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ASSESSING THE EFFECTS OF THE PL3887-2020 TOBACCO TAX REFORM

Assessing the Effects of the PL3887-2020 Tobacco Tax Reform[§]

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Key messages

- The tax reform proposed by the Bill PL3887-2020 would bring a new tax scheme to the cigarette industry with consequences for cigarette prices.

- The reform would replace PIS/COFINS with CBS, which is also a social contribution levied on turnover but designed to be a less complex tax.

- The cigarette industry is likely to change its price-setting strategy due to the higher tax burden and the CBS tendency of price equalization among cigarette brands across the country.

- Tobacco tax collection would increase by a minimum of BRL 2.8 billion per year and cross-border shopping across states would decrease.

- The Government should implement sustained efforts to fight cigarette smuggling nationwide, reducing the illicit cigarette market.

Executive summary

The Executive Power, in July 2020, submitted a Bill to the National Congress as the first step towards a wide reform in the national tax system. The Bill no. 3887/2020 (PL 3887-2020) proposes to replace the current PIS/COFINS at the federal level by the CBS (Social Contribution on Operations with Goods and Services), which includes a special regime for tobacco products.

In the case of cigarettes, the special regime is subject to a dual tax rate (Bill no. 3887/2020, art. 40, and Annex II), which is as follows: a 22 percent ad valorem tax rate on the highest retail price per brand plus a specific tax of BRL 1.10 per pack on all brands. This combination yields a substantially higher tax burden from the new CBS than from the current PIS/COFINS, which it would replace.

This research focuses on the tobacco section of the Bill PL3887-2020 to analyze the potential impacts of the tax reform on cigarette prices, cigarette consumption, and tax collection at both the national and subnational levels. Taking into consideration that, under PL 3887-2020, there is no change in the IPI and ICMS, which are other taxes levied on cigarettes, the research also assumes that the IPI and ICMS tax rates do not change.

This research simulates three scenarios that differ according to the price-setting strategy of the tobacco industry: i) minimum price adjustment in all the states (Scenario I); ii) keeping the markup per cigarette brand and state at the average pre-tax reform level (Scenario II); and iii) keeping the markup per cigarette brand and state at the highest pre-tax reform level (Scenario III).

In the simulations, the cigarette market is divided into four price categories (PC). Following Divino, J., et al (2019) all the brands sold below the minimum legal price are considered illicit brands and listed as price category 1 (PC1). The legal cigarette market is divided into low price brands (PC2), medium price brands (PC3), and high price (or premium) brands (PC4). Considering the most updated data (2019) as the baseline scenario, the average prices of the legal cigarette market categories in BRL are equal to 5.40, 7.90 and 12.80 for price categories 2 to 4, respectively. The effective tax as the share of retail price (tax burden) for these three price categories is 78.3, 69.4, and 62.2 percent, respectively. Total tobacco tax collection was about 17.75 BRL billions in the baseline year of 2019.

In Scenario I (minimum price adjustment), producers will choose the lowest prices that maintain the tax burden strictly below 100 percent and will not fully transfer the increase in tax burden to the retail prices. All brands will tend to have the same price across the country. This implies an extreme scenario as it defines the implicit floor price below which cigarette sales are not desired by the industry. The updated prices under this scenario are 8.40 BRL for categories 2 and 3 (which is well above the current official floor price of

5.00 BRL), while the high-price cigarettes category are 15.20 BRL per pack. This means the average price increases are 56.3, 6.3 and 19.8 percent for price categories 2 to 4, respectively. In turn, cigarette consumption would decrease by 38.1, 3.2 and 9.6 percent for categories 2 to 4, respectively. Total cigarette tax revenue would increase by 30.7%, or 5.4 billion BRL per year relative to the baseline year of 2019.

In the second scenario, updated prices for categories 2 to 4 are 10.0, 13.1 and 19.4 BRL, respectively. Since consumers are price sensitive, cigarette consumption would decrease by 58, 33, and 25 percent, respectively. The aggregate tax collection would increase by 23.5 percent, or 4.17 BRL billions higher than current tobacco tax collection.

Under Scenario III, the updated cigarette prices PCs 2-4 are 11.06, 14.87, and 23.38 BRL. Cigarette consumption would decrease sharply in PCs 2-4 by 71.5, 44.6, and 40.5 percent, respectively. Because of this substantial decrease in smoking, tax collection increases only by 15.7 percent, or 1.4 BRL billion per year relative to the baseline.

In all scenarios, the tax reform proposed by the PL3887-2020 would result in higher cigarette prices by far, lower cigarette consumption and in an implicit minimum price that is far above the current official minimum price. The tax burden would increase relative to the current situation and would tend to be the same across all states. Consequently, price dispersion and cross-border shopping across states would also reduce because prices per brand would tend to be the same across the country.

The partial tax reform proposed under PL 3887-2020 is a step forward for tobacco control in Brazil as it would significantly reduce cigarette consumption while still generating additional tax revenue. The extra resources could be either earmarked to social programs and health expenses or used freely by the government to support the public health system and deter people from smoking. Finally, a more intense nationwide effort to fight cigarette smuggling as a public policy would reduce smoking and the illicit cigarette market and raise fiscal revenue in these difficult times of the COVID-19 pandemic and chronic fiscal imbalance.

1. Introduction

Over the past decades, Brazil has significantly reduced the prevalence of smoking, from 34.8 percent in 1989 to approximately 10.5 percent in Brazilian capitals in 2019 (São José et al., 2017, Vigitel Brasil, 2019). This outstanding decrease can be attributed to the implementation of strong tobacco control policies, which includes smoking restrictions, advertising regulations, cutting economic incentives to tobacco farming and, above all, increasing taxes on tobacco products. According to the international evidence, increasing taxes on tobacco products is the most effective public policy to reduce smoking while at the same time, increase tax revenue that can be used to cover the costs of treatment for tobacco-related diseases by the public health system (Divino et al., 2019).

There are currently two Constitutional Amendment Bills in the National Congress that could result in a broad change in the Brazilian tax system. In addition, the Executive Power has also submitted a separate Bill to the Congress as the first step towards a wide reform in the national tax system. Bill no. 3887/2020 (PL 3887-2020)[1] proposes to replace the current PIS/COFINS at the federal level with the CBS (Social Contribution on Operations with Goods and Services), which includes a special regime for tobacco products. Under PL 3887-2020, there is no change in the IPI and ICMS, which are other taxes levied on cigarettes. Therefore, this research assumes that the tax rates due to IPI and ICMS will not change after the CBS is in place. This assumption is important, because the simulations are based only on the CBS impacts on cigarette prices.

This Research focuses on the tobacco section of the Bill PL3887-2020 to analyze the potential impacts of the tax reform on cigarette prices, cigarette consumption, and tax collection by considering effects at both the federal and state levels. This research simulates the effects of this tax reform on the tobacco sector, analyzes alternative price-responses of the cigarette industry to the new tax scheme, and evaluates potential impacts of these responses on the cigarette market and tax collection of the federal and state governments.

