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Sugar-sweetened Beverages and Pre-packaged Foods: the Impact of Taxation on Price, Consumption, and Revenues and its Contribution to Achieving the Sustainable Development Goals in Central America, Panama, and the Dominican Republic

PAHO Pan American Health Organization World Health Organization Americas

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Executive Summary

The growing prevalence of overweight and obesity among children and adolescents runs parallel with the manufacture, purchasing, and consumption of sugar-sweetened beverages and pre-packaged foods[1] in the sub-region of Central America, Panama, and the Dominican Republic.

The rise in the consumption of sugar-sweetened beverages per inhabitant in the region is in line with an increasing body mass index (BMI) and prevalence of overweight and obesity, both in children and adults. In Costa Rica, the consumption of sugary drinks per capita between 2003 and 2016 rose by 12.6 percent, or an average of 0.9 percent each year. In Guatemala, these increases accounted for 27.3 percent and 1.9 percent respectively. In the Dominican Republic, the growth rate was similar: 27.8 percent between 2013 and 2016 or 1.9 percent annually. In El Salvador, consumption per capita grew by 6.4 percent (an average annual rate of 2.1 percent), while in Honduras and Panama it grew by 3.7 percent and 4.1 percent respectively. The prevalence of overweight and obesity in adults (defined as a BMI over 25) grew substantially between 1975 and 2016 in all countries in the region. The country with the lowest prevalence of overweight and obesity, Honduras, went from just over 22 percent in 1975 to about 52 percent in 2016 (a 136 percent growth between peaks or an average annual growth rate of 2.2 percent). The highest growth in prevalence was in the Dominican Republic, which averaged 2.4 percent per year. In the same period, the overweight and obesity prevalence in children aged between 5 and 19 years old averaged 4.3 percent per year, which was even higher than among adults.

The World Bank, the Pan American Health Organization (PAHO), and the Institute of Nutrition of Central America and Panama (INCAP) supported by the Japan Trust Fund (JTF)[2] have conducted a study of the influence of prices, trade, and advertising on the consumption of sugar-sweetened beverages and pre-packaged foods with high calories and low nutritional value (ultra-processed products) in five Central American countries (Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua) as well as in Panama and the Dominican Republic. The study was conducted to examine whether trends in the consumption of these foods and beverages is affecting progress towards achieving the Sustainable Development Goals (SDGs). This document summarizes its findings regarding:

- **Consumption trends** and their adverse effects on human health in the region
- **Marketing, promotion, and advertising** and any strategies adopted by the industry to target children and adolescents
- **Drinking water**, its availability, coverage, and quality and its potential to be an alternative to sugar-sweetened beverages (see Annex 1).
- **The evolution of markets**, including the production, import, and export of pre-packaged foods and sugary drinks; legislation and regulation; trends in sugary drink marketing

[1] Throughout this document, pre-packaged foods are defined as those with high energy, fat, sugar, and/or salt content and low content of vitamins and minerals.
[2] The purpose of this fund is to generate information to inform public policymaking aimed at increasing the availability and consumption of healthy foods among vulnerable and low-income populations.

prices; sugar-sweetened beverage taxation; the structure of tariffs and domestic taxes; and relevant tax collection.

- **The fiscal impact of tax changes on sugar-sweetened beverages** in the sample countries, including models of tax increases on sugary drinks and their impact on prices, consumption, and revenue collection.

We estimated the price elasticity and revenue elasticity of demand (see methodology in Annex 2) as core modeling elements for simulating the impact of taxation increases on sugar-sweetened beverages, their effect on prices at the point of sale and on consumption, and their revenue projections for each country. Our findings are shown in the box below.

Table 1. Summary of the Price Elasticity of Sugar-sweetened Beverage Prices

Country	Estimation Method	Own price elasticity	Elasticity total expense
Costa Rica	AIDS per quality	-1,184	0,867
El Salvador	AIDS	-1,022	1,032
Honduras	QUAIDS	-1,404	1,039
Nicaragua	QUAIDS	-0,657	0,759
Panama	AIDS	-0,574	0,654
Dominican Republic	QUAIDS	-0,841	1,167
Average (unweighted)		-0,964	0,920

Note: AIDS: almost ideal demand system; QUAIDS: quadratic almost demand system.

These findings show that the demand for sugar-sweetened beverages behaves in accordance with international evidence for both developed and developing countries. The fact that the price elasticities of these beverages are negative would imply that a well-designed taxation policy could be effective in decreasing the consumption of these goods. On the other hand, the fact that the elasticities are close to or, in some cases, greater than 1 (absolute value) has two important implications. First, a price increase (caused by a tax rise) could proportionally or more than proportionally decrease their consumption, which is desirable from a public health perspective. Second, taxing these goods could make households willing to cut down their spending on these goods when the price goes up, that is, they would decrease their consumption of these products. In our analyses, we found that rural households or those with lower relative expenditures have higher price elasticities than wealthier ones, which provides further evidence that these taxes would not be regressive and may be most effective in reducing consumption among the poor (who are often the most vulnerable in terms of health). The health-related costs associated with the consumption of sugar-sweetened beverages, some of which are paid for from the public budget, together with the indirect costs (such as loss of human capital due to early death, loss of productivity, illness, and distress) constitute a typical case of negative externalities.

To assess the impact of taxing sugar-sweetened beverage on price, consumption, and tax revenues, we modeled multi-year simulations for the period 2018 to 2020 and assumed a staggered consumer price increase of 20 percent as recommended by the World Health Organization (WHO) (scenario 1) or a one-off 20 percent price increase (scenario 2). The price elasticity, income-elasticity, and pass-through assumptions resulting from this analysis served as the modeling foundation. The base year data covered 2016 and 2017, depending on what data were available from the countries' Ministries of Finance and Economic Development, and their

tax collection agencies, customs, and national tax statistics services. We also consulted the World Bank Group and International Monetary Fund databases (see Annex 3).

In both scenarios, we proposed increasing the tax on sugary drinks where available (as in Costa Rica, El Salvador, and Honduras) or implementing a new specific tax in addition to the existing ad valorem tax. In both cases, this would gradually increase the average price of a liter of sugar-sweetened beverages at the point of sale by up to 20 percent (as recommended by WHO). El Salvador, Costa Rica, and Honduras all have a mixed taxation structure with an ad valorem tax calculated as a percentage of the sales price on carbonated beverages, energy drinks, and stimulant drinks, plus a specific tax that varies according to the number of liters sold.

