalent Tax Base

c) Real Profit

The policy gap for Real Profit companies was obtained essentially from the calculation of the exemptions and reductions of CIT provided for in the legislation of such companies, such as: incentive to audiovisual activity, *Minha Casa, Minha Vida* program, SUDAM/SUDENE incentives, Citizen Company program, among others.

The calculation was based on the method already used by Cetad – Center for Tax and Customs Studies, in its DGT report – Statement of Tax Expenses [3], however, for methodological adequacy to this study, the following adjustments were made:

- Exclusion of companies that are not part of the scope of work (financial, government);

- Exclusion of the item related to the Simples Nacional, since such tax expenditure is already comprehensively accounted for in the policy gap already estimated;

vi. *Criteria for calculating the collection gap*

As mentioned, the collection gap constitutes the portion of the debts that tax authorities already know but has not yet been effectively collected. The credits that make up the collection gap are mostly those in litigation and administrative dispute.

In order to provide better adherence to the estimations of other countries, it was sought to adapt this calculation to the method of IMF, which was also applied to the Brazilian VAT gap study. However, in the case of CIT, some simplifications were made, given the differences between the two taxes.

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[3] https://www.gov.br/receitafederal/pt-br/centrais-de-conteudo/publicacoes/relatorios/renuncia/gastos-tributarios-ploa

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According to the aforementioned method, the collection gap can be expressed as follows:

Collection gap = AV3 – AV4

where:

AV3: represents the net CIT calculated in the accrual view. It is the total tax assessed by the taxpayer or the tax administration, including the tax declared by third parties (withholding taxes):

Declared debts + Collection from Declaration Exempts + Withholding + Audit Adjustments

AV4: represents the net accumulated tax, in the accrual view. It is expressed by the amount actually collected, the debts compensated and withholding taxes in favor of the taxpayer.

Effective Collection + Withholding Collection + Compensated Debts + Withholding

About these indicators, some explanations apply:

- The same value of withholding reported in AV3 was used in the calculation of AV4. This approach was adopted due to the technical difficulty in segregating, the amount of CIT collection that would be attributable to beneficiaries belonging to the universe of study (non-financial companies). Therefore, the premise was assumed that those who withheld the tax paid it fully. In other words, the existence of a compliance gap in relation to the withholding agents (declared withholding x collected withholding) was not considered.

- It was considered the withholdings made by all companies (including financial and government) whose beneficiaries were companies in the scope of work.

9.   Conclusions

i. About policy gap and tax avoidance

As previously mentioned, the Presumptive Profit tax regime not only shelters companies that have naturally chosen this option, but also companies that practice tax avoidance through abusive tax planning. One of these practices, widely used, consists of the fragmentation of a company into two or more, in order to transfer the profits to the unit that is under the Presumptive Profit regime and thus remove them from taxation by the Real Profit system. The following diagram exemplifies a hypothetical case of a usual arrangement set up by companies for such purposes:

Situation 1 – Real Profit Company

- Revenue – 100MM
- Costs – 70MM
- Profit – 30MM
- **CIT tax (34%) – 10.2MM**

ACME supermarket
(Real profit)

Situation 2 – transformation into a business group

Profit transfer for lighter tax regime

Revenue – 100MM
Costs – 70MM
Profit – 30MM
Tax base – 8% x 100 = 8MM
CIT tax (34%) – 2.72MM

ACME distributor
(Presumptive profit)

XPTO distributor
(Presumptive profit)

Sales

ACME group

ACME supermarket
(Real profit)