Assuming successful implementation of the new CBS through PL3887-2020, this research simulates three price-setting scenarios, where the Tobacco Industry adjusts price to: i) minimum price adjustment in all the states (Scenario I); ii) keeping the markup per cigarette brand and state at the average pre-tax reform level (Scenario II); and iii) keeping the markup per cigarette brand and state at the highest pre-tax reform level (Scenario III).

To simulate the effects of the proposed CBS on cigarette prices, consumption, and cigarette tax collection across states and by price category, this research replicates the

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observed cigarette consumption and tax revenue in the year of 2019, based on the current tax scheme and the smoking data from Vigitel (2018/19). Following Divino, J., et al (2019) all the brands sold below the minimum legal price are considered illicit brands and listed as price category 1 (PC1). The legal cigarette market is divided into three price categories (PC), represented by low price brands (PC2), medium price brands (PC3), and high price or premium brands (PC4).

The micro data serve as inputs in the simulations and allow one to predict the smoking behavior and consumption responses to price increases as accurately as possible across the different Brazilian states. Current and past cigarette tax structures are from the Ministry of Economy, while Receita Federal[2] provided the aggregate tax revenue at the national level. The price elasticities by geographical regions and cigarette price categories as well as the size of the illicit cigarette market are estimated using the same approach used by Divino et al. (2019). In the first step, the size of the illicit cigarette market in each state is calibrated. Starting from this baseline scenario, this research considers three alternative scenarios depending on the industry price-setting behavior in response to the new CBS.

In the baseline scenario, under the current tax structure, the tax burden on cigarettes differs among the 26 states and Federal District. The average prices in BRL are equal to 5.40, 7.90, and 12.80 for price categories 2 to 4, respectively. The effective tax as the share of retail price for these three price categories is 78.3, 69.4, and 62.2 percent, respectively.

The Tobacco industry will most likely react to the new tax structure by increasing retail prices such that they adjust the markup over the production cost from production to the point of sale. In the current situation, markups differ across states because the tax burden and logistics costs vary while production costs are basically the same. In a most likely scenario, the markup will be set to its current average value across all states. Consequently, cigarette prices will be higher than under the baseline Scenario.

In this average pre-reform markup scenario, the simulations indicate that prices for categories 2 to 4 will be equal to 10.0, 13.1, and 19.4 BRL, respectively. Since consumers are price sensitive, cigarette consumption would decline by 58, 33, and 25 percent, respectively for price categories 2-4, while the tax burden would be 87, 81.2, and 74 percent, respectively. These numbers indicate that the aggregate tax collection will be about 21.92 BRL billion per year, which represents an increase of about 23.5 percent in relation to the current tax collection.

Moreover, the simulations imply that there will be an implicit floor price below which cigarette sales are not desired by the industry. This price is 8.40 BRL, which is well above the current official floor price of 5.00 BRL. Since the tax base is the highest price per

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[2] Receita Federal (or Receita Federal do Brasil - RFB) is equivalent to the Internal Revenue Service in the US economy.

brand across the country, producers would lose incentive to charge different prices across states. That is, another relevant consequence of the reform is that cigarette prices per brand would tend toward uniformity across states. This induced behavior by the tax reform would reduce both cigarette price gap and cross-border shopping among states.

In conclusion, the present results highlight that the proposed tax reform represents an opportunity for the country to increase cigarette prices, reduce cigarette consumption, and raise cigarette tax collection. This additional tax revenue could be used to support the most vulnerable families during the COVID-19 pandemic and reduce the country's chronic fiscal imbalance.

2. Proposed tax reform under Bill no. 3887/2020

While two Constitutional Amendment Bills have been pending since the beginning of 2019 in the National Congress that could result in a change in the tax system at both federal and state levels, the Executive Power has also been working on a separate tax reform proposal and has submitted a Bill to the Congress. The two Constitutional Amendment Bills (Constitutional Amendments 45/2019 and 110/2019) are intended to simplify the consumption tax scheme by unifying different federal, state, and local taxes at the federal level. The general idea is the unification of the sub-national ICMS, the local ISSQN, the federal IPI and PIS/COFINS taxes into a unique and harmonized VAT-type tax, the Goods and Services Tax (GST). The Amendment proposals would also replace the current excise tax (IPI) with a federal excise tax, also be levied on cigarettes (which may be called Tobacco Excise Tax -TET). These amendments are not the focus of this research report as they were analyzed previously by Divino et al. (2020).

On the other hand, the Executive Power has presented to the Congress Bill no. 3887/2020 (PL 3887-2020). It intends to replace the current PIS/COFINS with the new CBS (Social Contribution on Operations with Goods and Services). Designed as a social contribution, the CBS is a general, non-cumulative tax on consumption that is assessed on company turnover. Under PL 3887-2020, there is no change in the IPI and ICMS, which are other taxes levied on cigarettes (the ISSQN is levied only on services).

The CBS is designed to be levied on the company´s turnover and on imports (in general). As a value added tax, it provides credit for the inputs and purchases of the company to compute the tax due. The tax rate is 12 percent for goods and services in general. However, some products will have special tax regime, which is the case for fuels, alcohol, cigarillos, and cigarettes. Under the special tax regime, the CBS is not levied as a value added tax, but as a single-phase tax. Thus, the CBS will be levied once at manufacture or import of cigarettes (Bill no. 3887/2020, art. 32).

In the case of cigarettes, the special regime is subject to a dual tax rate (Bill no. 3887/2020, art. 40, and Annex II), which is as follows: a 22% ad valorem tax rate on the

highest price per brand plus a specific tax of BRL 1.10 per pack on all brands. This combination yields a substantially higher tax burden for the new CBS than the current PIS/COFINS, which it replaces.

As stated in Bill no. 3887/2020, if a cigarette brand is sold at different prices across states, the tax base will be the highest price, irrespective of the quantity sold in the state. For instance, if prices for the same brand in states A, B, C and D are BRL 10.00, in states E, F, G, H and J are equal to BRL 12.50, and finally in state K the price is BRL 14.00, then the whole production (sold to states A to K) will be taxed at: 14.00 x 22% + 1.10 per pack. Therefore, the total CBS would be BRL 4.18 per pack across all states where this brand is sold.

3. Methodology and data

To implement the tax reform simulations, this research draws on previous approaches by Divino et al. (2019, 2020) and expands them. Unlike the previous approaches, more recent data on smoking behavior from Vigitel (2018/2019) is used. In addition, the distinction between different cigarette price classes is now more fine-grained. The following sub-sections contain the details of the underlying data set and the different simulations.[3]

3.1 Data and sources

The primary source of information on smoking behavior in Brazil is Vigitel—an annual national survey of the Ministry of Health conducted by phone call to individuals randomly chosen in the 26 state capitals and the Federal District. By applying sample weights, the information in this data set becomes representative for the entire population. The purpose of Vigitel is surveillance of risk and protective factors for chronic diseases. See Vigitel Brazil (2019) for further details.

To increase the precision of the estimates, data from the two most recent years, 2018 and 2019, are pooled. According to Vigitel, the average share of smokers varies between 4 and 13 percent across federal states. Altogether, 5,314 smokers are observed with complete information about their usual consumption and the price of cigarettes in their last purchase.