Table 2. Central America, Panama, and the Dominican Republic: Scenario 1 Simulation Base Year (2016) and Fiscal Impact on GDP Projected to 2020

COUNTRY	Calculation basis: average consumer price/liter Preliminary results (Base year: 2016)			Summarized simulation results for scenario 1 (20%) by 2020			
	Average tax burden (excise tax as % of price)	Average tax burden (total tax as % of price)	Contribution to GDP (%)	Average tax burden (excise tax as % of price)	Average tax burden (total tax as % of price)	Expected consumption decrease (2018-2020)	Contribution to GDP (%) 2020 (20% projection)
Costa Rica	5.8	19.8	0.09%	17.2	30.8	12.0%	0.23%
El Salvador	31.8	43.8	0.37%	40.1	52.4	12.4%	0.59%
Honduras	4.9	18.7	0.11%	13.8	28.2	16.7%	0.28%
Panama	0	2.1	0.01%	13.1	15.3	5.2%	0.11%
Dominican Republic	0	15.4	0.26%	8.5	23.9	11.0%	0.30%

Source: World Bank Group, project team's estimation.

The tax change simulations for this study show that, in all cases (sensitizing by price elasticity and "pass-through" value), the higher tax leads to significant decreases in the consumption of sugary drinks and to increases in tax revenue (see table above). Taxes are the most effective tools for curbing the consumption of these goods. In accordance with international best practice, specific taxes should be adjusted annually to take into account general increases in prices (inflation) and increases in average consumer incomes (for example, using the proxy of increases in per capita GDP).

These estimates confirm that the countries in the sub-region have enough fiscal space to systematically increase taxes on sugar-sweetened beverages and highly processed foods. The study reveals that there are favorable production conditions for foreign companies in the sub-region with optimal conditions for distribution and sales in local and regional markets because of the current free trade agreement incentives. At the same time, it raises concerns about the quality of the water available as a replacement for sugar-sweetened beverages and emphasize

the need to regulate advertising in order to encourage healthy eating as these are both indispensable accompaniments to public policies that reduce the availability of sugar-sweetened beverages and highly processed foods on the market.

The findings of this study should be approached from both the national and the sub-regional perspectives. The close trade relationships in the sub-region (between the five Central American countries, Panama and the Dominican Republic) clearly indicates that it will not be possible to reduce the availability highly processed foods and sugar-sweetened beverages in one country without the cooperation and agreement of the others. It will be necessary to adopt harmonized advertising regulations to cover all multinational companies marketing these products in the sub-region and to prevent any cross-border advertising. Sub-regional entities such as the Council of Ministers of Health of Central America and the Dominican Republic (COMISCA) and the Central American Integration System (SICA) need to be supported to create mechanisms for joint public policymaking and inter-country coordination. At this point, a road map might be developed that includes an integrated plan for reviewing each country's trade policies, tariffs, and local production with the aim of improving the quality of goods sold to the public in the sub-region.

Each country should review, among other things, the conditions under which high-calorie low-nutrient foods and beverages are produced, the distribution of such products in local markets, existing local regulations and how they are enforced, and opportunities to encourage the production of healthier options, with clear guidance on serving sizes, nutrition facts, and labels detailing calorie, sugar, salt, and fat content. Similarly, countries should review their free trade agreements bearing in mind their effects and health consequences as well as their impact on population's health costs.

Countries in the sub-region that impose non-preferential tariffs should review these tariff barriers as well as the products imported through this trade route and their impact on public health.

The governments of the countries in the sub-region should consider creating a forum to explore the implications of imposing taxes and of increasing or reducing prices and marginal tax rates. This will make it easier for them to reach joint agreements on how gradual to make the tax increase and on its likely impact on GDP and public health in the short and medium term. They could also consider creating committees of stakeholders to address specific issues in greater depth. For example, the taxation approach as the most effective tool to reduce the consumption of sugar-sweetened beverages should fall under the purview of an economic and trade committee, while increasing access to drinking water and improving its quality would fall under a Water Sanitation and Hygiene (WASH) committee. Another sub-committee should be formed to discuss the regulation of the nutritional composition and content of ultra-processed food products, whether imported or domestically manufactured, including discussions about labelling standards and advertising regulations. The committee set up to review the sales, distribution and advertising of food in school settings should interact with the committee responsible for discussing subsidies and incentives for the agricultural production and distribution of nutritious foods, including their availability in school cafeterias. In other words, governments can no longer address the malnutrition issue in isolation, as improving the nutrition of their populations will require coordinated interventions and responses.

I. Introduction

The production of sugar-sweetened beverages and pre-packaged food has grown worldwide since 1980,[3] and this has led to a growing consumption of these items by the population.[4] A study published in 2019 that evaluated the determinants of diet in 79 countries found that pre-packaged foods dominated the food supply, especially in middle-income countries where their consumption is rapidly increasing.[5] Another systematic evaluation of different dietary patterns in 187 countries between 1990 and 2010 showed that the consumption of unhealthy foods has increased.[6] Global evidence[7] has shown that unhealthy eating is the main risk factor for non-communicable diseases such as diabetes, cardiovascular disease, heart attack, stroke, and some types of cancer, which have a significant negative effect on health and, consequently, on the economy. In the United States of America, several studies have found a direct association between the inadequate intake of specific foods and nutrients (fruits, vegetables, nuts, seeds, and whole grains) and a substantial proportion of deaths due to heart disease or type 2 diabetes.[8]

The Codex Alimentarius[9] defines pre-packaged foods as food packaged or made up in advance in a container in the absence of the consumer and offered for sale to the consumer. Processed products are low in fiber, and there is evidence that low-fiber and high- calories food diets cause sudden increases in blood sugar, increasing the risk of heart disease, diabetes, diverticular disease, and constipation. A diet high in cereal fiber and low in high glycemic index foods helps to regulate the consumption and content of sugars in the body and to control hunger.[10] Pre-packaged foods and drinks contain large amounts of refined sugars as well as more added sugar -than unprocessed foods.[11]

The consumption of pre-packaged foods is associated with the appearance of cardio-metabolic factors and other risk factors in children and adolescents. They are affected by their exposure to factors that influence food purchase and consumption, such as the availability, affordability,

[3] Zobel, E.H., T.W.Hansen, P. Rossing, and B.J. von Scholten (2016). "Global Changes in Food Supply and the Obesity Epidemic." Curr Obes Rep**.** December, 5(4):449-455. Review. PubMed
PMID: 27696237.