- Revenue – 100MM
- Costs – 100MM
- Profit – zero
- **CIT tax (34%) – zero**
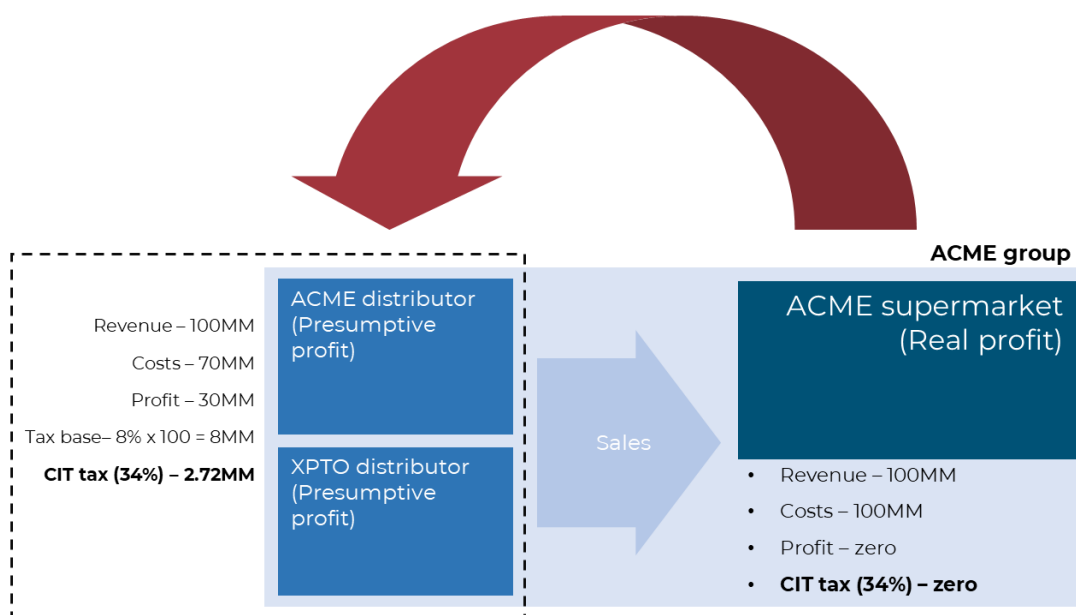
ii. Tax gap and TADAT

This report is considered to be an important evolutive milestone in the tax gap monitoring indicator established in TADAT (indicator P6-22). By the time of diagnosis, the RFB was evaluated as grade D, insufficient level, and last step on the scale. Currently, the agency is situated in level C, however close to level B, which can be reached as soon as the last actions already in progress for requirements B(iii) and B(iv) are concluded, namely, the external auditing of the estimates (already in progress) and the integration of the tax gap results with Compliance Risk Management initiatives.

This CIT tax gap study delivery fulfills requirement A(i), which is the monitoring of the VAT tax gap and another main tax (CIT), paving the way so that in a near future it can be evaluated as level A, a level of excellence with the best international practices, based on compliance with the other requirements of the level.

P6-22 Monitoring the tax gap to assess inaccuracy of reporting levels Scoring method M1	Dimension. The soundness of method/s used by the tax administration to assess and monitor inaccurate reporting.	A	The tax administration monitors the extent of inaccurate reporting using a methodology or methodologies that satisfy the following tests: (i) Covers VAT and at least one other core tax. (ii) The methods are applied at least once every two years. (iii) The results are subjected to credibility tests, such as being independently reviewed (e.g., by the government auditor, a parliamentary committee or academia) and are made public. (iv) The results are used in designing tax administration interventions to improve accuracy of reporting.	We will go here after the delivery of a second version of the CIT tax gap and the fulfillment of the other requirements (ii, iii and iv)
		B	The tax administration monitors the extent of inaccurate reporting using a methodology or methodologies that satisfy the following tests: (i) Covers at least VAT. (ii) The methods are applied at least once every four years. (iii) Same as A(iii). (iv) Same as A(iv).	We will go here after the conclusion of the external audit and integration of the tax gap with the
		C	The tax administration monitors the extent of inaccurate reporting using a methodology or methodologies that satisfy the following tests: (i) Same as B(i). (ii) The methods are applied at least once every five years.	We are here after the 2nd Version of the VAT Tax Gap (Published)
		D	The requirements for a 'C' or higher have not been met OR Evidence to objectively assess the dimension is either insufficient or unavailable.	Start of the project