The cigarette market is divided into four different price segments. Price Category 1 (PC1) represents cigarettes that were obtained at a price below the official minimum price. Thus,

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[3] Where the text refers to tobacco tax revenue as cigarette tax revenue attributable to that state it does not mean that this specific revenue is available to the state. The expression refers to the total cigarette tax revenue accrued in that specific state or states (that is, the sum of federal (CBS and IPI), and state (ICMS) taxes on cigarette collected within each state).

these brands are classified as illicit (or illegal), in line with Divino et al. (2019). The remainder of the market is then divided into low, medium, and high price categories, according to the percentiles 33 and 66. That is, the legal market is split into three equally large segments. Figure 1 presents the distribution of smokers by price categories, federal states, and geographical regions.

Figure 1 - Distribution of smokers by price category
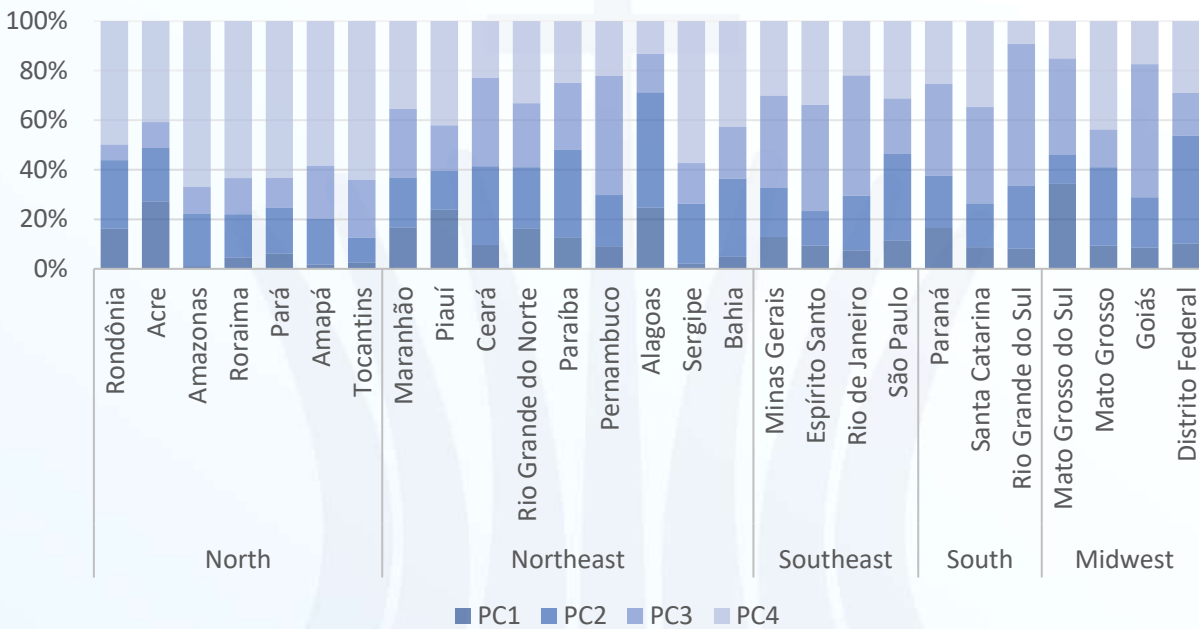
Although representative, the low number of smokers in Vigitel is critical for the estimation of price-elasticities by federal state and price categories.[4] Therefore, two other representative individual surveys, the National Household Sample Survey (PNAD) of 2008 and the National Health Survey (PNS) of 2013 are used. Both data sets contain the number of cigarettes an individual smoked per day and how much was paid for the cigarettes in the last purchase. Individual socio-economic characteristics, such as gender, income, years of smoking, are used as control variables to refine the price-elasticity estimation, as will be explained in the next section. Further information about the data sets and descriptive statistics can be found in Divino et al. (2019). As a robustness check, the elasticity estimation with Vigitel data was also performed and obtained consistent results but larger confidence intervals.

Table 1 reports a summary of the variables and respective sources used in the present research. The exact number of inhabitants per state multiplies the consumption patterns

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[4] Possibly due to both the low number of observations per state and Vigitel survey made by phone calls, the premium cigarettes have the highest share in the poor states, such as those in the North region.

and the current share of smokers from Vigitel in 2019 from the IBGE (Brazilian Institute of Geography and Statistics) to derive the aggregate cigarette consumption. Finally, average cigarette prices are updated by the aggregate wide consumer price index tobacco sub-category (IPCA-Tobacco) in the same period and for each federal state. Because this information is not available for all states, regional averages are used as a substitute when needed. Further information on the current tax system, officially registered cigarette price data, and cigarette tax revenue was obtained from Receita Federal. Unfortunately, Receita Federal only provides tax revenue aggregated at the federal level.

Table 1 – Variables and sources

Purpose	Variable	Source
Taxation	Current Cigarette Tax Rates	Federal and State Legislations
	Cigarette tax collection	Receita Federal
	Population per state	IBGE
Consumption	Share of smokers per federal state	Vigitel 2018, 2019
	Cigarette consumption per smoker and state	
Price elasticity estimation	Number of smokers per federal state and price category	PNAD 2008 and PNS 2013
	Cigarette consumption per smoker, state, and price category	

3.2 Price elasticity estimation

A price elasticity of consumption is a measure that indicates how many percentage points cigarette consumption would change if cigarette prices changed by one percent. Based on the procedure described in Divino et al. (2019), the price elasticity is obtained in two steps. The first step provides an estimate of how many individuals would quit or start smoking due to higher or lower cigarette prices.[5] The result of the second estimation indicates how continuing smokers would adjust the intensity of their current consumption after a price change. The combination of these so-called prevalence and conditional elasticities yields the total price elasticity that is used in the simulations. Note that the price elasticities are specific for each geographic region and price category. In both estimations, the individually reported price is substituted by the state average price to avoid the endogeneity bias that occurs because consumers may adjust to price changes by switching to a cheaper brand.

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[5] The conditional price elasticities in the first step are derived from a linear regression of the log cigarette consumption on log cigarette price interacted with price class and regional indicators controlling for differences in age, education, years of smoking, income, and gender among individuals.

3.3 Tax reform simulations

The simulated scenarios in this report depart from the current tax structure on cigarettes, which is then changed to a new tax scheme defined by the Bill PL3887-2020 with the introduction of the new CBS, replacing the former PIS/COFINS. Three alternative scenarios of industry price-setting behavior in response to the new CBS are considered. These scenarios are explained as follows.

3.3.1 Baseline scenario

The starting point of the simulations is the number of smokers, average consumption of cigarettes, and average prices of cigarettes across all Brazilian states, and within the four price categories defined previously. As explained in Section 3.1, these numbers refer to the baseline years of 2018/19. The share of cigarette sales in the first price category is the illicit market of cigarettes, defined as cigarettes sold below the minimum price in Brazil. Price categories 2, 3 and 4 represent low, medium, and high price brands, respectively.