[4] INCAP (2018). "Strategies to limit the marketing, promotion, advertising, and sponsorship aimed at children and adolescents of pre-packaged food and beverages: The case of Central America, Panama, and the Dominican Republic," May 2018, Institute of Nutrition of Central America and Panama**.**

[5] Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017 GBD 2017 Diet Collaborators* Published Online April 3, 2019 http://dx.doi.org/10.1016/ S0140-6736(19)30041-8

[6] Fumiaki, Imamura, et al (2015). "Dietary quality among men and women in 187 countries in 1990 and 2010: a systematic assessment," *Lancet Global Health*. February 19; 3(3): e132–e142.

[7] Lim, S.S., T. Vos, A.D. Flaxman et al (2012). "A comparative risk assessment of the burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010." *Lancet* 380(9859): 2224-2260.

[8] Renata Micha, RD, Ph.D., Jose L. Peñalvo, Ph.D., et al (2017). "Association Between Dietary Factors and Mortality from Heart Disease, Stroke, and Type 2 Diabetes in the United States," *JAMA*, March 7, 2017 Volume 317, Number 9.

[9] The Codex Alimentarius, or "Food Code" is a collection of standards, guidelines, and codes of practice adopted by the Codex Alimentarius Commission. The Commission, also known as CAC, is the central part of the Joint FAO/WHO Food Standards Program and was established by FAO and WHO to protect consumer health and promote fair practices in food trade.

[10] Harvard School of Public Health (2018). "Fiber"https://www.hsph.harvard.edu/nutritionsource/carbohydrates/fiber/.

[11] Martínez Steele, Eurídice, Larissa Galastri Baraldi, Maria Laura da Costa Louzada, Jean-Claude Moubarac, Dariush Mozaffarian, and Carlos Augusto Monteiro (2016). "Ultra-processed foods and added sugars in the US diet: evidence from a nationally representative cross-sectional study." *BMJ Open* 6, n.o 3 (2016): e009892. https://doi.org/10.1136/bmjopen-2015-009892.

palatability, convenience, and aggressive marketing of pre-packaged food and sugary beverages. Sugar and other refined carbohydrates, which are an essential element of pre-packaged foods, have a rapid rate of absorption by the body as well as high addiction potential.

The consumption of sugary drinks increases caloric consumption beyond that the calories in the drinks themselves (due to a non-satiety effect[12]) and leads to a corresponding increase in body weight.[13] Similarly, a strong positive correlation has been found between the consumption of sugary drinks and the prevalence of type 2 diabetes and a negative (low, but significant) correlation with hypocalcemia, increased bone fractures, dental cavities, and high blood pressure.

In recent years, the countries of Central America, Panama, and the Dominican Republic experienced the co-existence of high rates of malnutrition and of obesity and other chronic diseases. Therefore, there is an urgent need to find effective ways to prevent chronic food-related diseases, which impose significant financial and structural burdens on the health systems of these countries.

A. Trends in the Consumption of Sugary Drinks and their Adverse Effects on the health of the Population of Central America, Panama, and the Dominican Republic

As in all countries exposed to urbanization and the epidemiological and nutritional transition, children and adolescents in Central America, Panama, and the Dominican Republic are consuming large amounts of ultra-processed products and foods with high sugar, salt, and fat content. In Guatemala, for example, in a sample of 2,000 packaged foods available in supermarkets,[14] a study found that most pre-packaged foods had added sugar in excess of the recommendations of the Pan American Health Organization (PAHO).

Using data from Euromonitor International, we estimated the recent evolution of per capita consumption of non-alcoholic beverages (soft drinks). Specifically, we used the data on total consumption by direct purchase of non-alcoholic drinks (excluding bottled water), both off-trade (purchases in liquor stores or supermarkets) and on-trade (consumption in restaurants and bars). We then divided this total by the total population to obtain consumption in liters per inhabitant.[15] Figure 1 shows data corresponding to the total consumption per capita in Costa Rica, Guatemala, and the Dominican Republic.

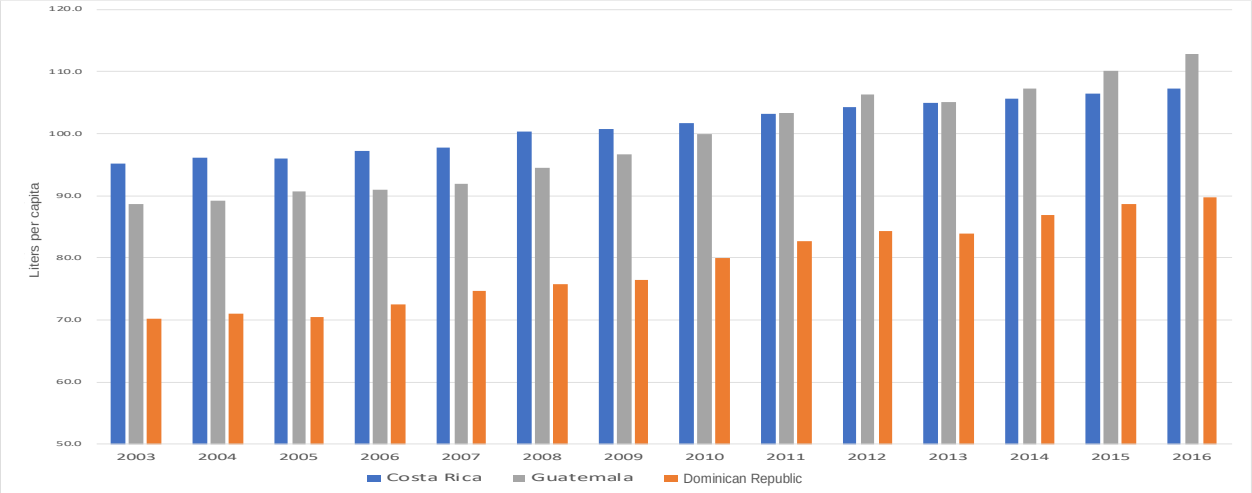
[12] It stimulates the desire to eat more

[13] Vartanian, L.R., M.B. Schwartz, and K.D. Brownell (2007). "Effects of soft drink consumption on nutrition and health: a systematic review and meta-analysis." *American Journal of Public Health*. 2007;97(4):667-75.

[14] Alarcón Calderón, A., M.F. Kroker-Lobos, and M. Ramirez-Zea (n.d.). "Analysis of the Composition of Packaged Food Products in Guatemala," (Unpublished data).

