Centro de Análisis y Difusión de la Economía Paraguaya

TOBACCO OVERSUPPLY IN PARAGUAY AND ITS CROSS-BORDER IMPACTS

Fernando Masi (coord.)
Juan Cresta
Fernando Ovando
Belén Servín

June 2021

Centro de Análisis y Difusión de la Economía Paraguaya

TOBACCO OVERSUPPLY IN PARAGUAY AND ITS CROSS-BORDER IMPACTS

Fernando Masi (coord.)
Juan Cresta
Fernando Ovando
Belén Servín

June 2021

The Centro de Análisis y Difusión de la Economía Paraguaya (CADEP) is grateful to the Institute for Health Research and Policy of the University of Illinois at Chicago (UIC) and Bloomberg Philanthropies for their support for research on tobacco supply and demand in Paraguay. The views expressed in this report cannot be attributed to, nor do they represent, the views of UIC, the Institute for Health Research and Policy, or Bloomberg Philanthropies.

A special thanks to Sara Costa who has collaborated with this research through a report on the illicit trade in cigarettes manufactured in Paraguay.

Piribebuy 1058. Asuncion - Paraguay
Phones: 595-21 496813/494140/ 452520
cadep@cadep.org.py
www.cadep.org.py

Design and layout: Karina Palleros
Cover photo: www.shutterstock.com / De Nomad Soul

June 2021
Revised Second Version
ISBN: 978-99925-244-2-8

CONTENTS

1/

Key Messages

Tobacco consumption in Paraguay has consistently decreased over the last twenty years.

Estimations of the price elasticity of tobacco consumption in Paraguay suggest that a ten percent increase in the price of tobacco products, as a result of tax increase, would reduce tobacco consumption by 9.7 percent.

Between 2008 and 2019 the estimated net supply of cigarettes in Paraguay is about seven times higher than the estimated domestic consumption. This large gap suggests significant illicit exports to Brazil and other neighboring countries.

Official and independent data are necessary to implement informed public policies to reduce tobacco consumption and illicit flows.

More coordination between Paraguay, Brazil, and other neighboring countries is needed to effectively implement tobacco control policies and increase control along the tobacco supply chain.

2/

Executive Summary

This study first estimates tobacco demand in Paraguay to understand the evolution of domestic consumption of tobacco as well as to estimate the effects of increases in tobacco prices on local consumption. Second, this study approximates the potential supply of cigarettes available in Paraguay with respect to the tobacco companies' total declared sales as well as domestic consumption of cigarettes.

In Paraguay, there are no systematic studies on the evolution of tobacco product consumption over time. Data on this subject are available, however, in the form of multiple national surveys – each conducted at different times, using varied methodologies, and targeting assorted populations. Despite these limitations, data from these surveys are used in this study to estimate the domestic demand of cigarettes as well as the price elasticity of tobacco consumption.

The prevalence of tobacco consumption among young people (13 to 15 years old) in Paraguay significantly decreased in the period from 2003 to 2019. Adult smokers are predominantly males residing in urban areas with low levels of education, who are unemployed. Smokers as household heads are mostly males residing in urban areas with low levels of education, who are fully employed. A higher number of tobacco-smoking households in Paraguay are in the lowest income deciles for the country.

Results of estimation of demand for tobacco consumption show a significant decrease in the quantity demanded in the domestic market between 1997 and 2019.

Estimations of the price elasticity of tobacco consumption indicate that increases in prices due to higher taxes on cigarettes have a significant impact on reducing consumption of tobacco products in Paraguay: a ten percent increase in the price of tobacco products (for example, as a result of tax increase) would reduce tobacco consumption by 9.7 percent. In addition, tax collection that results from the consumption of tobacco products, all else remaining constant, increases because the reduction in tobacco consumption is slightly lower than the potential increase in tobacco prices.

The supply of tobacco products from companies located in Paraguay has significantly increased over the last two decades. In this study, two methods are applied to estimate the net supply of cigarettes in Paraguay using data on imports of inputs and raw materials for manufacturing cigarettes as well as data on imports of cigarettes.

After a period of moderate growth (1995–1999), there was a jump in net imports of inputs and raw materials for cigarette production from the mid-2000s to 2019, resulting in an accelerated growth of the volume of domestic production of cigarette packs. In the same period, imports of cigarette packs declined, and registered exports of cigarette packs experienced moderate growth.

One important outcome to mention is that there was a wide gap between total estimated net supply of cigarettes and quantity of cigarettes consumed domestically between 2010 and 2019.

Studies in Brazil[1] have indicated that Paraguay has become a hub for illegal re-exporting operations of international and Brazilian cigarette brands into the Brazilian market, perhaps incentivized by the price differentials between the two countries. This re-exporting business ceased operation when export taxes on tobacco were imposed in Brazil, and a high number of Brazilian tobacco companies decided to invest in Paraguay beginning in the early 2000s. This decision triggered an accelerated growth of cigarette production in Paraguay, mainly for the purpose of providing cigarettes to neighboring markets using the same illegal routes of re-exporting operations as in the past.

This study provides evidence on the decreasing trend in domestic tobacco consumption and the increasing trend of supply of cigarettes in Paraguay. This uncontrolled overproduction seems to be fueling illicit trade in Brazil and other countries. More control along the domestic and transborder tobacco supply chain would result in more effective tobacco control polices in Paraguay and the region.

1 Ramos (2009), Gomis et al (2018), Iglesias et al (2018)

3/

Introduction

Tobacco consumption and its consequences on health are major concerns for public policy. Bardach et al. (2016) estimate that 3,354 annual deaths are caused by tobacco consumption in Paraguay (12.2 percent of all deaths for people older than 35 years of age). The public health costs of dealing with illnesses related to tobacco consumption in Paraguay greatly exceed cigarette tax revenues: the direct costs of tobacco consumption represent 1.09 percent of GDP and 12.1 percent of public health expenditures, while tax revenues from cigarettes cover only 20 percent of public expenditures for tobacco-related illnesses.

A robust body of literature demonstrates that the negative health and economic consequences of tobacco consumption can be reduced through tobacco control policies. The evidence consistently shows that excise taxes on tobacco products are the most effective as well as the most cost-effective tools to reduce smoking (Ranson et al., 2000; Chaloupka et al., 2011). At the same time, taxes on tobacco consumption increase government revenues (Sunley et al., 2001; Instituto Nacional del Cáncer de los EE.UU. & OMS, 2016), since smokers reduce consumption less than proportionally when faced with higher prices. That is, the demand for cigarettes is inelastic (Greenhalgh et al., 2020).

Calculations of price elasticities of demand (Guindon et al., 2018) show that elasticity is equal to -0.4, on average, for high-income countries and -0.8, on average, for middle- and low-income countries. No recent estimations of price elasticities of tobacco consumption have been made in Paraguay. Measuring price elasticities is essential for estimating the effects of price and tax increases on tobacco consumption.

Currently, an excise tax (ad valorem) on tobacco consumption in Paraguay is fixed at 18 percent, and it could go up to 22 percent according to Article 115 of Law 6380/19 (*Modernización y Simplificación del Sistema Tributario Nacional*). The current excise tax (ad valorem) rate on tobacco in Paraguay (*Impuesto Selectivo al Consumo,* or ISC) is the lowest in Latin America.[2] Rates of excise taxes plus other specific tobacco taxes are higher than 65 percent in Argentina, Brazil, and Uruguay (CEPAL, 2019). Also, the excise tax rate in Paraguay is substantially lower than the level recommended by the World Health Organization (WHO) to reduce tobacco consumption and increase tax revenues, which is a minimum rate of 70 percent of the retail price of cigarettes (OMS, 2010).

Recent studies have highlighted Paraguay's changing role in legal and illegal tobacco trade flows in the MERCOSUR region.[3] Beginning in the 1960s and 1970s, Paraguay was the transit hub for international cigarette brands as part of a triangulation strategy designed by multinational companies to penetrate the Brazilian and Argentinian markets. In the 1980s and 1990s, cigarettes made in Brazil were exported to Paraguay

2 ISC as an excise tax in Paraguay is imposed, with different tax rates, on luxury goods like tobacco, alcoholic beverages, and others.

3 MERCOSUR is an economic integration bloc composed of four countries: Argentina, Brazil, Paraguay, and Uruguay.

in great amounts to be re-exported illegally into Brazil at a differential price.[4] This strategy created conditions for manufacturing tobacco products in Paraguay beginning in the mid-1990s, to compete with neighboring markets with low prices and through counterfeiting of international brands as well as manufacturing national brands. Both national and counterfeited brands started to be exported legally and illegally to Brazil and Argentina at this time (Iglesias et al., 2018).[5]

In 1999, in order to put a stop to re-exporting operations from Paraguay, Brazil imposed a tax on the export of cigarettes. This decision triggered an accelerated growth of cigarette production in Paraguay to provide to neighboring markets using the same means of cigarette triangulation introduced by multinational companies. A great number of foreign enterprises (especially Brazilian ones) decided to invest in Paraguay, adding to existing and new national tobacco firms. Paraguay has experienced a boom in tobacco production since the beginning of the 2000s, and the tobacco industry has been strengthened because of the existing competitive advantages in Paraguay with respect to the Brazilian market (Gomis et al., 2018).[6]

Policy regulations on tobacco products in Paraguay

An excise tax on tobacco was first introduced in Paraguay in 1991 within Law 125/91 with the name of *Impuesto Selectivo al Consumo* (ISC) at an ad valorem rate of eight percent on wholesale prices (domestic production) and on custom value in foreign currency for imports. This rate was increased in 2004 (Law 2421/04) to 12 percent and to 13 percent in 2010 (Law 4045/10). A new legal norm (Law 5538/15 and its regulatory decree 4694) raised this rate to 16 percent in 2015, with a top ceiling of 20 percent. The current rate for ISC is 18 percent, with a top ceiling of 22 percent, established by a new tax rule (Decree 159/18) in 2018 and endorsed in 2019 by a new legal norm (Law 6380/19). Since 1992, tobacco products are also taxed at a general rate of 10 percent of the value added tax (VAT).