Calibration of the model first adjusts the size of the illicit market, that is, the share of smokers that consume cigarettes in price category 1, such that the calculated aggregate tax revenue matches the observed cigarette tax collection in 2019. Based on the average cigarette prices and the number of smokers, current tax rules are used to calculate the monthly tobacco tax collection per state for the IPI, PIS/CONFINS, and ICMS. In absence of further information about the brand of cigarettes purchased, the Special Rule for IPI calculation is considered throughout the simulations. The ICMS tax rates on tobacco products for each Brazilian State are obtained from Table 6 in Ribeiro and Pinto (2019).

The rationale for choosing the size of the illegal market as the calibration parameter for the baseline simulation is the following. Even with the most sophisticated techniques, a quantification of illegal cigarette consumption will always remain an imprecise estimate because the illicit market is unobserved in practice. In the present research, the classification of cigarette sales as legal or illegal depends on the official minimum price and smokers' responses of cigarette purchases in the representative Vigitel surveys in 2018/19.[6] Due to sales "out of the pack" of loose cigarettes and illegal sales of premium brands, this approximation most likely underestimates the true extent of the illegal market. The "misspecification" is considered equal for the three price categories and across Brazilian states. That is, each of the price categories in the legal market are reduced by the same number of percentage points, which are then added to the market share of illegal cigarettes. This adjustment is done until the tax collection in the baseline scenario

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[6] Alternative measures of the cigarette illicit market are discussed in Szklo et al. (2018).

approaches the observed tax collection in 2019 under the restriction that the share of smokers in PC2, PC3, and PC4 does not become negative.

An explicit assumption in the reform scenario simulations is that, once the size of the illegal market is adjusted in the baseline scenario, it remains constant. In other words, the fact that individuals may switch from the legal to the illegal market after the tax reform is not considered. Although, this behavior may be rational and may occur in many instances, the lack of credible cross-price elasticities estimations forces this simplification. Other studies impose a switching behavior but only based on ad hoc assumptions and not on reliable data-based estimations.

3.3.2 Scenario I – Minimum price adjustment

The no price-adjustment strategy is not feasible because this would imply negative profits for some cigarette brands that would have a tax burden above 100 percent of the retail price, depending on the state. The industry would most likely react to the new tax structure by increasing retail prices such that profits are positive again for all brands. This is possible by choosing the highest price per brand so that tax burden is smaller than 100 percent for all brands. This scenario represents a minimum price adjustment by the cigarette industry to keep positive profits after the tax reform resulting from the PL3887-2020.

Because the proposed reform specifies that the tax incidence on cigarettes be based on the highest retail price per brand in the country, this research assumes that cigarette producers would rationally charge the same price for a given brand across all states. This assumption is maintained in this and in the following scenarios due to specific features of the PL3887-2020 discussed in Section 2. The rationale for this is that if a producer sets price below the highest price in the country for a given brand then its tax burden would increase, and consequently, the markup would reduce for that brand. Under this reform, the producer would pay the same amount of tax for both the lower and the higher retail price. Thus, there would be no reason to sell below the highest retail price per brand across the country.

Since the price-adjustment rule in this scenario implies choosing the lowest price that maintains the tax burden strictly below 100 percent (given that it does not make sense to have the retail price below the amount of tax due), the producers would not transfer the tax burden increase to the retail prices in full. That is, if cigarette production and logistics costs do not change, the producers would be implicitly accepting a reduction in their markup (profit margin).

Consumers adjust their consumption behavior according to the estimated total price-elasticity of demand. It is important to note that, by assumption, the distribution of

consumers by price category does not change. Consumers do not switch price categories, but instead adjust the intensity of their cigarette consumption.

3.3.4 Scenario II – Average pre-reform markup price-adjustment

Scenario II allows the cigarette producers to choose any price which leads to a markup above the one implicitly defined in Scenario I.

In Scenario II, the assumption of highest price-setting is kept and additionally, producers choose to maintain the average-weighted markup of the baseline. This means that, for some brands and states, producers might transfer only part of the tax burden increase to the retail prices to keep the pre-reform average markup. In some states the markup may increase while in others it may decrease up to the average level. The average-weighted values are obtained considering the share of consumers across Brazilian states.

This research assumes that the cigarette producers not only adjust their prices to avoid losses but also adjust the markup over the production cost from production to point of sale. In the current tax structure, markups differ across states because the tax burden and logistics costs vary across the states, while production costs are basically the same. In this second scenario, the markup is set to its current average value across all states. Consequentially, cigarette prices as well as profits are higher than under Scenario I.

3.3.5 Scenario III – Maximum pre-reform markup price-adjustment

Scenario III is an extreme scenario. In addition to the highest price-setting assumption, producers do not accept any reduction to their markup. So, they keep the highest retail price combined with the highest markup among the Brazilian states resulting from the new tax burden.

This scenario is much like the previous one except that the cigarette industry adjusts its price-setting strategy to preserve markups (from production to point of sale). Under the new tax structure, the industry would have an incentive to choose the highest price per brand that at least maintains the pre-reform markup across states.

4. Results

4.1 Price elasticity of cigarette consumption

Table 2 reports the estimated price elasticities by geographic region and price category. The prevalence component indicates that a price increase of 10 percent would reduce smoking prevalence by about two percent. The other component of total price elasticity

indicates how much smokers who continue to smoke reduce their consumption of cigarettes.

The differences between the total elasticities show that richer regions tend to be less sensitive to price increases. Moreover, individuals who buy brands that are more expensive respond less to price changes. Thus, the total elasticity estimates indicate that low price brands (PC1 and PC2) sold in the poorest regions of the country (Northeast and North) present the highest sensitivities to price changes in cigarettes. On the other hand, consumers of high-price brands in the wealthier South region are the least price sensitive, according to expectation. Across all Brazilian states, a 10 percent price increase would decrease consumption between 3.9 percent for the high-price cigarettes in the South and 8.6 percent for illegal cigarette consumption in the Northeast.

Table 2 – Price-elasticities by regions and price categories

Region	Prevalence	Total			
		PC1	PC2	PC3	PC4
Northeast	-0.26	-0.86	-0.68	-0.62	-0.57
North	-0.24	-0.73	-0.68	-0.50	-0.48
Southeast	-0.24	-0.56	-0.68	-0.46	-0.42
South	-0.21	-0.51	-0.66	-0.40	-0.39
Midwest	-0.23	-0.69	-0.67	-0.42	-0.47

Notes: PC1 = price category 1 or illicit market, PC2 = low price brands, PC3 = medium price brands and PC4 = high price brands. Standard errors in our elasticity estimations are robust to heterogeneity. According to these standard errors, the prevalence elasticity is significant at the 10% level, whereas the conditional elasticities are significant at the 1% level.

4.2 Baseline scenario

The total tax collection from tobacco related products in 2019 was about 17.75 BRL billion.[7] Since Receita Federal does not publish tax revenues at subnational levels, the model is calibrated in the baseline scenario to match the aggregate tobacco tax collection.

The definition of illicit market corresponds to cigarettes sold below the minimum legal price, as in Divino et al. (2019). Using information on cigarette packs found in litter collection, Figueiredo et al. (2020) finds that in the five surveyed state capitals, the share of illicit cigarettes is between 30 and 68 percent. These findings stress the need to adjust this key parameter in the baseline scenario.