[15] Total population statistics were retrieved from ECLAC data (available at http://estadisticas.cepal.org/cepalstat/web_cepalstat/estadisticasIndicadores.asp?idioma=e)

Figure 1: Total Per Capita Consumption of Non-alcoholic Soft Drinks (excluding bottled water) in Costa Rica, Guatemala and Dominican Republic, 2003-2016



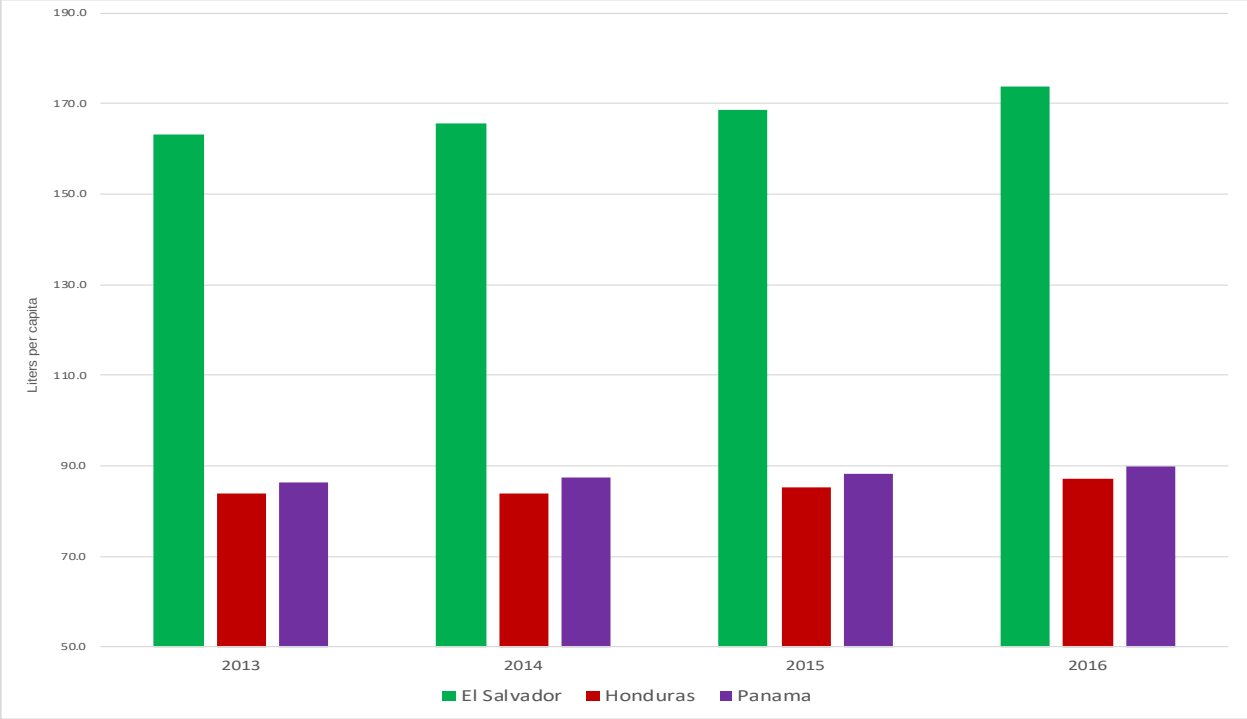
Source: Euromonitor International 2003-2016.

In all three countries, total per capita consumption increased steadily between 2003 and 2016. In the case of Costa Rica, consumption grew by 12.6 percent, an average annual growth rate of 0.9 percent. In Guatemala, it grew by 27.3 percent over the 13-year period and 1.9 percent annually. In the Dominican Republic, the growth rates were similar: 27.8 percent total growth and 1.9 percent annual growth. In the case of Costa Rica and Guatemala, total consumption per capita of soft drinks was close to 110 liters per inhabitant (in 2016), while in the case of the Dominican Republic, it was close to 90 liters per inhabitant (during 2016).[16] Considering that, in the three countries, less than 10 percent of these drinks (excluding water) were low-calorie options (sweetened with artificial sweeteners), it is reasonable to assume that these data show trends in the consumption of sugary drinks and their levels correspond mainly to the consumption of these drinks.

[16] Not all of this consumption was strictly of sugary drinks. According to Euromonitor International, in Costa Rica, carbonated beverages accounted for 62 percent of total consumption (less than 10 percent being beverages sweetened with artificial sweeteners), and juices represented 22 percent (less than 5 percent being non-reconstituted fruit juices). In Guatemala, 77 percent were carbonated drinks (less than 10 percent of which were low in calories), and 15 percent was juices (more than 95 percent having up to 24 percent of natural juices and nectars). In the Dominican Republic, 78 percent of the total was carbonated drinks (less than 10 percent of which were low calorie drinks), while juices represented 13 percent (less than 2 percent of which were natural juices).

Figure 2 shows the per capita consumption of soft drinks in El Salvador, Honduras, and Panama, but only through off-trade purchases from liquor stores or supermarkets. These data only cover the period 2013 to 2016, but they also show an increasing consumption. In El Salvador, the growth in per capita consumption during this period was 6.4 percent (an average annual rate of 2.1 percent), while in Honduras and Panama, it was 3.7 percent and 4.1 percent respectively.

Figure 8: Off-Trade Per Capita Consumption of Non-alcoholic Beverages, (excluding bottled water) in El Salvador, Honduras, and Panama 2013-2016



Source: Euromonitor International 2003-2016.

In the case of these countries, there is no information on the type of beverage being consumed, nor on the type of sweeteners used. There is no reason to suppose that the pattern of consumption of sugary beverages compared to beverages containing sweeteners in these countries is any different from the pattern observed in Costa Rica, Guatemala, and the Dominican Republic.

B. Prevalence of Overweight and Obesity

In 2013, analysts undertook a systematic review of articles published between 2008 and 2013 to evaluate the prevalence of overweight and obesity in children between 0 to 19 years old in Latin America. Their results showed that the aggregate overweight and obesity prevalence ranged from 18.9 percent to 36.9 percent in schoolchildren (aged 5 to 11 years old) and from 16.6

percent to 35.8 percent in adolescents (aged 12 to 19 years old).[17] Also, 4 million children under the age of 5, between 22 and 26 million schoolchildren, and between 17 and 21 million adolescents were overweight or obese. This represents between 43 and 52 million children and adolescents between 0 and 19 years old (20 to 25 percent of the population of Latin America). This very high prevalence of overweight and obesity in Latin America co-exists with high rates of malnutrition in the region, especially in Ecuador and in indigenous groups in Guatemala[18] (see Box 1).