Law 4045/10 had established that one percent of all revenues collected by ISC be directed to the National Secretariat of Sport. Five years later, Law 5538/15 established that 40 percent of all revenues collected by this specific tax would be directed to the Ministry of Health to be spent in programs related to prevention and care of noncommunicable diseases.

Tax rate adjustments on tobacco products in Paraguay have become more frequent since 2010. The highest effective tax in Paraguay is 18 percent.

4 In this case, the price differential is due to lower taxes paid on the re-exporting of cigarettes back into Brazil.

5 Tax rates and tax pressure are much lower in Paraguay than in Brazil and Argentina.

6 Particularly in terms of lower tax and tariff rates

Table 1. Evolution of tax rates (ISC) on consumption of cigarettes and other tobacco products.

ISC Rates	Time Period	General Rule / Ad Valorem	Related Legislation
8%	18/12/1991 to 04/07/2004	Local production: 18% on wholesale price Imports: 18% on custom values in foreign currency	Law 125/91
12%	05/07/2004 to 27/07/2010		Law 2421/2004
13%	30/07/2010 to 30/12/2015		Law 4045/2010
16%	01/01/2016 to 30/08/2018		Law 5538/2015 and Regulatory Decree 4694/2015
18%	01/09/2018 to the present		Decree 159/2018 and Law 6380/19

Source: Ministry of Finance of Paraguay

Paraguay is a signatory of the Framework Convention on Tobacco Control (FCTC) of the World Health Organization (WHO) since 2006. This Convention established policies to protect the health of the global population from tobacco consumption and its economic, social, and environmental consequences (OMS, 2015). Law 5538/15 follows the guidelines of the FCTC setting regulations on: i) commercialization of tobacco products, ii) tobacco consumption habits, iii) advertising and promotion of tobacco products, iv) packaging and labeling of tobacco products, and v) prevention of smoking and for abandoning tobacco use.

This Law, enacted in 2015, also established a Tobacco Traceability System in Paraguay (*Sistema de Trazabilidad del Tabaco en Paraguay*, or SITRATAP) that imposes an obligation to tobacco companies to report on the use and imports of raw materials and inputs for the manufacturing of tobacco products.

A new Law (6107/18) was enacted in 2018 with the purpose of implementing measures to control the supply chain of tobacco products in order to combat illicit trade, tax evasion, and counterfeiting/adulteration of these products. This task should be carried out mainly by the Ministry of Industry and Commerce with the support of the Ministry of Finance. Currently this Law lacks regulations.

The Protocol to Eliminate Illicit Trade of Tobacco Products is a companion treaty to the FCTC, and it has not yet been ratified by Paraguay. The Protocol requires each ratifying state to monitor tobacco trade in terms of licensing, tracking and tracing, and sales by internet, international transit, and other type of tobacco sales. It also promotes international cooperation in information sharing and mutual legal assistance (OMS, 2015).

This study first estimates tobacco demand in Paraguay to understand the evolution of domestic consumption of tobacco as well as to estimate the effects of price increases in tobacco on local consumption. Second, this study estimates the supply of cigarettes available in Paraguay compared to domestic consumption of cigarettes.

This report is organized as follows. Section 4 characterizes tobacco consumption in Paraguay through estimations of consumption and the price elasticity of tobacco consumption. Section 5 discusses the methodology used to calculate production and total net supply of tobacco products and to compare this supply with estimates of consumption in Paraguay. Section 6 presents a discussion of the results of the estimates of demand and supply of tobacco products. Conclusions and policy recommendations are presented in the last section.

4/ Tobacco Consumption in Paraguay

Currently there are no systematic studies on the evolution of consumption of tobacco products in Paraguay over time. Data on this subject are available in a number of national surveys conducted at different time intervals, using varied methodologies, and targeting assorted populations. For these reasons, tobacco consumption patterns in household spending are difficult to estimate.

The Integrated National Survey (*Encuesta Integrada de Hogares*, or EIH) 1997/1998 presents data on socioeconomic indicators of households at the country level. This survey collected data on household spending, but it was limited to capturing the amount spent on goods, not the quantity of goods consumed. On the other hand, the Integrated National Survey (EIH) 2000/2001 included a module on household consumption, but this information was not actually collected, according to the *Dirección Nacional de Estadísticas, Encuestas y Censos* (DGEEC).[7]

The Global Youth Tobacco Use Survey (GYTS), focusing on students 13 to 15 years old, was applied at the country level for the following years: 2003, 2008, 2014, and 2019. GYTS is a component of the Global Tobacco Surveillance System carried out worldwide. In Paraguay, it is implemented by the Ministry of Education under the coordination of the Ministry of Health (MSP) and the Pan American Health Organization (PAHO)/WHO Paraguay.

Data from the National Survey of Risk Factors for Noncommunicable Diseases (NSRF) 2011, carried out by the MSP, allow for tobacco consumption in Paraguay to be characterized at an individual level. This survey is the first and only one to do so in Paraguay, and it contains cross-sectional data at the country level.

The Survey of Income and Expenditures (EIG&CV) carried out in 2011/2012 by the DGEEC contains cross-sectional data that are also representative of the total population. In addition to individual and household characteristics, the EIG&CV captures the amount of tobacco consumed and the expenditures on tobacco products at a household level. It is the most up-to-date survey that provides this type of data on household consumption in Paraguay.

Both surveys (NSRF and EIG&CV) are very useful and link aspects of household behavior in terms of spending on tobacco products with those related to risks or impacts on population health conditions.

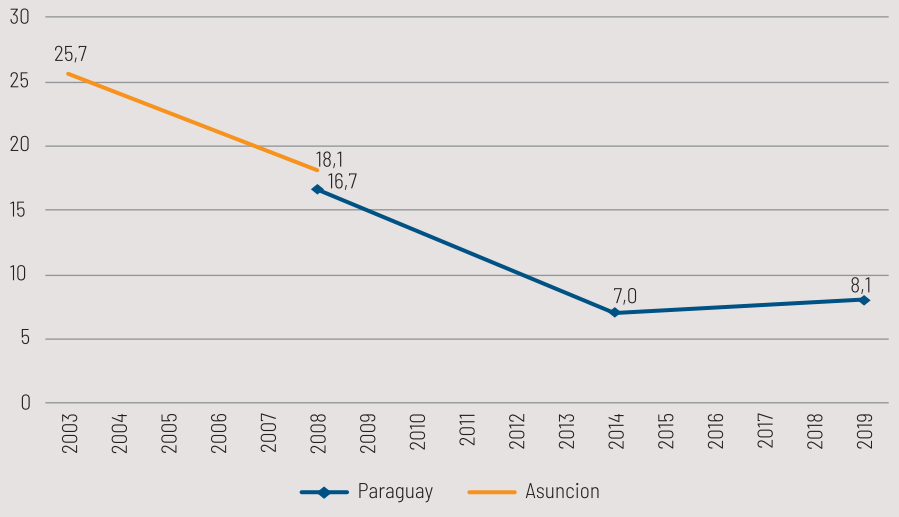
7 Request for Access to Public Data, tobacco consumption from the EIH 1997/1998 and 2000/2001: https://informacionpublica.paraguay.gov.py/portal/#!/ciudadano/solicitud/30254

4.1. Demand for cigarettes for local consumption

4.1.1. Prevalence of tobacco consumption among young people

Conducted in 2003, 2008, 2014, and 2019, GYTS results show the evolution of the prevalence of tobacco consumption[8] among young people in Paraguay. The first survey carried out in 2003 only collected information in Asuncion (the Capital). The next survey in 2008 captured information from Asuncion as well as the entire country. Data collected in the 2014 and 2019 surveys also refer to the whole country. Tobacco consumption among young people has diminished in recent years, according to the prevalence indicators of these surveys. The evolution of prevalence indicators is shown in Figure 1, combining available data for Asunción and the entire country. Reduction of tobacco consumption among young people in Asunción is observed between 2003 and 2008, going from 25.7 percent to 18.1 percent. The data at the country level show a significant decrease between 2008 and 2019, from 16.7 percent to 8.1 percent.

Figure 1.
Prevalence of tobacco consumption among young people (2003–2019)



Source: Authors' calculations using data from GYTS 2003–2019

8 Prevalence of current smokers in a country is calculated as the number of respondents in a survey who indicate that they smoke every day + the number of respondents who report smoking occasionally, divided by the total number of survey participants (OMS, 2015).