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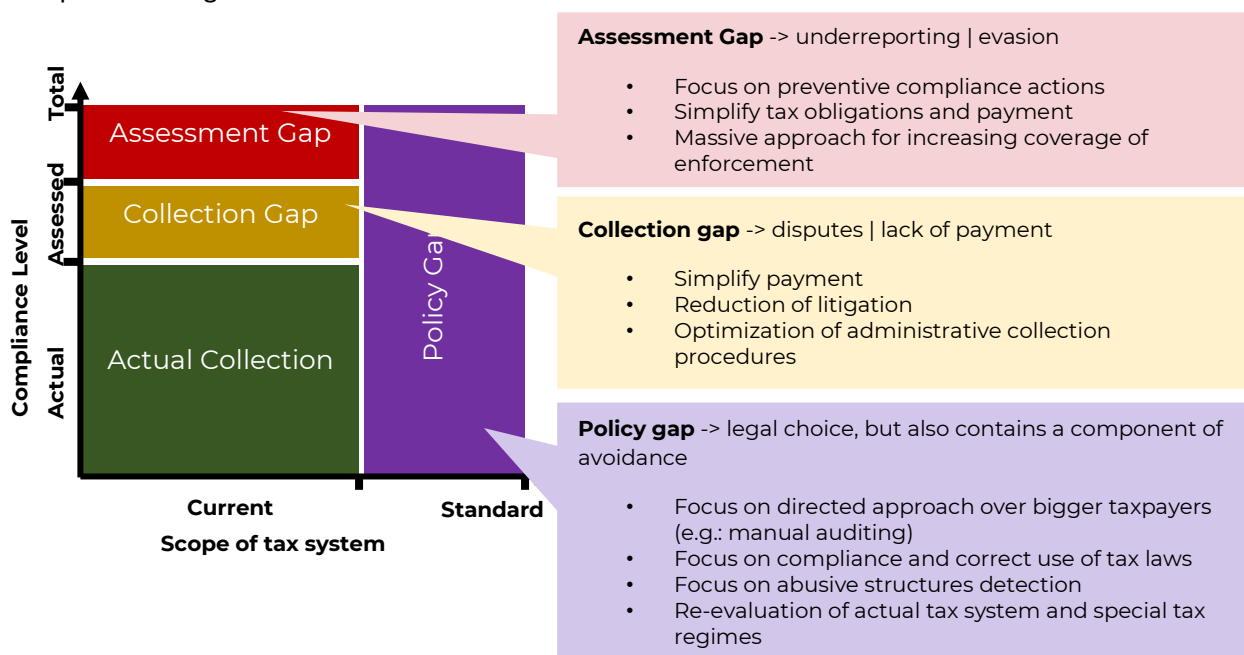
iii. General Directions

According to what was presented in this report, it is observed that there are two major tax gaps to be addressed, assessment and policy, notwithstanding the existence of a collection gap that must also be continuously worked on to be reduced.

The assessment gap has a strong correlation with the concept of tax evasion, i.e., tax evasion itself, characterized by illegal conduct from taxpayers. Among the evasion practices, the omission of revenue is, probably, the most prevalent, especially in regimes such as the Presumptive Profit and Simples Nacional in which the revenue directly composes the tax base and there is no need for complex legal maneuvers to commit the unlawful act.

Tackling the assessment gap usually requires a broad fiscal presence, since evasive conduct is usually prevalent in small and medium-sized companies, therefore spread over several thousand taxpayers. To this end, a massive approach is essential, with intensive use of technology and information, aiming to obtain maximum presence with less expenditure of resources. It is also necessary, in the long term, to simplify tax obligations and enforce the preventive compliance measures, to better treat taxpayers that are willing to pay and trying to enter in the compliance zone.

The policy gap, although part of the "rule of the game", that is, the possibility of choice within the rules of the current tax system, contains a share of tax avoidance, to the extent that abusive planning structures use this regime improperly, even without the direct commission of unlawful acts.

Addressing the policy gap and tackling such abusive arrangements requires an approach with a greater focus on specific actions such as audits to detect these structures, in the search for a compliant interpretation of tax legislation and, eventually, in the review of actual tax system and the special tax regimes.