Box 1: Excess Weight in Central American Children

According to a United Nations report, in 2016, 1 million children under the age of 5 was overweight in Central America, representing 6.0 percent of the population, compared to 6.9 percent in the Caribbean, 7.4 percent in South America, and 7.8 percent in the United States of America. Furthermore, overweight and obesity in Central America rose from 5.6 percent of the population to 6.0 percent between 2000 and 2016. Some studies have shown differences between the prevalence of obesity among indigenous children compared to non-indigenous children in Guatemala and a higher prevalence of excess weight in children residing in urban areas than in rural areas in Honduras. However, the opposite occurs in Nicaragua, where children in rural areas have the highest prevalence of excess weight.

Source: UNICEF, WHO, and World Bank Group (2017). "UNICEF-WHO-The World Bank Group: Joint Child Malnutrition Estimates. Levels and Trends in Child Malnutrition. Key findings of the 2017 edition. Levels and Trends in Child Malnutrition." http://www.who.int/nutgrowthdb/jme_brochoure2017.pdf.

The increase in the consumption of sugary drinks per inhabitant coincides with the increase in the body mass index (BMI) and the prevalence of overweight and obesity in both children and adults. Although we did not conduct a causality analysis between these aggregates, this simultaneous growth is certainly striking. However, as already mentioned, some studies have shown that the increasing consumption of sugary drinks is one of the factors that explain the increase in overweight, obesity, and BMI.[19] Figure 3 shows the evolution between 1975 and 2016 of BMI in adults in the countries of Central America, Panama, and the Dominican Republic, while Figure 4 shows this evolution for children between 5 and 19 years old. In both cases, BMI increased substantially in all of the countries in the region. In the case of adults, the country that

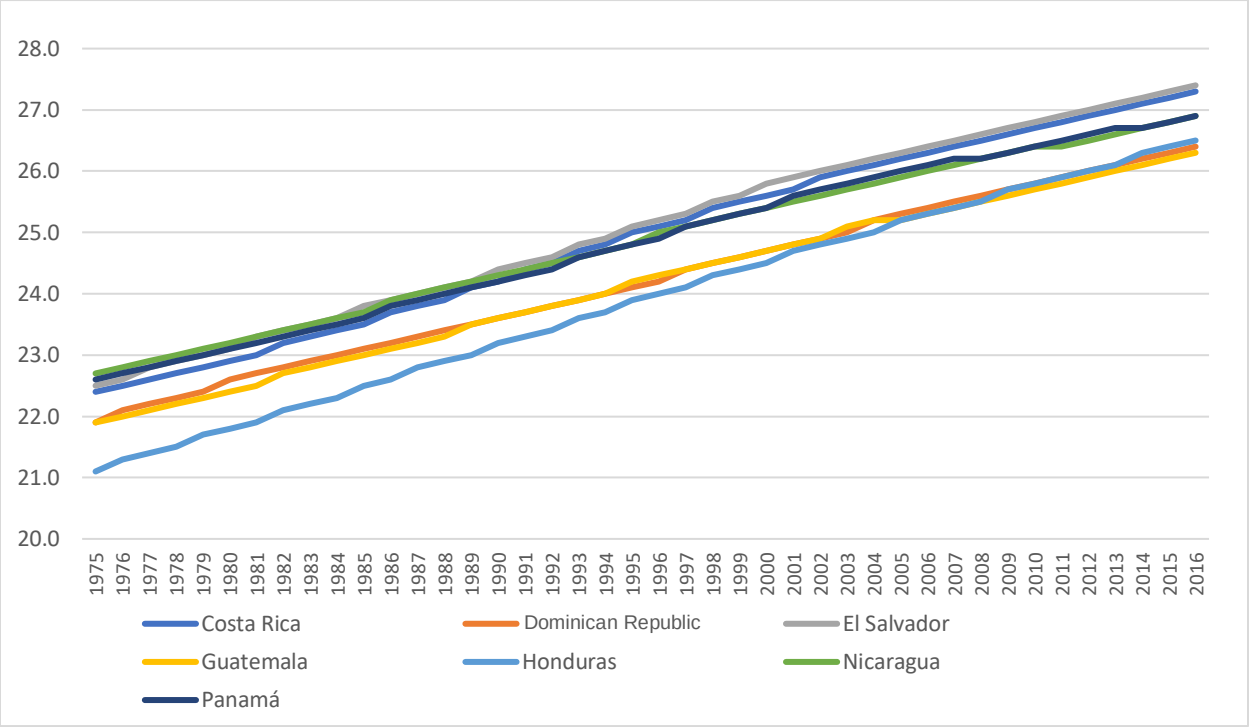
[17] Rivera, Juan Ángel, Teresita González de Cossío, Lilia Susana Pedraza, Tania Cony Aburto, Tania Georgina Sánchez, and Reynaldo Martorell (2013). "Childhood and adolescent overweight and obesity in Latin America: a systematic review." *The Lancet Diabetes & Endocrinology* 2, No 4 (s. f.): 321-32. https://doi.org/10.1016/S2213-8587(13)70173-6.

[18] Corvalán, C., M.L. Garmendia, J. Jones-Smith, C.K. Lutter, J.J. Miranda, L.S. Pedraza, B.M. Popkin, M. Ramirez-Zea, D. Salvo, and A.D. Stein (2017). "Nutrition status of children in Latin America." *Obesity Reviews* 18 (July 1, 2017): 7-18. https://doi.org/10.1111/obr.12571

[19] Vartanian, L.R., M.B. Schwartz, and K.D. Brownell (2007). "Effects of soft drink consumption on nutrition and health: a systematic review and meta-analysis." *American Journal of Public Health*. 2007;97(4):667-75.