4.1.2. Prevalence of tobacco consumption among adults

According to the NSRF the number of total smokers in Paraguay reached 612,570 in 2011, which represents a prevalence of 14.6 percent at the country level (Table 2). Smoking prevalence differs significantly between men (22.7 percent) and women (6.1 percent). In this sense, it should be noted that among smokers of tobacco products, 79.2 percent are men and 20.8 percent are women.

Prevalence is higher among adults with lower education levels. For those with 1–6 years of schooling, prevalence is 17.3 percent, whereas for those with 7–12 years of schooling it is 11.9 percent. As for age groups, a slightly higher prevalence of smoking corresponds to adults aged 45 to 54 (17.2 percent), followed by those between 55 and 64 years old (16.7 percent), and adults between 35 and 44 years of age (16.5 percent). Variations in prevalence are also observed by labor status. For unemployed adults, the prevalence ratio is 29.7 percent, while it is 18.8 percent for employed adults and 6.2 percent for labor-inactive adults.[9]

Table 2. Descriptive statistics of tobacco smokers at an individual level (2011)

	Total population	Smokers	Prevalence (%)
n (Sample)	2,538	310	12.2
N (Population)	4,204,845	612,570	14.6
	Gender (%)		Gender (%)
Men	50.6	79.2	22.8
Women	49.4	20.8	6.1
	Type of residence (%)		Type of residence (%)
Urban	60.3	58.7	14.2
Rural	39.7	41.3	15.2
	Years of education (%)		Years of education (%)
None	1.4	1.0	10.6
1-6	40.0	47.7	17.3
7-12	39.8	32.6	11.9
13 and more	18.8	18.7	14.5
	Age range (%)		Age range (%)
15-24	24.2	20.4	12.3
25-34	21.8	18.4	12.3
35-44	17.6	20.0	16.5
45-54	14.9	17.5	17.2

9 Labor-inactive adults are those who are not actively participating in the labor market.

	Total population	Smokers	Prevalence (%)
55-64	12.6	14.5	16.7
65-74	9.0	9.3	15.1
	Labor status (%)		Labor status (%)
Employed	60.1	77.6	18.8
Unemployed	3.4	6.8	29.7
Inactive	36.5	15.6	6.2

Source: Authors' calculations using data from the NSRF, 2011

4.1.3. Tobacco consumption among households

Data from the National Survey on Income and Expenditures (EIG&CV) 2011/2012 show that 70 percent of smoking household heads are men. Guarani is the predominant language among tobacco smokers who are heads of households (52 percent), while 25.5 percent of them are bilingual (Guarani and Spanish), and 25.2 percent speak only Spanish. In terms of education, more than 60 percent of smoking heads of household have 6 or fewer years of education, 29.8 percent have between 7 and 12 years of education, and 9.3 percent have 13 or more years of education. Regarding labor status, 84.8 percent of smoking household heads are employed, and 13.3 percent are labor inactive.

Table 3. Descriptive statistics of households of tobacco smokers (2011/2012)

Variables		Total households (%)	Tobacco-smoking households (%)
Type of residence	Urban	61.2	57.0
	Rural	38.8	43.0
Gender of household head	Women	34.5	29.9
	Men	65.5	70.1
Language of household head	Guarani	42.1	52.0
	Guarani and Spanish	32.5	25.5
	Spanish	22.3	20.3
	Others	3.0	2.2
Years of education	None	3.1	5.3
	1-6	47.5	55.6
	7-12	35.1	29.8
	13 and more	14.4	9.3

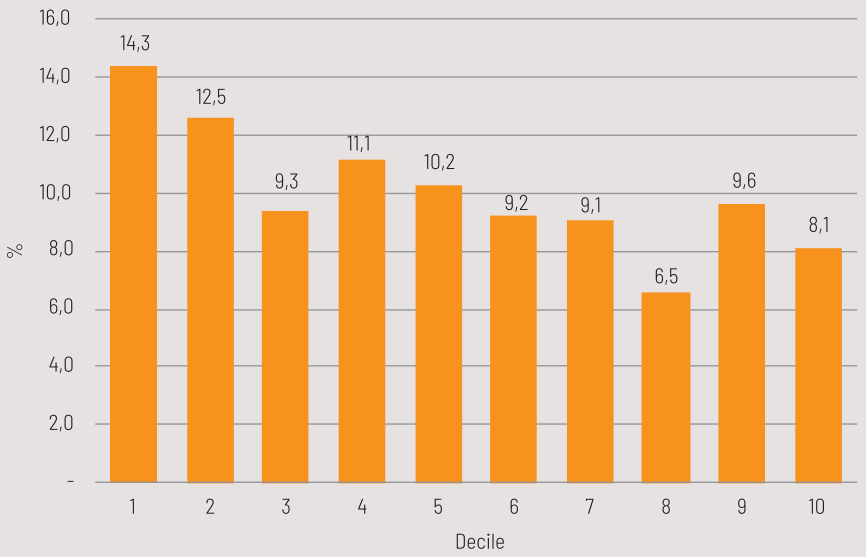
Variables		Total households (%)	Tobacco-smoking households (%)
Labor status of household head	Employed	83.3	84.8
	Unemployed	1.4	1.9
	Inactive	15.2	13.3
	No response	0.1	0.1
Economic activity of household head	Agriculture, livestock, and other primary activities	24.2	29.3
	Manufacturing	10.9	9.0
	Electricity, gas, and water	0.7	0.3
	Construction	8.0	14.6
	Commerce, restaurants, hotels	26.6	21.8
	Transportation, storage, and communications	4.4	4.8
	Finance, insurance, and real estate	4.8	4.6
	Personal, social, and community services	20.3	15.5
	No response	0.1	0.1
N	Sample	5,430	960
	Population	1,684,450	303,133

Source: Authors' calculations using data from the National Survey of Income and Expenditures 2011/2012 (EIGyCV)

On average, in 2011/2012 tobacco smokers had fewer years of education than non-smokers (6.4 years and 7.4 years, respectively). According to the EIG&CV, tobacco consumption by households reached an average of 294 cigarette sticks per month, and 1.9 percent of total expenses of households were devoted to tobacco consumption (Annex 1).

Figure 2 shows the distribution of tobacco-smoking households by income group (deciles). A higher number of smoking households are in the lowest income deciles: 47 percent of tobacco smokers are concentrated in the first four income deciles. Income levels of households become particularly relevant when studying the effects of changes in fiscal policies on tobacco consumers' behavior.

Figure 2.
Distribution of smoking households by income decile (%)

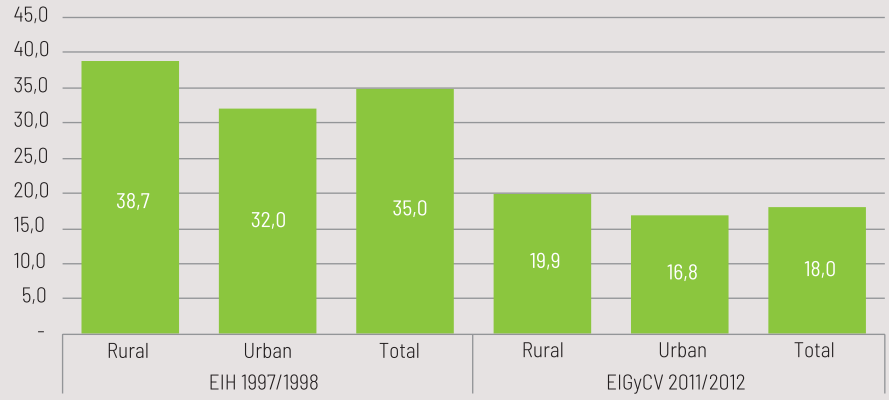


Source: Authors' calculations using data from the National Survey of Income and Expenditures 2011/2012 (EIGyCV)

In Latin America, household surveys that collect data on income are implemented very frequently, while surveys on household expenditures are scarce and conducted at irregular intervals (CEPAL, 2019). In the case of Paraguay, household surveys that collect income data are performed quarterly, but expenditure surveys are limited. The last household expenditure survey was performed in 2011. In order to observe changes in tobacco consumption patterns by households, data collected for the 2011/2012 Survey of Income and Expenditures (EIG&CV) could only be compared to data collected for the Household Integrated Survey (EIH) 1997/1998.

Information from both surveys shows an important reduction of tobacco-smoking households, from 35 percent in 1997/1998 to 18 percent in 2011/2012. Both surveys also show that tobacco consumption is higher in rural households than in urban ones. Data captured by both surveys are representative of the entire country and comparable for the same time period. Despite solid conclusions on the decreasing trend of tobacco-smoking households, it is not possible to obtain accurate estimates of the reduction in the number of tobacco-smoking households due to the differing survey methodologies.