Assessment Gap -> underreporting | evasion

- Focus on preventive compliance actions
- Simplify tax obligations and payment
- Massive approach for increasing coverage of enforcement

Collection gap -> disputes | lack of payment

- Simplify payment
- Reduction of litigation
- Optimization of administrative collection procedures

Policy gap -> legal choice, but also contains a component of avoidance

- Focus on directed approach over bigger taxpayers (e.g.: manual auditing)
- Focus on compliance and correct use of tax laws
- Focus on abusive structures detection
- Re-evaluation of actual tax system and special tax regimes

iv. *Random audits for Simples Nacional*

The study allowed to learn about tax gap estimation methods used around the world, as well as to deepen the understanding of tax compliance within the scope of the RFB. In this sense, one of the relevant findings is the existence of a high gross revenue gap in companies of Simples Nacional.

Such companies are audited within the existing tax selection program, but the coverage in this segment is quite low, given the small tax recovery potential (which affects tax relevance in the selection process) and the large size of its population.

Despite the other compliance actions that can be applied to this segment, it is noted that, in general, the tax administrations with greater resources opt for the use of random audits on these taxpayers, aiming not only at compliance actions but also at obtaining statistics on tax gap and evasion. We cite as examples of use the countries of Denmark, Sweden, Canada, and the United Kingdom.

The use of random audits is especially useful in determining the tax gaps of small businesses. Among the advantages of establishing a Random Audit Program, the following could be mentioned:

- Allow the estimation of the tax gap directly by direct extrapolation of the samples, minimizing the need for theoretical assumptions and complex estimations;

- Obtain reliable indicators of noncompliance levels and its causes, since the data collected in the audit procedures are representative of the general behavior of the population under study;

- Obtain a broad and detailed map of the types and causes of noncompliance and their degree of prevalence in the population, due to the standardization and breadth of the audit procedures performed in this modality;

- The result of random audits allows to evaluate the effectiveness and feed back into the risk-based selection process, as well as evaluating the results of other compliance actions;

- The Program can be used as a training tool for new inspection auditors, preparing them for more complex cases.

As mentioned, implementing a random audit program is often costly. It is known that the human and technological resources to conduct the program compete with other inspection demands of the tax administration. However, in view of the benefits mentioned above, it is relevant to evaluate the possibility of its implementation in Brazil. In this sense, some initiatives can be taken to reduce the total cost of implementation and maintenance of this modality:

- Creation of a well-designed and specific roadmap for the program, containing the mandatory checks to be made in the course of the audit and their degree of depth. The establishment of a standardized script allows productivity gains and reduction of average hours, enabling a greater number of procedures with savings in human resources. The standardization of the procedure also allows for the partial automation of some steps, such as, for example, the issuance of the term of initiation for the audit procedure;

- Adoption of a multi-year approach to audits (e.g., 3 years), maximizing the amount of statistical information collected in each procedure and reducing the periodicity of the program. In the example above, it would be possible to perform audits every 3 years, seeking information from the last three concluded tax periods;

- Careful planning of the random selection in order to obtain the most representative samples for the population of interest and with the smallest possible number of companies. In the case of the United Kingdom, a country with solid experience in this method, the last round of random audits carried out only 330 tax procedures in a population of 5,900,000 small companies, corresponding to 0.005%;

- Distribution of audit workforce into sub-teams, composed of more experienced auditors together with newer ones, in order to achieve skill transfer effects in the course of the work. Optionally, in multi-year actions, the execution of the program can be made coincident with the entry of new auditors in the revenue service, therefore facilitating this mixed approach;

The following table exemplifies a random audit model applicable to Simples Nacional with a triannual periodicity and the respective demand for human resources:

Estimation for a Random Audit Program	
Population of Simples Nacional companies (2022)	5,200,000
Multi-year sample (3 years)	520
% of population coverage	0.01%
Estimated Average Procedure Time (h)	100
Total Effort (h)	52,000
Hours available per auditor (annual)	1,550
Number of auditors (including 3 team leader auditors)	**37**

10. Upcoming deliverables and evolutions

This study was the first performed in Brazil for CIT and resulted from an exploratory and experimental process, with the use of different methods, contour solutions and assumptions of methodological premises, aiming to overcome the existing difficulties. The estimation of gaps in corporate income taxes is not a trivial task and even in other countries it presents relevant difficulties due to its characteristics.