The share of the first price category (PC1), which is a proxy for the illegal market, is increased to reach 30 percentage points (p.p.) and the share of the other three price

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[7]   This value also matches the National Commission for WHO Framework Convention on Tobacco Control (FCTC) implementation in Brazil projections.

categories is reduced proportionately across all states. As can be seen from the resulting distribution of smokers across price segments in Table 3, the average size of the illicit market is now equal to 30%. This share varies between 53% in Mato Grosso do Sul, a state in the Midwest region bordering Paraguay, and 19% in the Amazonas state in the North region.

Table 3 - Smoking behavior across Brazilian States and price categories - Baseline Scenario

Region	State Name	Distribution of smokers by price category (%)				Tax burden (%)		
		PC1	PC2	PC3	PC4	PC2	PC3	PC4
North	Rondônia	34.58	21.52	0.25	43.65	82.94	73.51	68.41
	Acre	45.62	15.38	4.35	34.66	79.47	69.76	63.76
	Amazonas	19.45	14.99	4.73	60.83	79.87	70.08	62.23
	Roraima	22.90	11.37	8.47	57.26	73.92	65.11	59.42
	Pará	24.50	12.46	5.86	57.17	79.25	69.89	62.15
	Amapá	20.12	12.17	15.47	52.24	74.71	65.14	57.32
	Tocantins	20.91	3.94	17.23	57.92	78.93	69.34	61.40
Northeast	Maranhão	35.06	14.11	21.44	29.40	78.97	69.17	62.04
	Piauí	42.13	9.75	12.20	35.92	78.41	68.39	62.08
	Ceará	27.94	25.66	29.75	16.65	78.95	70.67	60.83
	Rio Grande do Norte	34.64	18.65	19.72	26.99	78.88	69.11	61.64
	Paraíba	31.02	29.25	21.00	18.72	79.00	71.83	64.94
	Pernambuco	27.45	14.60	41.89	16.05	77.07	70.07	60.91
	Alagoas	43.05	40.41	9.46	7.08	80.63	71.36	64.71
	Sergipe	20.52	17.98	10.27	51.24	78.49	68.25	62.29
	Bahia	23.26	25.30	14.99	36.45	80.19	69.80	61.70
Southeast	Minas Gerais	31.25	13.65	31.21	23.90	74.71	66.57	58.55
	Espírito Santo	27.75	7.84	36.77	27.65	74.17	65.70	57.86
	Rio de Janeiro	25.79	15.96	42.42	15.84	77.53	69.13	60.10
	São Paulo	29.61	29.23	16.03	25.13	78.71	71.21	65.62
South	Paraná	34.87	14.86	30.98	19.29	76.22	68.37	64.61
	Santa Catarina	27.04	11.66	32.79	28.52	72.19	64.86	56.70
	Rio Grande do Sul	26.61	19.31	51.14	2.94	74.92	66.95	58.48
Midwest	Mato Grosso do Sul	52.65	5.74	32.68	8.93	79.14	69.68	64.61
	Mato Grosso	27.67	25.60	9.11	37.62	85.71	76.05	68.58
	Goiás	26.96	14.13	47.65	11.27	76.03	67.16	59.83
	Distrito Federal	28.56	37.48	11.12	22.84	85.06	75.93	68.23

Note: Updated values for 2019 using values from Tables 1 and 2.

Table 3 also reports the tax burden of cigarettes by state and price category—one of the key variables in comparing the effects of the tax reform in the following simulations. Due

to the current mixing of specific and ad valorem components (due do IPI), the cigarette tax burden decreases as the cigarette final price increases. The average prices of the categories in BRL are equal to 5.40, 7.90, and 12.80 for price categories 2 to 4, respectively.

The average cigarette tax burden, defined as the effective tax as the share of retail price, was 78.3, 69.4 and 62.2 percent for price categories 2 to 4, respectively. The difference between the states with the lowest and highest retail price within a price category lies between 14, 10, and 9 percentage points for categories 2, 3 and 4, respectively, despite the fact that the ICMS and the price-setting behavior of producers are the only components by which cigarette taxation differs regionally. Cigarette consumption also varies across these three price categories and across the states due to differences in income, culture, logistics costs, and other individual specific characteristics.

4.3 Scenario I – Minimum price adjustment

Since no price adjustment would imply negative profits for some brands, the industry would most likely react to the new tax structure by increasing retail prices such that profits are positive for all brands. This is possible by choosing the highest price per brand across the states so that tax burden is smaller than 100 percent for all brands. According to the simulations reported in Table 4, this price is at least 8.40 BRL. After this price adjustment, the low and medium price categories essentially collapse to the same price. Moreover, this implies that there is an implicit floor price below which cigarette sales are not desired by the industry. This price is 8.40 BRL, which is well above the current official floor price of 5.00 BRL.

Since the tax base is the highest price per brand across the country, producers would have little incentive to charge different prices across states. That is, another relevant consequence of the tax reform in PL3887-2020 is that cigarette prices per brand would become uniform or almost uniform across states. This is the case because logistics costs and other taxes, such as the ICMS, are different across states. Thus, currently, prices per brand are also different across states. The new CBS would be charged at the highest price per brand across all states. If the industry charges a lower price for a given brand in a given state, it would still pay CBS over the highest price for that brand. In consequence, the new CBS would dramatically reduce the price differences among the states, although some price differences could still persist due to differences in demand and the logistics costs. This policy-induced industry behavior would lead to reduced cross-border shopping among bordering states. For the simplicity of the model, it is assumed that the tax reform reduces the price differences down to zero.

Table 4 shows the aggregate changes relative to the baseline scenario of prices per pack, consumption, share in total tax collection and tax burden under this and the following

scenarios for price categories 2, 3, and 4, respectively. Under the considerations in Scenario I, cigarette tax revenue increases by 30.7 percent, or 5.4 billion BRL per year. Low price cigarette prices increase by 56.3 percent or 3 BRL per pack to 8.40 BRL. Medium price brand prices increase by 6.3 percent (0.50 BRL) and high price brands by 19.8 percent or 2.4 BRL on average. In turn, cigarette consumption decreases by 38.1, 3.2, and 9.6 percent for categories 2 to 4, respectively, in relation to the baseline. Note also that the tax burden for PC2 and PC3 is still considerably high and equal to 92.3 percent in both cases. The tax burden of high price brands climbs to 78.5 percent, which is still higher than the tax burden of low price cigarettes under the current legislation.

Table 4 – Tax reform simulation results across different scenarios

	Baseline	Scenario I	Scenario II	Scenario III
Tax collection (BRL Bi per year)	17.75	23.20	21.92	20.53
Change (Baseline ref)	---	30.7%	23.5%	15.7%
PC2: Low price brands (BRL)	**5.38**	**8.40**	**10.03**	**11.06**
Tax burden	78.3%	92.3%	87.3%	84.9%
Share in tax collection	24.06%	21.89%	19.63%	18.1%
Consumption (% change)	---	-38.1%	-58.6%	-71.50%
PC3: Medium price brands (BRL)	**7.90**	**8.40**	**13.15**	**14.87**
Tax burden	69.4%	92.3%	81.2%	78.9%
Share in tax collection	35.75%	37.28%	37.56%	38.21%
Consumption (% change)	---	-3.2%	-33.5%	-44.6%
PC4: Premium brands (BRL)	**12.84**	**15.23**	**19.42**	**23.38**
Tax burden	62.2%	78.5%	74.8%	72.5%
Share in tax collection	40.19%	40.83%	42.81%	43.7%
Consumption (% change)	---	-9.6%	-25.5%	-40.50%

Notes: Scenario I is the minimum price adjustment case, Scenario II defines that the industry implements average pre-reform markup price adjustment and Scenario III considers the maximum pre-reform markup in each state and price class. The share in total tax collection refers to the percentage of revenue obtained by each price category relatively to the total cigarette tax revenue.