Figure 3.
Evolution of tobacco consumption by households (%)

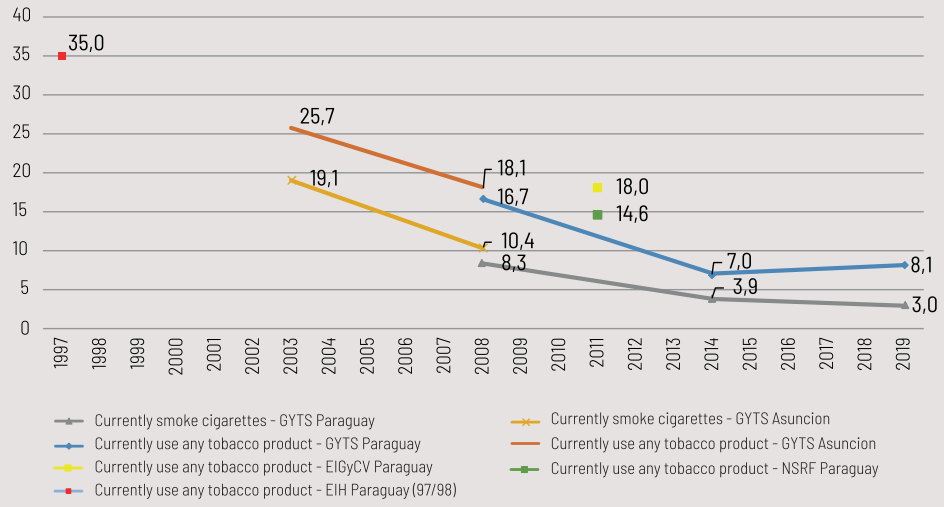


Source: Authors' calculations using data from EIG&CV 2011/2012 and EIH 1997/1998

4.2. Results of the estimation of demand for cigarettes

The following figure offers a summary of all available information on tobacco consumption in Paraguay from different surveys conducted over the last two decades. Although different methodologies were used for each survey, the outcomes all show a general trend of reduction in the consumption of tobacco products in Paraguay.

Figure 4.
Evolution of tobacco consumption according to available information, 1997–2019 (%)



Source: Authors' calculations using consumption data reported by surveys (EIH, 1997-1998; EIG&CV 2011; GYTS 2003-2019; and NSFR 2011)

National surveys collecting information on tobacco consumption provide very little evidence on the number of cigarettes consumed in Paraguay. Previous estimates of local cigarette consumption are also scarce. Ramos (2009) estimated local consumption to be three billion cigarettes (equivalent to 150 million cigarette packs) in 2006, but without clearly stating the methodology used for this estimation. On the other hand, Ng et al. (2014) made estimations for 187 countries (including Paraguay) from 1980 to 2012. These estimations are based on models using data from all countries. In the case of Paraguay, they used information available for 2003, 2008, and 2011. They estimated local consumption in 2012 to be a total of 221 million cigarette packs.

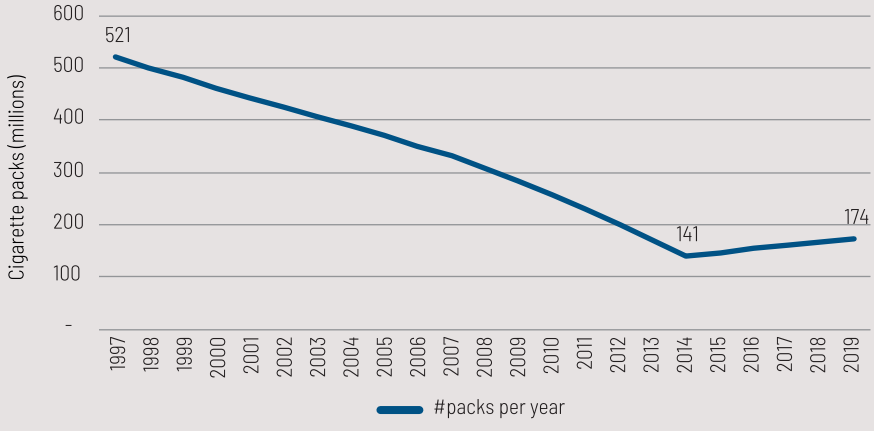
This research estimates the annual quantity of cigarettes consumed in Paraguay, based on available information on prevalence of consumption provided by each survey on the use of tobacco products, annual total population of the country, and annual per capita consumption of cigarettes.

As this estimation is based on a combination of data from Asuncion and the entire country as well as from a combination of data on tobacco consumption prevalence in both youth and adult populations, it faces limitations since the data were all collected from different sources. The ENFR provides data on the prevalence or percentage of the population that consumes tobacco products (cigarettes, roll tobacco, pipes and cigars), collected at the individual level within each surveyed household. While the GYTS is applied to young people from 13 to 15 years of age who attend schools. It is representative at the national level and makes it possible to identify prevalence of young people who consume a tobacco product and those who consume cigarettes. On the other hand, the EIGyCV and EIH surveys capture information at the household level according to declared expenditures. The EIGyCV provides data on the percentage of households that consume cigarettes and cigars, while the EIH identifies the percentage of households that declare consumption of tobacco products in general (cigarettes, cigars and others). Nevertheless, this estimation gathers all available data on tobacco consumption and demonstrates the trend of cigarette consumption in the domestic market.

Consequently, this estimation of tobacco consumption shows a significant contraction of the quantity demanded in the domestic market between 1997 and 2019. This trend was constant until 2014 when consumption began a steady but slower growth, reaching 174 million cigarette packs in 2019.[10]

10 Each pack contains 20 units of cigarettes.

Figure 5.
Estimation of domestic cigarette consumption (1997–2019)



Source: Authors' calculations using data from different surveys (EIH, 1997-1998; EIG&CV 2011; GYTS 2003-2019; and NSFR 2011)

4.3. Estimation of price elasticity of tobacco consumption

4.3.1. Methodology

Demand for tobacco products in Paraguay is estimated using the methodology developed by Deaton (1987). This methodology estimates a system of demand equations that include price and cross-price elasticities. It handles the spatial variation of prices through the use of unit values of goods and the location of households in order to set aside effects of measurement errors on variations in prices. This methodological application to data collected in Paraguay is performed following the adaptations made by John et al. (2019), based on Deaton (1988) and Muellbauer (1980), who developed the conceptual framework of the model, including a practical application that goes along with the analysis.

For this estimation, EIG&CV (2011/2012) data are used. In this survey two tobacco products are identified: cigarettes and cigars. Descriptive statistics on these two products are shown below:

Table 4. Households of tobacco consumers (sample data)

Item	Frequency	Frequency (%)	Accumulated frequency (%)
Cigarettes	869	90.52	90.52
Cigars	91	9.48	100.00
Total	960	100.00	

Source: Authors' calculations using data from EIG&CV 2011/2012

As more than 90 percent of households report smoking cigarettes (EIGV&CV 2011/2012) and 98.7 percent of all smokers in Paraguay are cigarette smokers (NSRF 2011), this study uses "tobacco products" and "cigarettes" interchangeably.

The first attempt was to estimate a general elasticity. However, the quality of available data was insufficient to obtain reliable and statistically significant estimates for the quantification of price elasticity for the total of households. Estimations of price and expenditure elasticities are performed only for those households with tobacco consumers (cigarettes and other tobacco products). The results of these estimations correspond to conditional demand of tobacco consumption, and they are reliable and statistically significant. In other words, outcomes refer only to current tobacco consumers. In this model of demand, the variables used are the ones suggested by Deaton (2018) that are included in John et al. (2019). Descriptions of the variables used are shown below.

Table 5. Variables in the model

luvcig	*Logarithm of the unit value of cigarettes (expenditure in cigarettes/quantity of consumed cigarettes)*
Lexp	*Logarithm of total household expenditures*
lhsize	*Logarithm of household size*
maleratio	*Percentage of men in households*
meanedu	*Average years of education in households*
Leng	*Dummy of language of household heads (1=Guaraní)*

Source: Authors' own work

The Sampling Primary Unit (SPU) is used as proxy for a cluster. SPUs are segments defined from a selected quantity of households: 30 households on average for urban areas and 35 for rural areas. The survey geographical division is identified through the variable *samplingstratus* that comprises only thirteen segments and, thus, is discarded as a cluster variable for the model. Although there are 536 SPUs within 960 tobacco-consuming households, the model works only with a limited quantity of households in each cluster. The explanation for this drawback is discussed by John et al. (2019), where the decision is made to eliminate clusters with less than two tobacco-consuming households, which reduces the number of clusters available for the analysis to 128.

The analysis of variance reinforces the identification assumption. The F statistic with a high value and the R-square of 0.9644 indicate that 97 percent of variation in unit prices is explained by the effects between the clusters considered (Annex 4). Although the number of households per cluster is small, the consistency of the model parameters depends on the number of clusters and not on the number of households per cluster.

Results of regressions between the unit value of tobacco products and the share of tobacco spending in total expenditures are shown in Annex 3: an R-square with a high value suggests that, as a group, independent variables adequately explain the performance of the dependent variables in the model.

4.3.2. Estimated results

The cigarette price elasticity of -0.969 suggests that a ten percent increase in the price of tobacco products reduces the quantity consumed by 9.69 percent. While other countries in the region – with per capita income levels higher than Paraguay – show lower values that are between -0.4 and -0.5 (Guindon et al., 2018), the estimated price elasticity is within the range that empirical evidence shows for low- and middle-income countries. Adopting the same methodology and using data from household surveys, countries such as Pakistan (Nayab et al., 2018) and Bangladesh (Ahmed et al., 2019) reveal price elasticity coefficients of -1.06 and -1.03, respectively. In South America, Ecuador (Chávez, 2016) presents a price elasticity coefficient of -0.87.