Within the scope of the project, new deliverables, and improvements to what has been done so far are planned. We highlight the most relevant below:

- Estimation of the CIT gap from Real Profit and Presumptive Profit using the stochastic frontier method, on an experimental basis, in order to compare the results with the obtained by the top-down and bottom-up approaches;

- Customization of the IMF's VAT gap method (used in the Brazilian VAT gap study) for application on CIT, on an experimental basis;

- Estimation of the CIT gap from financial companies;

- Estimation of the assessment and policy gap for years 2020 and 2021;

- Estimation of the assessment gap and policy gap with a 12 sectors detail level;

- Use of machine learning to estimate the CIT gap on an experimental basis and evaluate the results in comparison with other methods;

- Automation of the collection gap calculation through Python scripts, aiming to deliver greater agility in the calculation of these indicators and delivering a closer and more timely monitoring of this gap.

11. Acronyms and glossary

- Cetad – Centro de Estudos Tributários e Aduaneiros (Center for Tax and Customs Studies)

- CIT – Corporate Income Tax

- CSLL – Contribuição Social sobre o Lucro Líquido (Social Contribution over Net Profit – same nature of Brazilian CIT)

- Defis – Brazilian annual tax form for small companies from Simples Nacional

- DGT – Demonstrativo de Gastos Tributários (Statement of Tax Expenses)

- DRE – Demonstrativo do Resultado do Exercício (income statement for the year)

- ECD – Digital Financial Accounting Bookkeeping

- ECF – Digital Tax Accounting Bookkeeping

- Fiscal GOS – GOS calculated through tax and/or financial accounting data

- GFIP – Brazilian tax form for reporting taxes over labor

- GOS - Gross Operating Surplus

- IBGE – Instituto Brasileiro de Geografia e Estatística (Brazil Statistics and Geography Institute)

- IRPJ – Imposto sobre a Renda da Pessoa Jurídica (Brazilian CIT tax)

- NF-e – Electronic invoice

- PGDAS – Brazilian monthly tax form for small companies from Simples Nacional

- Presumptive Profit – Brazilian special tax regime for small to mid-sized companies

- Real Profit – Brazilian general tax regime for CIT

- RFB – Receita Federal do Brasil (Federal Revenue Service of Brazil)

- RPETB – Real Profit Equivalent Tax Base

- Simples Nacional – Brazilian special tax regime for small companies

12. Appendix I - IMF Top-Down Method (RA-GAP) application in Brazil

For a better understanding of the results of this report, it is important to briefly describe the history of the methodological choice for the study performed.

The work initially explored the possibility of using the IMF's RA-GAP methodology, a standardized method for calculating the corporate income tax (CIT) tax gap. However, characteristics of the Brazilian tax system and limitations in the available information resulted in the abandonment of this methodology, towards a specific method.

The first difficulty encountered was the heterogeneity of information between the different tax regimes, in this case the Real Profit, Presumptive Profit and Simples Nacional. The RA-GAP method requires information on accounting and tax adjustments so that it can start from the economy's production and arrive at the CIT tax base, something unfeasible in the case of the last two regimes due to the absence of detailed information, such as: depreciation, interests, profit adjustments and carried-over losses.

Additionally, the IBGE does not have the information of National Accounts detailed by tax regime, which would allow, for instance, to segregate the companies of the Real Profit for the estimation of the gap using this method. It is worth noting that the first attempt to estimate the gap involved such approach (only Real Profit companies) and in the course of the work it proved to be unfeasible.

Such difficulties, presented in a global calculation, proved to be even greater in the attempt to perform sectoral calculations, since the aggregate composition of the three tax regimes varies greatly among sectors, causing even greater distortions in the results.

The following figure shows a framework for estimating the tax gap according to the IMF methodology. It should be noted that at the top of the spreadsheet is the production of the economy and in a downward direction it goes through successive adjustments until the potential tax is obtained at the end. As already mentioned, the National Accounts System information does not reach a tax regime detail level and, therefore, presents its macroeconomic aggregates as the sum of all activity of the companies from Real Profit, Presumptive Profit and Simple National regimes.

It can be noticed that from the GOS line – Gross Operating Surplus, adjustment information from the tax administration (RFB) is introduced in the calculation. On the other hand, during the contacts maintained with the IBGE while developing the work, it was observed that a large part of the information provided by IBGE from the GOS line onwards is originated from information from the own tax administration, that is, there is relevant endogeny in this data.