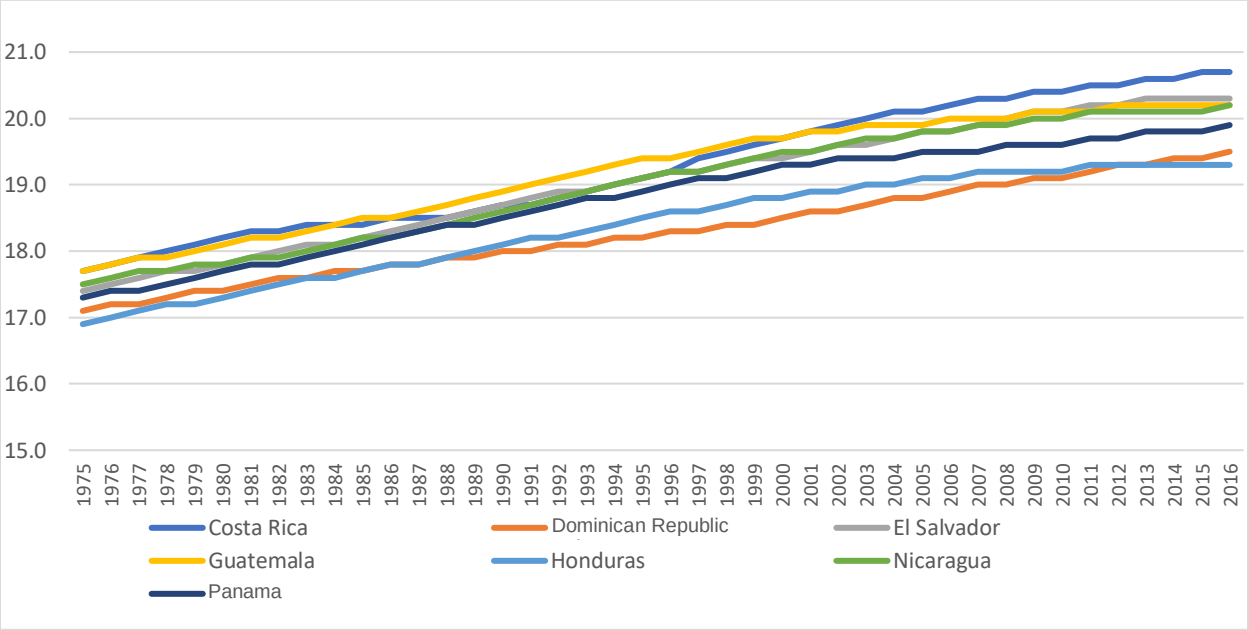
started with the lowest BMI in 1975, Honduras, increased its average BMI by 26 percent, and similar increases occurred in the rest of the countries. In the case of children, the average BMI more than doubled, including in Honduras.

Figure 9: Evolution of Body Mass Index (BMI) in Adults aged over 18 in Central America, Panama, and the Dominican Republic, 1975-2016



Source: World Bank Group, project team's projections based on data from the WHO Global Health Observatory, http://www.who.int/gho/ncd/risk_factors/overweight/en/

Figure 10: Evolution of Body Mass Index (BMI) for Children between 5 and 19 Years Old in Central America, Panama, and the Dominican Republic, 1975-2016

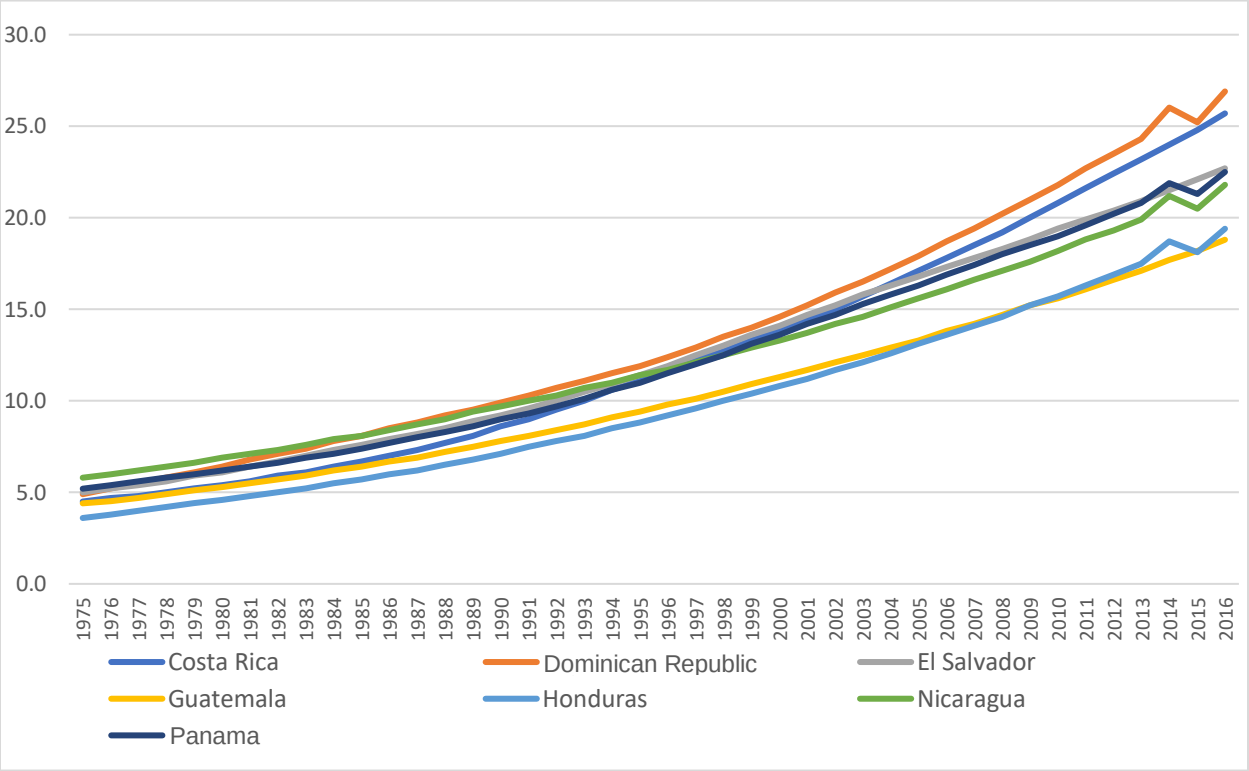


Source: World Bank Group, project team's projections based on data from the WHO Global Health Observatory

This increase in BMI is influenced by the eating habits of the population. Eating a low calorie and low protein diet will result in underweight (a BMI equal to or less than 18.5) while a high intake of calories will lead to overweight (a BMI over 25). Because the quality of a person's diet affects their weight and therefore their BMI, the indicators of prevalence of overweight and obesity are an effective way to show the harmful effects that the current the eating patterns of the population are likely to have on their health.