This observed price elasticity can be explained by a concentration of tobacco consumers among the lowest income deciles. Lower-income consumers are more prone to changes in the quantity of demand for tobacco products in response to price changes.

On the other hand, the expenditure elasticity of demand is 0.759, which is statistically significant at ten percent. Thus, considering that total expenditure reported by households is used as a proxy for income, it can be stated that an increase of ten percent in income generates a 7.59 percent increase in demand for tobacco products.

These results lead to important conclusions. A negative price elasticity of demand, as in the case of Paraguay, leads to the conclusion that increases in cigarette prices reduce tobacco consumption. In addition, the empirical evidence supports the notion that revenues will increase as a result of increased excise taxes on tobacco products.

5/

Manufacture and Supply of Tobacco Products in Paraguay

This section provides an evaluation of the supply of tobacco products, specifically manufactured cigarettes. Previous studies indicate that Paraguay has experienced a significant growth in manufacturing tobacco (Gomis et al., 2018; Iglesias et al., 2018; Ribeiro & Pinto, 2019), but these claims have not always been supported by data. This is because official records on cigarette production are limited, access to statistical data is difficult, and some of these data may not even exist.

5.1. Methodology for estimating supply of cigarettes

To estimate production of cigarettes, two methodologies are used based on available information on cigarette inputs. Method 1 uses available data on artificial cables or filaments for cigarette filters. This technique was previously used by Iglesias et al. (2018) for an analysis of the illegal movement of cigarettes between Argentina, Brazil, and Paraguay. Method 2 uses available information on unmanufactured or raw tobacco, both imported and domestically produced. This technique was previously applied by Gomis et al. (2018), in an evaluation of the role of *Tabacalera del Este S.A.* (a national manufacturing company) within the international trade of cigarettes, and by Ribeiro and Pinto (2019) for an analysis of trading cigarettes with Brazil. Once the series are estimated for production of cigarettes, they are compared with the total cigarette sales reported by the tax authority (*Subsecretaria de Estado de Tributación* or SET) as well as with domestic consumption calculated from survey data. Both methods are described in further detail below.

5.1.1. Method 1: Estimation of cigarette production from cigarette filter materials

Filters are an essential part of manufactured cigarettes. Filters are manufactured from cellulose cables, filaments, or simply acetate. A review of imports of materials used to manufacture filters therefore provides evidence on the production of cigarettes.

Studies such as one performed by the Law Enforcement Alliance of America (2014), indicate that 0.000125 kilograms of artificial filaments are needed to produce one unit of a cigarette (stick). Applying this technical coefficient along with import data of filaments used in cigarette filters, it is possible to estimate the trend of cigarette production in Paraguay.

For this purpose, import data (volume) from the Central Bank of Paraguay (BCP) trade statistics database for the period from 1997 to 2019 are used. In order to identify filters, a four-digit tariff code (NCM 5502) is used. Exports are subtracted from these values (using the same tariff code) with the purpose of calculating net imports of filters. Then, this technical coefficient is applied to net imports in order to obtain the number of manufactured cigarettes.

Paper for cigarettes (NCM 4813) is also considered an important input for manufacturing tobacco. However, this input is not used in calculating domestic production of cigarettes because no explicit reference has been found in the literature about technical coefficients that would permit processing this input into final goods. Thus, calculations made in Method 1 are only based on filters for cigarettes as inputs. Nevertheless, comparison is made later between imports of filters (NCM 5502) and cigarette papers (NCM 4813) because it is useful to observe whether there is consistency of import data of both inputs over time.

This technique is not without limitations. For instance, insufficient sources of information are an important limitation to work on transformation coefficients. There is also a shortage of information on the accumulation of inventories and on losses within the manufacturing process. Likewise, import and export data show some inconsistencies for the first years of the sample, since there are no records for some inputs from the tobacco industry. Additionally, some errors could exist in the process of classifying goods.

Although mainly used in manufacturing cigarettes, items included in the four-digit tariff code (NCM 5502) are also inputs used in other manufacturing sectors like clothing and medical supplies. Data obtained from the Single Window of Imports (*Ventanilla Única de Importaciones*) of the Ministry of Industry and Commerce show that, on average, more than 98 percent of these items were imported by tobacco companies in Paraguay between 2012 and 2019. Therefore, this study assumes that all imports of the mentioned code are used in manufacturing cigarettes. Although this estimation will not provide the exact number of filters used in the production of cigarettes, it will establish the trend of domestic production of cigarettes.

5.1.2. Method 2: Estimation of cigarette production from the use of tobacco leaf

Estimation of cigarette production through unmanufactured tobacco (also known as non-processed tobacco or raw tobacco) is more direct than the first method since tobacco leaf is (almost) exclusively used for the production of cigarettes. Following Ramos (2009) and Iglesias (2012), data are used from official sources for the 1995–2019 period. The purpose is to estimate the supply of cigarettes annually, applying transformation coefficients to domestic production and to imports of non-processed tobacco (raw material). Data from domestic production of raw materials (planting and harvesting) are obtained from the Ministry of Agriculture and Livestock (MAG), while import and export data are provided by the trade database of the Central Bank of Paraguay (BCP).

The first step is to combine domestic raw tobacco production and net imports (NCM 2401.10 and NCM 2401.20). This shows the total available supply of non-processed tobacco (kilograms) for tobacco manufacturing companies. As a second step, non-processed tobacco is converted into manufactured tobacco through coefficients of transformation. Following the methodology adopted by Ribeiro and

Pinto (2019) for the Brazilian case, a coefficient of 80 percent of non-processed tobacco is used for its transformation through curing, deveining and classification, mincing, flavoring, and other steps to obtain manufacturing conditions for cigarettes.

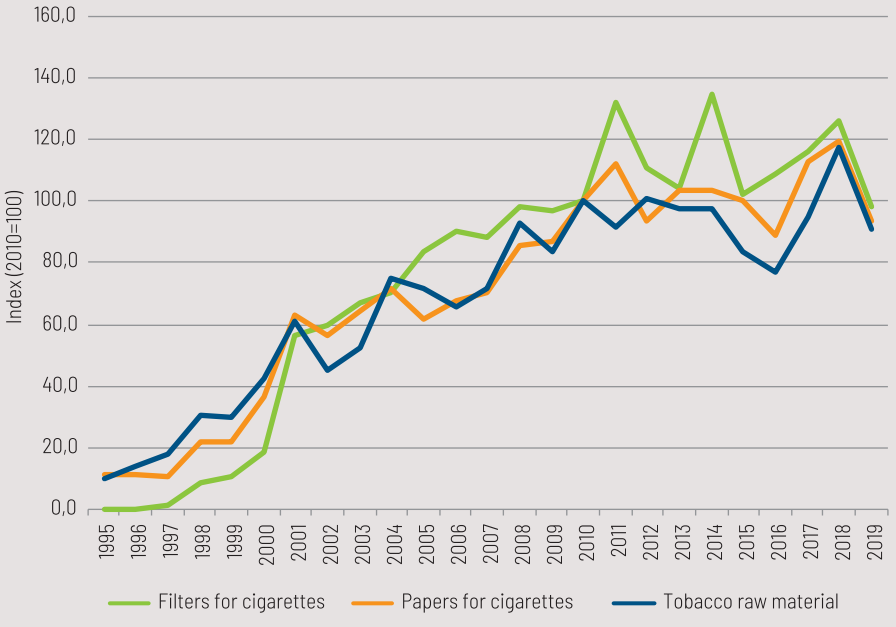
The estimated supply of tobacco for domestic production should be consolidated with imports net of exports (NCM 2403 and NCM 2401.30). Once the estimated supply of raw material is obtained, the next step is to infer a series of estimated production of cigarettes by applying another coefficient. Following Ribeiro and Pinto (2019) and OCDE Health Statistics (2019), a technical coefficient of 0.7 percent is applied to transform semi-processed tobacco into units of cigarettes. The total estimated supply results from the calculation of domestic cigarette production adding total imports, net of total (legal) exports of cigarettes (NCM 2402.20: cigarettes with tobacco content).

This methodology also has limitations. There are insufficient sources of information to work on transformation coefficients, as well as errors in records of agricultural production and the trade of tobacco products. Thus, important assumptions are made on the accumulation of inventories as well as on transformation coefficients that are regarded as constants for all types of tobacco and for every year of the sample.

5.2. Results of estimating cigarettes supply

The data show coherence in the evolution of net imports of filters and non-processed tobacco used for calculating domestic production of cigarettes. In Figure 6 a comparison is observed between net imports of filters and non-processed tobacco with net imports of papers (NCM 4813). Although this last item is not considered for calculating domestic production of cigarettes, data on its net import shows a similar trend with the evolution of net imports of filters and non-processed tobacco. After a period of moderate growth (1995–1999), there is a jump in net imports of the three inputs by the year 2000, and from that year on there has been a positive trend despite fluctuations at several points in the analyzed period. This trend implies that cigarette production has strongly increased in Paraguay over the last 20 years.