It is also important to recall that there is a direct relation between the tax burden, tax revenue, and consumer prices. The initial change occurs via change of the tax burden, that is, the introduction of the CBS. Higher taxes provoke higher prices and, although this

change decreases the consumption of cigarettes in the population, the final change in tax revenue is still positive. The tax increase is followed by a revenue increase because of the low price elasticity of the cigarette demand, which yields a decrease in the cigarette consumption less than proportional to the increase in the retail price.

The finding that prices of cheaper cigarettes increase more than those of premium brands is of major political relevance. There is a debate between several public departments in Brazil about whether an alteration of the current cigarette price would affect the size of the illegal cigarette market. The present simulations indicate that the gap between low and high price cigarettes in the legal market closes. Without a reinforcement of police and tax authorities, one may indeed worry that the much higher implicit minimum price would stimulate illegal cigarette consumption even further. Another concern is that *lower* taxation could diminish revenue and increase consumption, which is clearly confirmed by the estimations of this research.

The final report of a task force on the evaluation of cigarette tax reduction comes to the conclusion that there is no substantial evidence that lower taxation would cause a relevant reduction of cigarette smuggling (Ministry of Justice and Public Security, 2019). As no tax is paid on the illicit cigarettes coming from Paraguay as well as those illicit cigarettes produced domestically, the price advantage of illicit cigarettes over legal cigarettes is still maintained, even with lower Brazilian cigarette taxes. Thus, curbing illicit cigarette trade cannot be accomplished by lowering taxes, but instead requires better supply chain control, stronger law enforcement, and effective international cooperation.

### 4.4 Scenario II – Average pre-reform markup price adjustment

The mechanisms and CBS value used to obtain the results under the second reform scenario are the same as in the previous case. The only difference is the assumption that the cigarette producers not only adjust their prices to avoid losses but adjust them to equal to the average pre-reform markup (or profit margin) over the production costs from production to the point of sale. In the current situation, markups differ across states because the tax burden and logistics costs vary while production costs are basically the same. In this second scenario, the markup is set to its current average value across all states. Consequentially, cigarette prices as well as profits are higher than under the first scenario.

Under the average pre-reform markup price-adjustment scenario, cigarette prices increase by 4.6, 5.2, and 6.6 BRL, for price categories 2, 3, and 4 resulting in a decrease in consumption by 58.6, 33.5, and 25.5 percent, respectively. The tax burden is generally lower in this scenario than in Scenario I, which can be explained by the specific component of the CBS. Finally, the overall tax collection increases by 23.5 percent or 4.2

billion BRL per year. Figures 2-4 illustrate the effects under this scenario disaggregated by state and price category.

Figure 2 shows that, compared to the baseline scenario, the change in price is strictly positive and above 20 percent in all states and cigarette price categories. With the exception of Paraná, the relative price increase is highest for low price cigarettes. The usual pattern is that the higher the initial price the higher the relative price change, apart from states like Paraná, Rondônia, Roraima, Sergipe, and Mato Grosso do Sul where the pre-reform tax burden of cigarettes in PC3 and PC4 is particularly close. For the same reason, the consumption change in Figure 3 is essentially opposite to the pattern of price changes. That is, consumption after the tax reform is strictly lower and, besides the states cited above, it decreases even more for low and medium price cigarette brands. Cigarette consumption decreases proportionately more among lower income individuals, who mostly consume lower priced cigarettes.

Figure 2 - Percentage price changes by price categories relative to the baseline - Scenario II
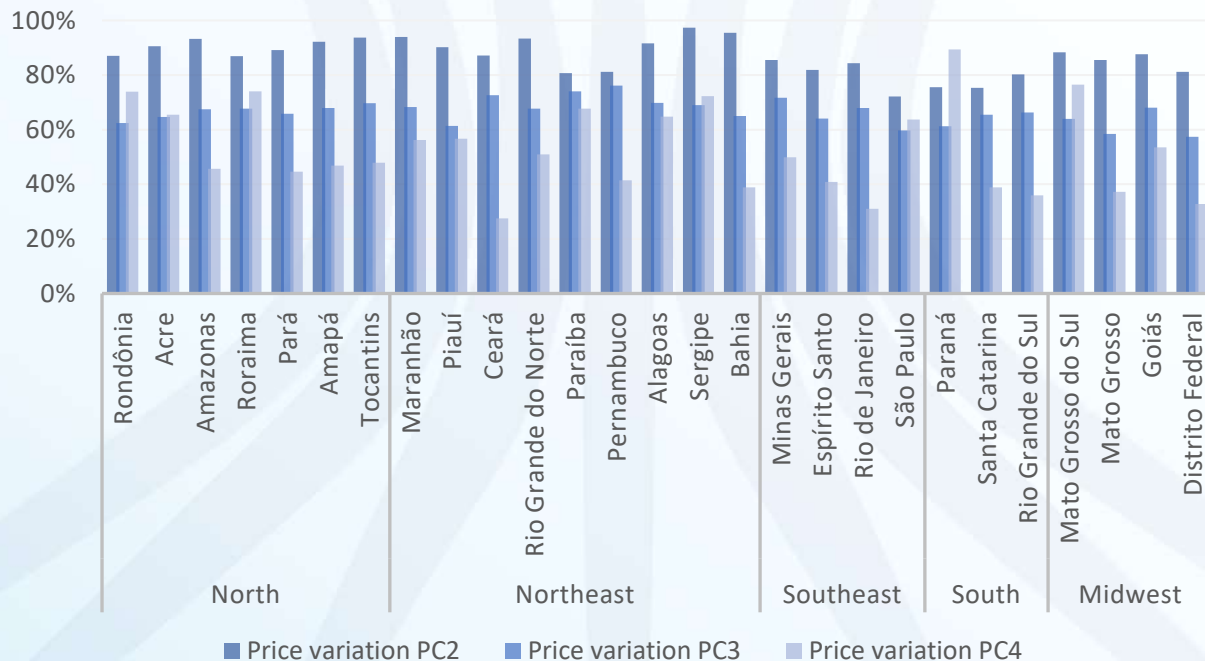
Figure 3 - Percentage consumption changes by price categories relative to the baseline - Scenario II