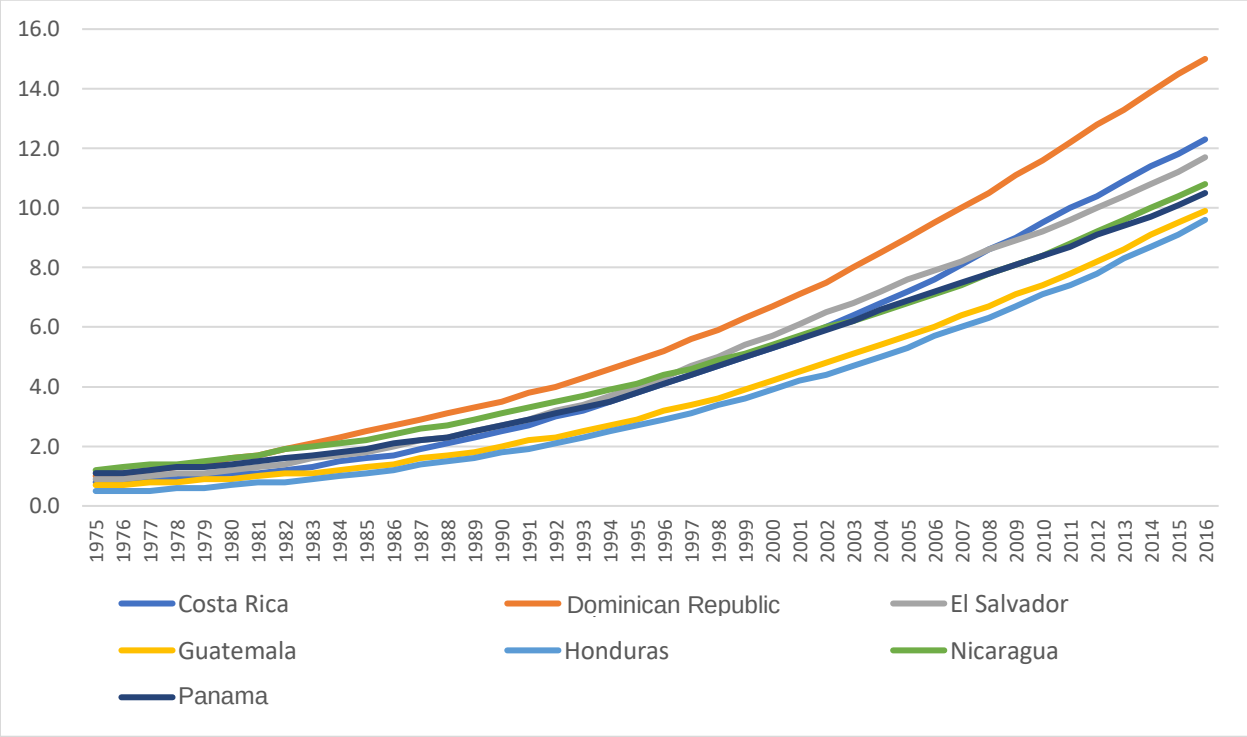
Figure 5 shows trends in the prevalence of overweight and obesity (a BMI over 25) in adults between 1975 and 2016. Again, the pattern of strong growth is common to all countries in the region. The country with the lowest prevalence of overweight and obesity, Honduras, went from just over 22 percent in 1975 to about 52 percent in 2016 (a growth of 136 percent or an average annual growth rate of 2.2 percent). Within the sample, the Dominican Republic had the highest growth, with an average annual growth rate of 2.4 percent.

Figure 11: Prevalence of Overweight and Obesity in Adults over 18 Years Old in Centro America, Panama, and Dominican Republic, 1975-2016



Source: World Bank Group, project team's projections based on data from the WHO Global Health Observatory Data: Overweight and obesity. Available at: http://www.who.int/gho/ncd/risk_factors/overweight/en/

Figure 12: Prevalence of Overweight and Obesity in Children and Adolescents from 5 to 19 Years Old in Central America, Panama, and Dominican Republic, 1975-2016

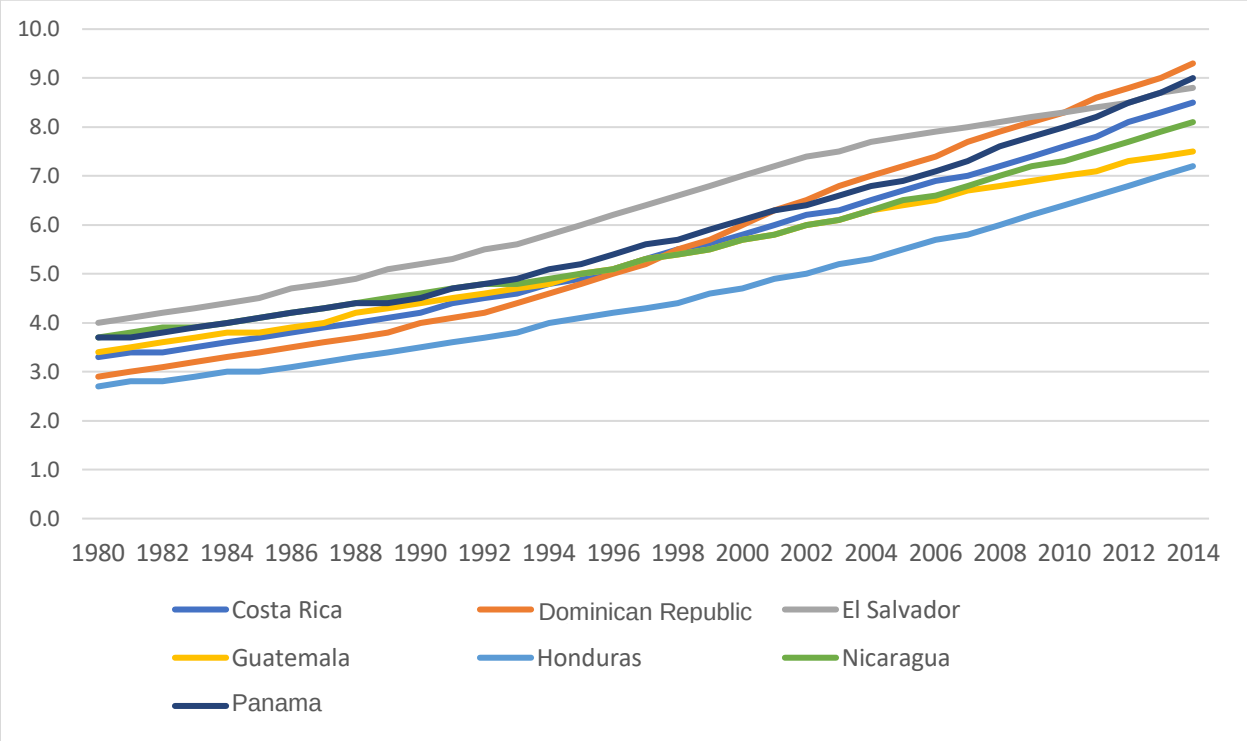


Source: World Bank Group, project team's projections based on data from the WHO World Health Observatory Data: Overweight and obesity. Available at: http://www.who.int/gho/ncd/risk_factors/overweight/en/

Figure 6 shows the prevalence of and trend in overweight and obesity among children between 5 to 19 years old from 1975 to 2016. As for adults, the prevalence increased in all countries but at a higher growth rate than that for adults. Once again, Honduras is the country that had the lowest prevalence at the start of this period, but this increased by 570 percent, at an average annual growth rate of 4.9 percent.