Figure 6.
Evolution of net imports of raw materials and inputs for manufacturing tobacco (volume)



Source: Authors' calculations using data from BCP
Note: The tariff code for filters for cigarettes is NCM 5502. The tariff code for cigarette paper is NCM 4813; and tobacco as raw material corresponds to the following tariff codes: NCM 2401.10, NCM 2401.20, NCM 2401.30, NCM 2403.

The information gathered on inputs for cigarette production (filters and non-processed tobacco), combined with transformation coefficients, can be used to estimate the volume of packs of cigarettes produced in Paraguay. Figure 7, below, illustrates the following trends in estimated production along with registered imports and exports of cigarette packs in Paraguay, in millions of packs:

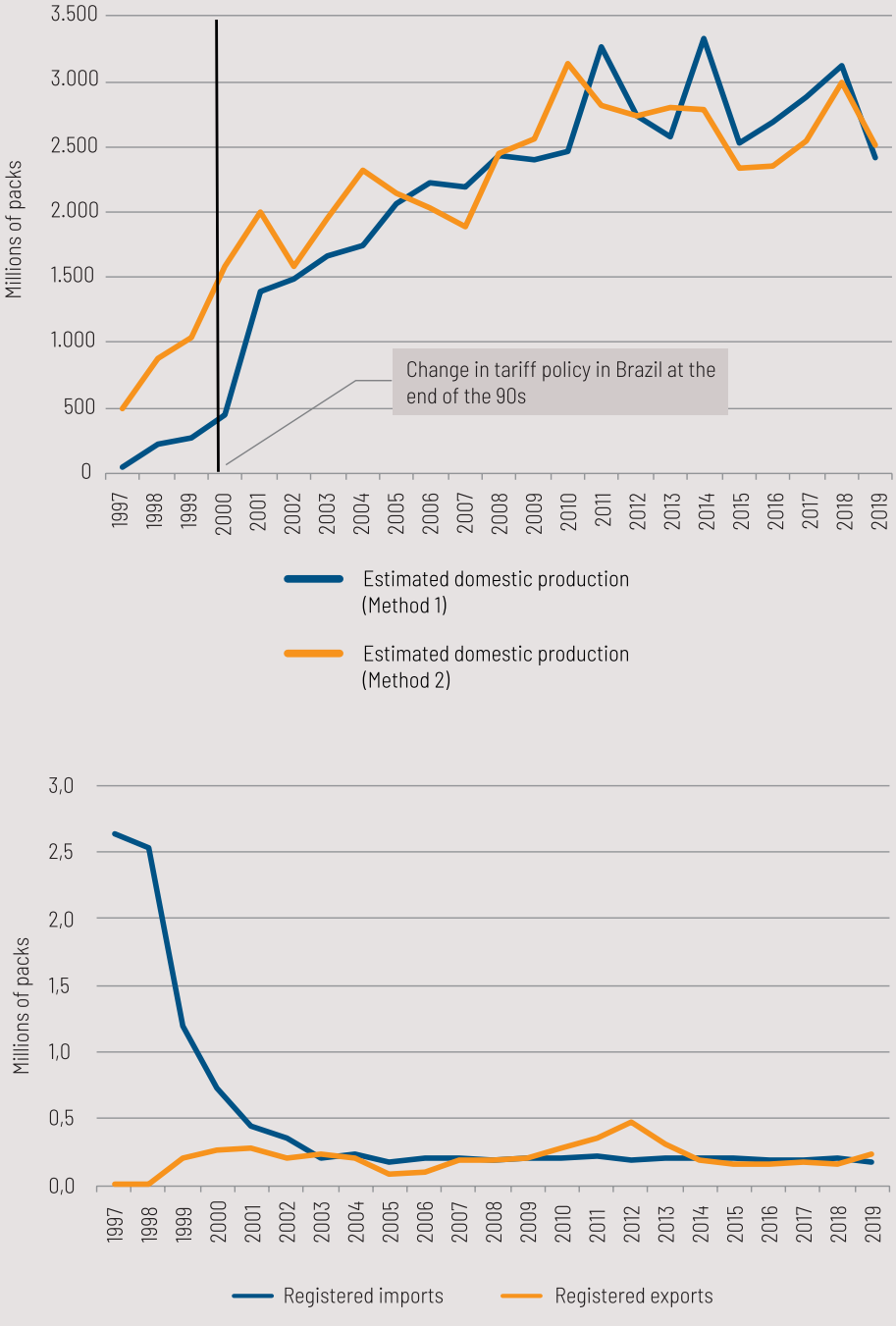
i. accelerated growth in domestic cigarette production;

ii. a steep drop in cigarette imports; and

iii. a relatively unchanged trend in registered cigarette exports.

Consequently, the volume of the estimated supply of cigarette packs, for domestic consumption and other uses, increased significantly over the last decades. More specifically, the domestic production of cigarette packs increased fivefold between 1997 and 2019.

Figure 7.
Estimated production and registered imports and exports of cigarette packs in Paraguay (millions of packs)



Source: Authors' calculations using data from BCP
Note: Calculations on production are made using the methods of technical coefficients. Imports and exports of cigarette packs correspond to tariff code NCM 2402.20 and NCM 2403.

These results are in agreement with findings from other studies on tobacco production and trade in Paraguay (Iglesias et al., 2018; Gomis et al., 2018; Ribeiro & Pinto, 2019). Accelerated growth in domestic cigarette production has been consistent with a steep drop in cigarette imports. Exports, however, have not increased in the same proportion as domestic production, according to official figures, suggesting that a substantial portion of them could have been channeled illegally to other countries. Thus, conditions and strategies that positioned Paraguay in the cigarette transit or triangulation scheme in the region were later adequate to turn it into a production and export center (Pan American Health Organization, 2002; Iglesias et al., 2018).

In summary, this significant increase in domestic production of cigarettes was accompanied by an abrupt decrease of imports but without a corresponding increase in registered exports that would be consistent with the added available volume of cigarette packs.[11] Thus, the estimated total supply of cigarettes has followed a growing trend with a high potential to supply the domestic market as well as other markets in the region. This estimated increase of supply of cigarettes has been sustained over the years despite tax adjustments and public regulations to discourage smoking in the Paraguayan domestic market.

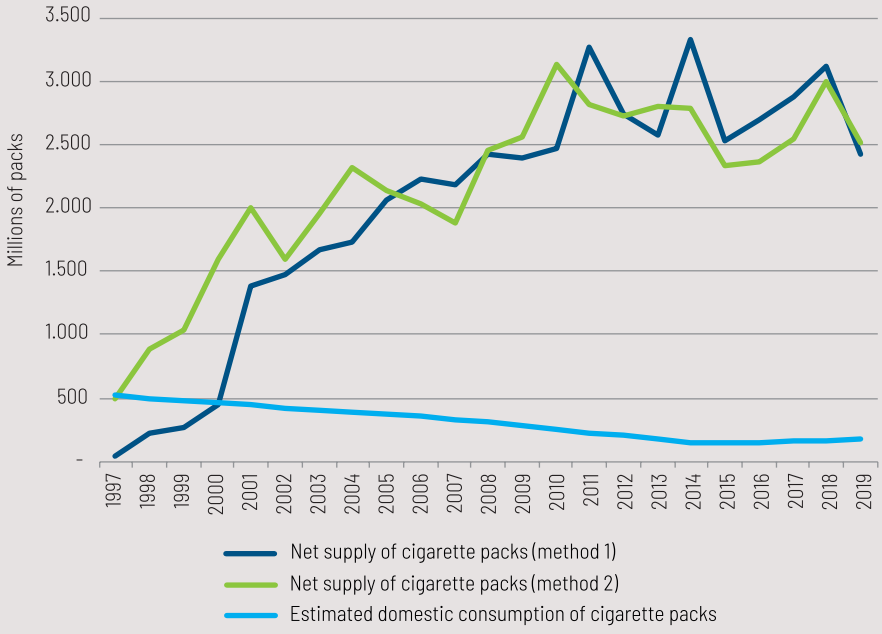
5.2.1. Gap between domestic consumption and estimated supply

The estimation of cigarette production in Paraguay shows a consistent and significant increase. Figure 8 shows coherence in the levels and evolution of the estimates of the net supply of cigarette packs (estimated production plus imports of cigarettes minus exports of cigarettes) using both Method 1 (technical coefficients on filters) and Method 2 (technical coefficients on unprocessed tobacco).

The gap observed between these estimates and domestic consumption is approximately seven times larger and leads to the assumption that a very high volume surplus of cigarettes is being produced in Paraguay to be potentially exported legally and illegally to other markets.

11 According to official data on registered exports

Figure 8.
Comparing net supply of cigarette packs with estimated domestic tobacco consumption



Source: Authors' calculations using data from the BCP, National Customs (DNA) and surveys on tobacco consumption.
Note: Data are in millions of cigarette packs (20 units each).

6/ Discussion

A significant decrease in domestic consumption of cigarettes in Paraguay is observed over the last decade. Tax rate increases over the last 15 years, as well as the implementation of other tobacco control policies, could have been effective in reducing domestic consumption of cigarettes. However, accurate estimations of domestic consumption of tobacco products faces limitations due to limited available information. Also, because of the low frequency of implementing expenditure surveys (EIGyCV) and of the ENFR. The first one measures consumption of tobacco products in households. The second one identifies prevalence in the consumption of tobacco products at individual level.