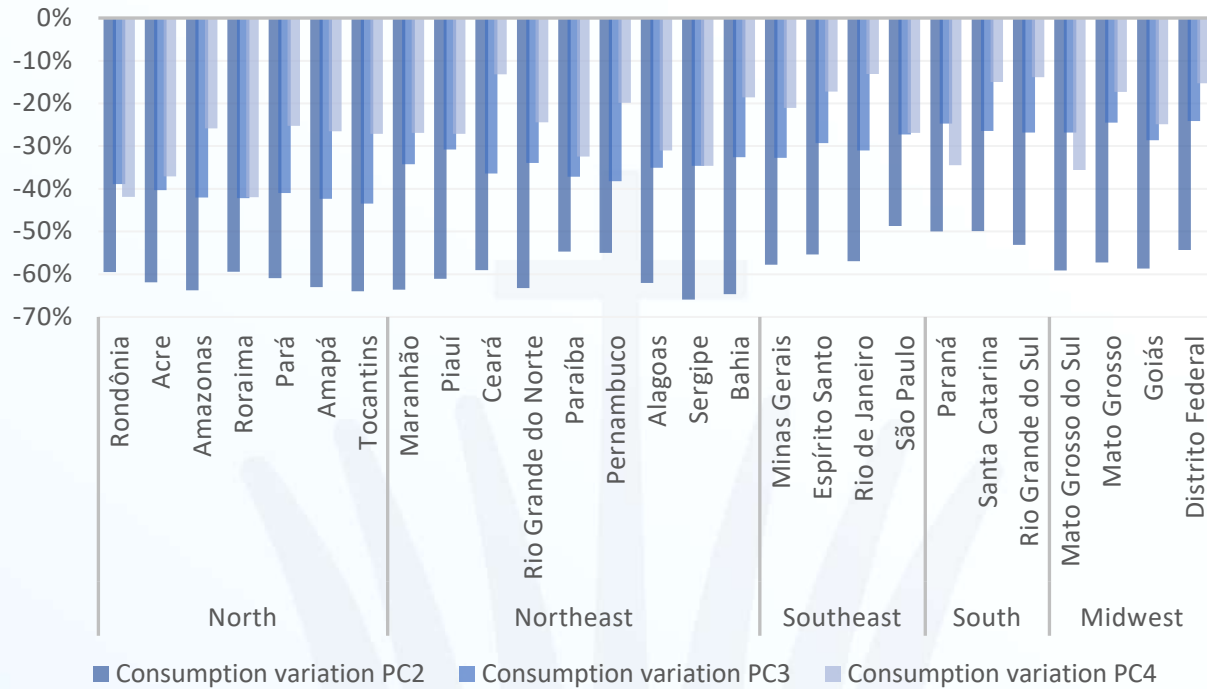■ Consumption variation PC2　■ Consumption variation PC3　■ Consumption variation PC4

Figure 4 reveals the differences in tax collection by states and price categories. As expected, the pronounced price increase of low price brands implies a tax reduction of up to 15 percent in all but three states. The exceptions are São Paulo, Santa Catarina, and Paraná, because in these regions the pre-reform prices of low price brands are the highest, ranging from 5.7 to 5.8 BRL. Tax collection from brands in PC3 and PC4, however, is unambiguously positive. The three states in the South have the highest relative gains, with increases above 30 percent in both PC3 and PC4. States in the North region register the lowest gains because pre-reform prices and consumption of cigarettes in these price categories are relatively low.

It is also interesting to compare the contribution of each Brazilian state and tax component to the total tobacco collection in country under this second scenario. Figure 5 illustrates that São Paulo is the most important state in terms of tobacco tax collection in the country, accounting for about 35 percent of the total collected in 2019. This is the case for the three tax components ICMS, IPI, and the proposed CBS that are considered in this research. Considering that São Paulo accounts for about 25 percent of the Brazilian population, its share of tobacco tax collection is proportionately higher than that of the total population. Other relevant states for tobacco tax collection are Rio de Janeiro, Rio Grande do Sul, and Minas Gerais. The case of Rio Grande do Sul stand out because it ranks seventh in terms of total population in the country, but third in the share of total tobacco tax collection.

Figure 4 - Percentage tax collection changes by price categories relative to the baseline - Scenario II
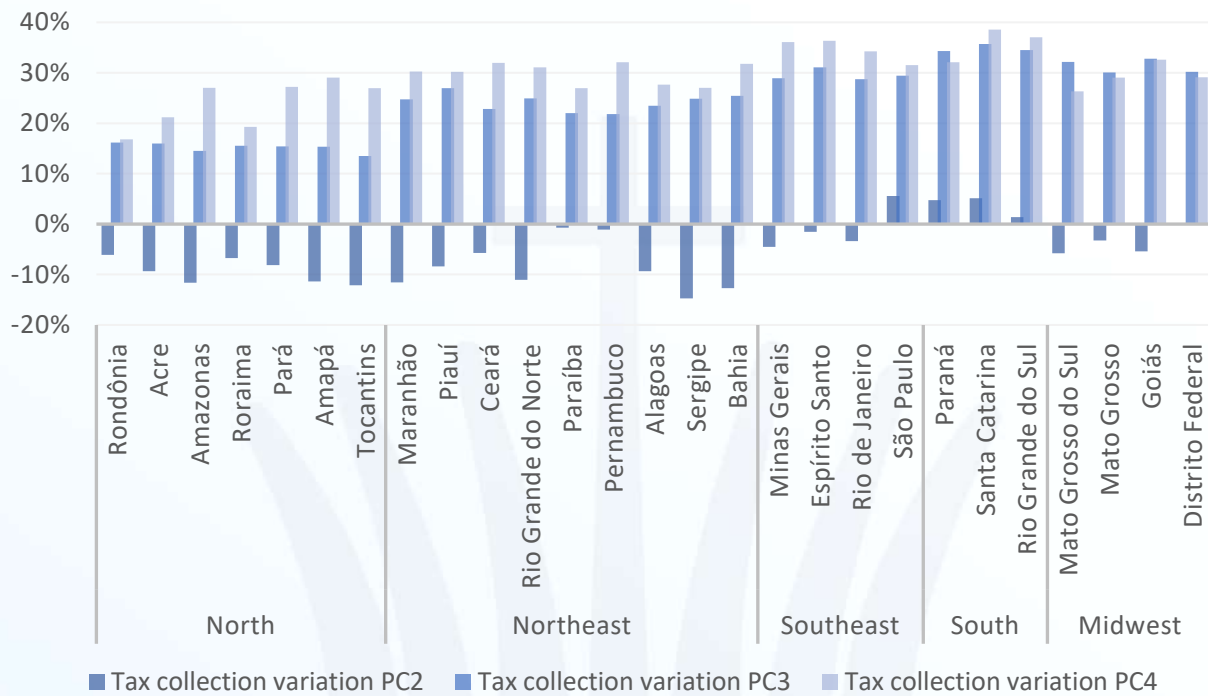
Figure 5 - Share in total tax collection by tax component and state - Scenario II
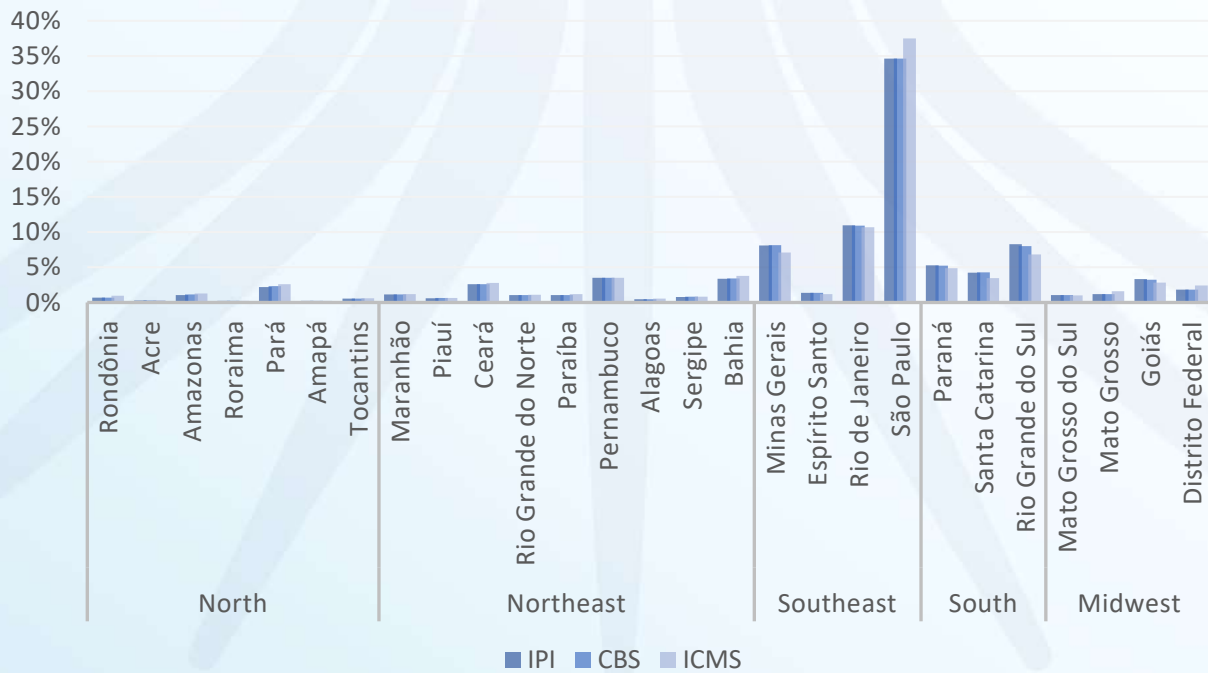
4.5 Scenario III – Maximum pre-reform markup price-adjustment