Added to this is the aforementioned lack of detailed information on the adjustments (green section – accounting adjustments and yellow section, tax adjustments) for the companies of the Presumptive Profit and Simples Nacional, as a result of the simplicity of the tax forms applicable to these companies.

Thus, the limitations of accounting and tax information, as well as the endogeneity of the data provided by the IBGE and the impossibility of segregation of the tax regimes, directed the

estimation towards using the last level of reliable information in the spreadsheet that could, at the same time, allow comparability with the tax information, the Gross Operating Surplus (GOS). At the GOS level, there is still information mostly from the National Accounts and not from the tax authorities, while it is also possible to obtain a reasonable approximation of the GOS for companies such as Simples Nacional and Presumptive Profit, based on tax data.

In other words, the main objective of a top-down method such as the one described here is to capture the omission and the tax gap from the economic activity that is detected by the National Accounts but is not known by the tax authorities. In the course of the work, it was evidenced that the largest portion of this activity not detected by the tax authorities effectively lies in the difference between fiscal GOS (tax data) and GOS from National Accounts data.

Item	Description		Information source
	Market output at basic prices		
		(-) Intermediate Comsumption	
GDP	Gross Domestic Product		CN-IBGE
		(-) Compensation of employees	CN-IBGE (D.1) / RFB
		(-) Taxes on production and imports less subsidies	CN-IBGE (D.2 e D.3)
		(-) Mixed income	CN-IBGE e RFB (S.3)
GOS	Gross Operating Surplus		Calculated
D1.1		(+) Received interests	CN-IBGE (D.4)
D1.1		(+) Dividends	RFB
D1.1		(+) Interests over own capital	RFB
D1.1		(+) Received rent	CN-IBGE (D.4)
D1.1		(+) Positive current transfers	CN-IBGE (D.7)
D1.1		(+) Positive capital transfers	CN-IBGE (D.9)
D1.1		(+) Capital gains	RFB
D1.1		(+) Profit of foreign branches	RFB
D1.2		(+) Fair value adjustments	RFB
D1.1		(+) Provision reversions	RFB
D1.1		(+) Positive exchange rate variation	RFB
D1.1		(+) Other financial receipts	RFB
D1.1		(+) Other positive adjustments	CN-IBGE (D.443)
D1.2		(-) Paid interests	CN-IBGE (D.4)
D1.2		(-) Paid interests over own capital	RFB
D1.2		(-) Paid rent	CN-IBGE (D.4)
D1.2		(-) Social benefits other than social transfers in kind	CN-IBGE (D.62)
D1.2		(-) Other current transfers	CN-IBGE (D.7)
D1.2		(-) Negative capital transfers	CN-IBGE (D.9)
D1.2		(-) Depreciation	RFB (ECF)
D1.2		(-) CIT and other taxes over income and capital	CN-IBGE (D.5)
D1.2		(-) Participations	RFB
D1.2		(-) Fair value adjustments	RFB
D1.2		(-) Provisions	RFB
D1.2		(-) Negative exchange rate variation	RFB
D1.2		(-) Other financial expenses	RFB
D1.2		(-) Other adjustments	CN-IBGE e RFB
FAP	Financial Accounting Profit		Calculated
D2.1		(+) Positive adjustments of FAP	RFB (ECF block M)
D2.2		(-) Negative adjustments of FAP	RFB (ECF block M)
C- NTB	Current year net tax base		Calculated
D3.1		(+) Current-year losses	RFB (ECF block M e Sapli)
C-TB	Current year tax base		Calculated
D3.2		(-) Carried-over losses	RFB (ECF block M)
TB	CIT tax base		Calculado
		(x) statutory rate	RFB (ECF block N630)
		Potential CIT liabilities	Calculado
		(+) Positive adjustments of liabilities	RFB (ECF block N630)
		(-) Exemptions / reductions of CIT liabilities	RFB (ECF block N630)
	Potential CIT		RFB

Last level of reliable and comparable information

Corporate Income
Tax Gap

2015 to 2019

Receita Federal