The price elasticity of demand calculated in this research – the first available estimation for Paraguay – provides a value of -0.969. This indicates that a price adjustment of around ten percent (through an increase of the excise tax, for instance), would lead to a reduction in the quantity consumed or demanded (cigarettes and other tobacco products) by 9.69 percent. That is, assuming this tax increase is fully transferred to prices and fully absorbed by consumers, this tax adjustment would generate, all else remaining constant, a reduction close to 337.2 million cigarettes consumed from an estimated domestic consumption of 3.48 billion cigarettes in 2019.

Paraguay appears to have a large excess potential for supplying cigarettes to Brazil and other countries. Furthermore, cigarette affordability in Paraguay could contribute to a significant volume of illicit trade to different destinations and especially to neighboring countries where taxes and prices are higher. This has motivated growing claims in favor of greater controls and a tightening of production conditions in Paraguay. Public opinion is also in favor of further tax increases to fund public health and address the high costs of treating tobacco-related diseases (Bardach et al., 2016).

Table 6 shows that, in 2008 total domestic consumption of cigarette packs were 310 million, while estimates of the net supply of cigarette packs were around 2.429 to 2.447 billion. By 2019 the estimated difference between domestic consumption and the net supply of cigarettes was even larger. Domestic consumption amount to 174 million cigarette packs and estimations of net supply of packs indicate 2.419 to 2.510 billion packs. Thus, the estimated excess of supply of cigarette packs between 2008 and 2019 reached, annually, around 2.5 billion packs on average.

Table 6. Comparing estimated net supply and estimated domestic consumption (millions of packs)

Year	Estimated supply method 1	Estimated supply method 2	Estimated consumption	Supply-consumption method 1	Supply-consumption method 2
2008	2.429	2.447	310	**2.119**	**2.138**
2009	2.395	2.558	283	**2.112**	**2.274**
2010	2.470	3.131	257	**2.214**	**2.875**
2011	3.265	2.820	229	**3.036**	**2.592**
2012	2.743	2.729	200	**2.543**	**2.529**
2013	2.573	2.797	171	**2.402**	**2.626**
2014	3.324	2.783	141	**3.183**	**2.642**
2015	2.521	2.337	147	**2.374**	**2.190**
2016	2.689	2.356	154	**2.535**	**2.203**
2017	2.876	2.548	160	**2.715**	**2.388**
2018	3.118	2.988	167	**2.951**	**2.821**
2019	2.419	2.510	174	**2.245**	**2.336**
Avg.	**2.735**	**2.667**	**199**	**2.536**	**2.468**

Source: Authors' calculations using data from BCP
Note: Cigarette packs have 20 units each.

7/

Conclusions and Policy Recommendations

The tobacco market has been an important part of public debate in Paraguay over the last few decades, both in anecdotal and academic terms. It has been argued that sustained growth in tobacco production has generated persistent problems in Paraguay, not only in terms of public health and tax collection but also in terms of border traffic control, corruption, and institutional weakness.

The purpose of this study is to contribute to the discussion regarding the tobacco industry in Paraguay with new evidence on the effects of price increases on tobacco consumption and on the net supply of cigarettes. It also helps to understand the evolution of these variables and their relations to tax collection and international trade using data from different sources.

This study provides estimations of the effects of price increases on consumption of tobacco in Paraguay. Results indicate that by increasing the price of tobacco products by ten percent, consumption of these products decreases by 9.7 percent. Previous evidence on these effects is absent in the literature on Paraguay, and it is expected that these results will lay the foundation for future estimates of the effects that fiscal policies have on tobacco consumption in the country.

During the 1990s, growth of cigarette production in Paraguay was moderate. The most notable increase was observed beginning in the early 2000s and has been consolidating ever since. In order to sustain this potential growth of cigarette production, domestic manufacturing increased imports of key inputs such as cigarette filters, papers, and tobacco raw materials. Analyzing data on this significant increase in imports, the total net supply of cigarettes in Paraguay is estimated, for the 2008–2019 period, to be around 2.7 billion cigarette packs annually, on average.

However, the total domestic consumption of cigarettes estimated to have been near 199 million packs annually, on average. The annual gap between net supply and domestic consumption of 2.5 billion cigarette packs suggests significant illicit exports to international markets. An emerging research from Brazil demonstrates that most of these packs currently end up in the Brazilian illicit market (Szklo et al., 2020).

For Paraguay, the lack of data on cigarette consumption and production results in serious challenges for public health and economics as well as foreign affairs. More control along the tobacco supply chain and official and independent data is needed to implement informed policies to reduce tobacco consumption and illicit flows.

Data availability. Absence of data on consumption and on production of cigarettes is one of the principal obstacles for a complete analysis of the tobacco industry in Paraguay as well as for developing recommendations oriented towards solving the global and regional conflicts caused by the illicit trade of tobacco products. Data availability on consumption and production are not only a priority for local decision-making on tobacco policies but also for regional and international dialogue within MERCOSUR and the WHO Framework Convention on Tobacco Control (FCTC).

Taxing consumption. Cigarette consumption is decreasing in Paraguay. However, the Paraguayan government should take a more active role implementing effective tobacco control policies. Taxing tobacco is the most effective public policy to reduce tobacco consumption, yet Paraguay's taxes on tobacco are among the lowest in the region and the world. Increasing prices of tobacco through taxes reduces consumption of cigarettes and provides additional resources to strengthen the tobacco tax administrators' capacity to monitor tobacco production.

Regulation and monitoring of tobacco productive chains. As a signatory of the FCTC, Paraguay has followed its guidelines in enacting laws on commercialization and promotion of tobacco products. One of them (2015) establishes a system of traceability of tobacco products (SITRATAP) that requires local tobacco companies to report on imports of raw materials and inputs for manufacturing cigarettes. The other one (2018) includes measures to control the supply chain of tobacco products in order to combat illicit trade, tax evasion, and counterfeiting. To date a lack of regulations stemming from these laws prevents their enforcement.

Public efforts must be directed towards stricter regulation and monitoring of the tobacco industry. To comply with the mentioned laws, it is important to have political willingness to enforce them and hence implement all measures needed for monitoring tobacco operations in Paraguay. Additionally, Paraguay has yet to ratify the Protocol to Eliminate Illicit Trade of Tobacco Product, as a vital companion treaty to the FCTC.

To reduce illicit flows, Paraguay and neighboring countries need to coordinate regulations, in particular tobacco control policies. Paraguay and bordering countries need to implement coordinated measures for stricter regulation and monitoring of the transborder tobacco markets. MERCOSUR and the FCTC provide an appropriate framework for coordination at regional level.

The following policy actions are recommended:

1. Paraguay must generate official and independent data on consumption and on production of cigarettes.
2. Increase taxes on tobacco. Introducing higher cigarette taxes will decrease cigarette consumption and increase revenue collection.
3. Strengthen tobacco tax administration. Good tax administration requires strong technical capacity by the administrative agency. Compliance can be strengthened by adopting independent tracking and tracing systems combined with enforcement. Investing in good administration pays off higher income.

4. The government should retool policies that better enforce the regulation of the tobacco industry. Tobacco tax administrators' capacity to monitor tobacco production should be strengthened, along with coordination between tax authorities from neighboring countries. Regional and global cooperation is key to reducing illicit trade.

References

Ahmed, N., Hossain, J., Huque, R., Hassan, M. T., & Mozumder, T. A. (2019). *The economics of tobacco taxation in Bangladesh.* Brac Institute of Governance and Development (BIGD). Brac University. https://tobacconomics.org/wp-content/uploads/2019/10/BIGD_Research-Report_Final.pdf

Bardach, A., Palacios, A., Caporale, J., Alcaraz, A., Rodríguez, B., Sequera, V. G., Cañete, F., Augustovski, F., & Pichon-Riviere, A. (2016). *Carga de enfermedad atribuible al uso del tabaco en Paraguay y potencial impacto del aumento del precio a través de impuestos*. Documento técnico IECS N° 18. Instituto de Efectividad Clínica y Sanitaria, Buenos Aires, Argentina. www.iecs.org.ar/tabaco

Benitez, G., & Masi, F. (2018). Sistematización y descripción de las modificaciones a Tributos en Debate Público. En: *Fiscalidad para la Equidad Social*. Asunción, DECIDAMOS-CADEP-CONACYT.

Chávez, R. (2016). Elasticidad precio de la demanda de cigarrillos y alcohol en Ecuador con datos de hogares. *Revista Panamericana de Salud Pública Ecuador*, *40*(4):222–8.

Chaloupka, F., Straif, K., & Leon, M. E. (2011). *Effectiveness of tax and price policies in tobacco control.* Tobacco Control Working Group, International Agency for Research on Cancer.

Comisión Económica para América Latina y el Caribe (CEPAL). (2019). *Panorama Fiscal de América Latina y el Caribe* (LC/PUB.2019/8-P). Santiago, Chile.