Under this scenario, the cigarette industry adjusts its price-setting strategy to preserve markups (from production to the point of sale). That is, the industry chooses the highest price per brand that maintains the pre-reform markup across states. In consequence, the markup is higher is all states but the Federal District where the markup remains constant at its pre-reform level. In practice, this is an unlikely scenario, as the cigarette industry might not be able to increase markup at the same level as there is an increase in the cigarette tax burden.

Table 4 above indicates that, in this case, the single prices per cigarette pack and brand for price categories 2 to 4 are 11.06, 14.87, and 23.38 BRL, respectively. Under this scenario, cigarette consumption decreases sharply in these price categories by 71.5, 44.6, and 40.5 percent, respectively. The new tax burdens for price categories 2 to 4 are 84.9, 78.9, and 72.5 percent, respectively. Because of this substantial decrease in smoking, tax collection increases only by 15.7 percent per year relative to the baseline, or about 2.8 BRL billions per year. Cross-border shopping across states also reduces because prices per brand will tend to be the same across the across the country.

5. Conclusion

This Research Report considers the tobacco section of Bill PL3887-2020 and analyzes the potential impacts of the tax reform on cigarette prices, cigarette consumption, and tax collection at both the federal and state level. This research simulates alternative price responses of the cigarette industry to the new tax scheme and evaluates potential impacts of these responses on the cigarette market and tax collection.

The research simulates how the Tobacco Industry could respond to the proposed CBS tax reform assuming three scenarios that differ according to the price-setting strategy of Tobacco Industry: i) Minimum price adjustment (Scenario I); ii) Average pre-reform markup price-adjustment (Scenario II); and iii) Maximum pre-reform markup price-adjustment (Scenario III). One of the main findings is that no matter how the tobacco industry responds to the tax increase, Bill PL3887-2020 would increase cigarette taxes and prices, resulting in a decrease in tobacco consumption. Despite this decrease in consumption of cigarettes in the population, the change in tax revenue is still positive. The CBS tax reform would reduce the gap between low and high price cigarettes as cheaper cigarettes prices would increase more than premium brands, something that is of major political relevance.

In aggregate, the major similarities and differences between the three scenarios relative to the baseline scenario are as follows. Either way, the tax reform proposed by the government would result in significantly higher cigarette prices and in an implicit minimum price that is far above the current official minimum price. In all simulated scenarios, the

tax burden, that is, the total tax share of the retail price, increases relative to the current baseline situation and it tends toward uniformity across all states. Consequently, cross-border shopping and the price gap between cigarette brands would be reduced.

Cigarette prices and the tax burden across states are currently varied, which implies that the distribution of gains from the reform across states is uneven. Yet no Brazilian state experiences tax revenue losses under either scenario, on aggregate. However, the assumption of the stability of the illicit market despite the increase of cigarette prices should be noted here. Thus, a crucial requirement to reap the positive aspects of the tobacco tax reform is curbing illicit trade through consistent and continuous public policies to fight cigarette smuggling.

The proposed CBS tax reform increases the retail price of low price cigarettes relatively more than those of medium and high price brands. This is desirable under a tobacco control policy perspective because it tends to reduce smoking proportionately more among lower income individuals, who are most likely to buy lower price brands according to other findings, such as Divino et al. (2019). This finding, however, does not necessarily imply that the tax reform is either progressive or regressive, as the simulations have not analyzed income levels but cigarette price categories instead. Only under the (strong) assumption that low income groups consume cheaper brands, lower income individuals would pay relatively more taxes than higher income smokers from premium brands after the tax increase. This would make the tax reform more regressive. However, this is not the case because the simulations have addressed only cigarette price categories and not individual income levels.

It is anticipated that the cigarette industry would change its price-setting strategy under the proposed tax reform. Irrespective of the new strategy, the country benefits from the reform by increasing tobacco tax collection in all simulated scenarios. The CBS implementation, however, is challenging due to the new format of charging a tax rate on the highest price per cigarette brand. In particular, there are potential challenges about computing and using the highest nationwide price per cigarette brand as a tax base and avoiding tax evasion through under-declaration of prices by the industry, and selling cigarettes above the reported price. Thus, coupled with the innovative tax scheme proposed by the Bill 3887/2020, there must be a strong tax administration to avoid potential tax revenue leakages.

The partial tax reform proposed under PL 3887-2020 is a step forward for tobacco control in Brazil as it would significantly reduce cigarette consumption while still generating additional tax revenue. The extra resources could be either earmarked to social programs and health expenses or used freely by the government to support the public health system and deter people from smoking. Finally, a more intense nationwide effort to fight cigarette smuggling as a public policy would reduce smoking and the illicit cigarette market and raise fiscal revenue in these difficult times of COVID-19 pandemic and chronic fiscal imbalance.

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