Comisión Económica para América Latina y el Caribe (CEPAL). (2019). *Diagnóstico sobre el estado de las Encuestas de Gastos e Ingresos en América Latina y el Caribe*. Santiago, Chile.

Deaton, A. (1987). Estimation of own- and cross-price elasticities from household survey data. *Journal of Econometrics, 36*(1-2), 7-30.

Deaton, A. (1988). Quality, quantity, and spatial variation of price. *American Economic Review, 78*(3): 418-430.

Deaton, A. (2018). *The Analysis of Household Surveys: A microeconometric approach to development policy.* Reissue edition with a new preface. Washington, DC: World Bank. doi:10.1596/ 978-1-4648-1331-3

Deaton, A., & Muellbauer, J. (1980). An almost ideal demand system. *American Economic Review, 70*(3), 312-326. www.jstor.org/stable/1805222

Dirección General de Estadísticas, Encuestas y Censos (DGEEC). (). Encuesta de Ingresos y Gastos y de Condiciones de Vida (EIGyCV) 2011-2012. https://www.dgeec.gov.py/microdatos/microdatos.php#collapse-8

Gomis, B., Lee, K., Carrillo Botero, N., Shepherd, P., & Iglesias, R. (2018). We think globally: The rise of Paraguay´s Tabacalera del Este as a threat to global tobacco control. *Globalization and Health*. https://doi.org/10.1186/s12992-018-0412-3.

Greenhalgh, E., Scollo, M., & Winstanley, M. H. (2020). *Tobacco in Australia: Facts and issues.* Melbourne: Cancer Council Victoria. www.TobaccoInAustralia.org.au

Guindon, G. E., Paraje, G. R., & Chaloupka, F. J. (2018). The impact of prices and taxes on the use of tobacco products in Latin America and the Caribbean. *American Journal of Public Health, 108*(Suppl 6), S492–S502. https://doi.org/10.2105/AJPH.2014.302396r

Iglesias, R., Gomis, B., Carrillo Botero, N., Shepherd, P., & Lee, K. (2018). From transit hub to major supplier of illicit cigarettes to Argentina and Brazil: The changing role of domestic production and transnational tobacco companies in Paraguay between 1960 and 2003. *Globalization and Health*. https://doi.org/10.1186/s12992-018-0413-2

Instituto Nacional del Cáncer de los EE.UU. y Organización Mundial de la Salud. (2016). *Los aspectos económicos del tabaco y del control del tabaco*. Monografía 21 sobre el control del tabaco del Instituto Nacional del Cáncer. Publicación de los NIH nº. 16-CA-8029A.

Jha, P., & Chaloupka, F. (2000). *Tobacco control in developing countries*. Oxford University Press, Inc.

John, R., Chelwa, G., Vulovic, V., & Chaloupka, F. (2019). *Using household expenditure surveys for research in the economics of tobacco control.* A Tobacconomics Toolkit. Chicago, IL: Tobacconomics, Health Policy Center, Institute for Health Research and Policy, University of Illinois at Chicago.

Law Enforcement Alliance of America. (2014). *Controlling key inputs to starve illicit trade.* http://www.leaa.org

Ministerio de Salud Pública y Bienestar Social (MSPyBS). (2011). *Primera Encuesta Nacional de Factores de Riesgo de Enfermedades No Transmisibles.* http://portal.mspbs.gov.py/dvent/wp-content/uploads/2015/10/Encuesta-Nacional.pdf

Nayab, D., Nasir, M., Memon, J. A., Khalid, M., & Hussain, A. (2018). *Economics of tobacco taxation and consumption in Pakistan*. Institute of Development Economics. https://tobacconomics.org/wp-content/uploads/2019/01/Economics-of-Tobacco.pdf

Ng, M., Freeman, M. K., Fleming, T. D., Robinson, M., Dwyer-Lindgren, L., Thompson, B., Wollum, A., Sanman, E., Wulf, S., López, A. D., Murray, C. J. L., & Gakidou, E. (2014). Smoking prevalence and cigarette consumption in 187 countries, 1980-2012. *JAMA, 311*(2):183–192. doi:10.1001/jama.2013.284692

OECD. (2020). *Health statistics 2019: Definitions, sources and methods*. http://www.oecd.org/health/health-data.htm

Organización Mundial de la Salud (OMS). (2015). *Compendio de indicadores-convenio marco para el control del tabaco.* https://www.who.int/fctc/reporting/who_fctc_indicator_compendium_1st_edition_es.pdf?ua=1

PAHO. (2002). *Profits over people: Tobacco industry activities to market cigarettes and undermine public health in Latin America and the Caribbean*. Washington DC: PAHO. https://www.paho.org/English/DD/PUB/profits_over_people.pdf

Ramos, A. (2009). *Illegal trade in tobacco in MERCOSUR countries*. Centro de Investigación de la epidemia de tabaquismo (CIET). Montevideo, Uruguay.

Ranson, K., Jha, P., Chaloupka, F., Nguyen, S., & Mundial, B. (2000). Effectiveness and cost-effectiveness of price increases and other tobacco-control policies. In: P. Jha & F. J. Chaloupka (Eds.), *Tobacco control in developing countries* (pp. 427-447). Oxford University Press.

Ribeiro, L., & Pinto, V. (2019). *Accelerating effective tobacco taxes in Brazil: Trends and perspectives.* Country Study No. 3/2019. Country Studies Series Tobacco Taxes in Latin America. Red Sudamericana de Economía Aplicada/Red Sur.

Sunley, E. M., Yurekli, A. A., & Chaloupka, F. J. (2001). The design, administration, and potential revenue of tobacco excises. In: P. Jha & F. J. Chaloupka (Eds.), *Tobacco control in developing countries*. New York: Oxford University Press.

Szklo André , Roberto Iglesias, Michal Stoklosa, Valeska Carvalho Figueiredo, Kevin Welding, Paulo Roberto Borges de Souza Junior, Alessandra Trindade Machado, Luis Felipe Leite Martins, Hannah Nascimento, Jeffrey Drope. (2020). "Cross-validation of Four Different Survey Methods Used to Estimate Illicit Cigarette Consumption in Brazil". http://dx.doi.org/10.1136/tobaccocontrol-2020-056060

World Health Organization. (2010). *Technical Manual on Tobacco Tax Administration*. Geneva: WHO. http://www.who.int/tobacco/publications/tax_administration/en/

ANNEXES

Annex 1.
Descriptive statistics of tobacco-consuming households (2011–2012)

Variable	Total households				Tobacco-consuming households			
	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
hsize	3.9	2.1147	1	14	4.2	2.4951	1	14
meanedu	7.4	3.8392	0	44.3	6.4	3.5966	0	18
maxedu	10.8	5.9707	0	18	9.4	4.3917	0	18
maleratio	0.5	0.2576	0	1.0	0.6	0.2560	0	1
ipcm	1,464,929	4,069,329	0	256,000,000	1,529,226	7,884,842	0	256,000,000
qcig					294.1	268.5736	3	4,200
expcig					55,712	58310.73	998.5	481,396
uvcig					283.0	512.1466	31.2	8,685
exptotal					3,720,297	2,953,700	182,052	25,200,000
bscig					0.01915	0.0200	0.0002	0.1494
n				5,430				960
N				1,684,450				303,133

Note: qcig = quantity of cigarettes; expcig = expenditure on cigarettes; uvcig = unit value of cigarettes; exptotal = total expenditure; bscig = budget share devoted to cigarettes
Source: Authors' calculations using data from the EIGyCV 2011/2012

Annex 2.
Regression results for unit prices and budget share

Variables	(1) Unit values	(2) Budget share
lexp	-0.0192	-0.00544
	(0.0364)	(0.00574)
lhsize	0.000264	-0.00986**
	(0.0305)	(0.00481)
meanedu	0.00922	-0.00379***
	(0.00760)	(0.00120)
leng	0.0407	-0.000274
	(0.0584)	(0.00921)
maleratio	0.0367	0.00148
	(0.0663)	(0.0105)

Variables	(1) Unit values	(2) Budget share
Constant	4.990***	0.129*
	(0.479)	(0.0756)
Observations	110	110
R-squared	0.966	0.735

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Note: lexp = natural log of expenditure; lhsize = log of household size; meanedu = mean education of household in years; leng = language; maleratio = ratio of number of males to household size.
Source: Authors' calculations using data from the EIGyCV 2011/2012

Annex 3.
Price elasticities and tobacco consumption

Variables	(1) Expenditures	(2) Price
Expel	0.759*	
	(0.413)	
EP		-0.969**
		(0.448)
Observations	110	53

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
Source: Authors' calculations using data from EIGyCV 2011/2012

Annex 4.
Anova. Unit price variation test between clusters

Number of obs = 110 Root MSE = 0.096591			R-squared = 0.9644 Adj R-squared = 0.9319		
Source	Partial SS	df	MS	F	Prob>0
Model	14.409418	52	0.27710419	29.70	0.0000
Clust	14.409418	52	0.27710419	29.70	0.0000
Residual	0.53180287	57	0.00932987		
Total	14.409418	109	0.13707542		

Source: Authors' calculations using data from EIGyCV 2011/2012

Centro de Análisis y Difusión de la Economía Paraguaya

ISBN: 978-99925-244-2-8