Finally, Figure 7 shows the evolution of the prevalence of high blood glucose after fasting (≥ 7.0 mmol / L or with medication to control it) in the countries of the sub-region. We observed the same growth pattern as for the indicators of BMI and overweight and obesity. Again, the country with the lowest prevalence at the outset was Honduras, but between 1980 and 2016, the prevalence rate increased by 166 percent (or 2.5 percent per year). The country in the region with the highest current prevalence is the Dominican Republic, where rates of high blood glucose after fasting increased by 220 percent (or 3 percent per year).

Figure 13: Evolution of the Prevalence of Fasting High Blood Glucose in Central America, Panama, and the Dominican Republic



Source: World Bank Group, project team's projections based on data from the WHO Global Health Observatory on blood glucose. http://www.who.int/gho/ncd/risk_factors/overweight/en/

Note: A fasting blood sugar level less than 100 mg/dL (5.6 mmol/L) is normal. A fasting blood sugar level from 100 to 125 mg/dL (5.6 to 6.9 mmol/L) is considered prediabetes. If it's 126 mg/dL (7 mmol/L) or higher on two separate tests, you have diabetes.

C. Marketing and Advertising of Pre-packaged Foods and Sugary Drinks in Central America, Panama, and the Dominican Republic

Pre-packaged food and sugary beverages are becoming increasingly central to the production, purchase, and consumption of food and beverages in Central America, Panama, and the Dominican Republic. At the same time, they are contributing to the increase in obesity and overweight rates in children and adolescents in the region. In this section, we present evidence of marketing, promotion, advertising, and sponsorship strategies for pre-packaged foods and beverages that are aimed to attract children and adolescents.

The food market not only seeks to expose adolescents and children to advertisements but also to encourage their consumption by encouraging them to interact and relate to brands and to integrate them into their identities and social vocabulary.[20] This marketing involves advocacy, brand development, and claims that can influence consumers' expectations about the sensory and non-sensory benefits of the food or beverage being marketed. The influence of marketing can be subtle, for example, through price changes**,** but consumers may not always be aware of new forms of marketing such as "advergaming" or games that integrate the sponsoring brand and do not realize that their consumption decisions are being influenced.[21] The food market is increasingly diverting its budget from television, radio, or print ads to new forms of communication (websites, video games, social media, and point-of-sale ads) and through packaging, direct marketing, public relations, and event sponsorship. The message shared through these media is that eating pre-packaged food is normal, fun, and personally rewarding.

The main persuasive strategies used to market pre-packaged foods and beverages to children and adolescents in the sub-region (often used in combination – see Box 2) are:

- Binding the use of trademarks to the identities and social vocabulary of young people
- Reducing prices and selling several units together
- Depicting cartoon characters on packaging
- Including toys in food sales
- Selling pre-packaged food in schools, around schools, and in places where children and adolescents gather
- Using humor and other themes
- Making health claims for the product.

[20] Montgomery, K., and J. Chester (2011). "Digital food marketing to children and youth: problematic practices and policy interventions."
http://case-studies. digitalads.org/wp-content/uploads/2011/10/DigitalMercadeoReport_FINAL_web_ 20111017.pdf.
[21] Chandon, Pierre, and Brian Wansink (2012). "Does Food Marketing Need to Make Us Fat? A Review and Solutions." *Nutrition Reviews* 70, no. 10 (October 2012): 571–93. https://doi.org/10.1111/j.1753-4887.2012.00518.x.

Box 2: Effects of Persuasive Marketing Techniques used in Central America, Panama, and the Dominican Republic

Combination of persuasive techniques	More than a third of products that should not be advertised to children due to their poor nutritional quality were displayed using persuasive techniques such as promotional characters and special offers in supermarkets in Guatemala and Costa Rica.
Cartoons	When offered the same foods in packaged versions with and without promotional characters, Guatemalan children preferred those with cartoons and said they tasted better.
Toy gifts	Several fast food restaurants in Guatemala give away toys to promote the sale of combo[22] foods for children.
Advertising near schools at food outlets	In Costa Rica, most of the ads evaluated in stores located within a 500-meter radius of nine public schools were for pre-packaged foods.
The food offered in schools	In Guatemala, energy-dense snacks and sugary drinks were offered in urban schools.
Use of specific themes	In El Salvador, pre-packaged food and drink advertisements at convenience stores covered themes of joy, nationalism, low prices, gender roles, family, friendship, health, and community.
Media used to advertise pre-packaged food and beverages.	• **Honduras**: Most television commercials advertised high-calorie, sugar, fat, or low-nutrient foods on three cable channels and specifically targeted children. • **Costa Rica**: Most of the advertised foods and beverages exceeded the WHO recommended levels of calories, sugar, sodium, and fats, and the ads peaked at 19:00 hours.[23]

Source: INCAP (2018). "Strategies to limit the marketing, promotion, advertising, and sponsorship aimed at children and adolescents of pre-packaged food and beverages: The case of Central America, Panama, and the Dominican Republic," May 2018, Institute of Nutrition of Central America and Panama**.**

II. The Market for Beverages and Ultra-processed Products

According to the World Health Organization (WHO) and the Pan American Health Organization (PAHO), urbanization, income growth, and market deregulation are the key factors that drive the greater production, sale, and consumption of beverages and ultra-processed products.[24]

[22] Combo food is defined as the food advertised including drinks or side deserts and even toys

[23] Prime-time ad spots are in the evening between 8 p.m. and 11 p.m., when most people are watching TV.

[24] Ultra-processed food and drink products in Latin America: Trends, impact on obesity, policy implications. Washington, DC: PAHO, 2015.

According to studies carried out by both organizations, sales of ultra-processed products are higher in more urbanized countries. In other words, the more people live in urban areas, the greater the consumption of ultra-processed foods. Migration from rural to urban areas together with a faster pace of life and the wider availability of prepared food have promoted this consumption. Statistics reveal that sales of ultra-processed products are higher in higher-income countries but are increasing rapidly in lower-income economies. Finally, the deregulation of markets and the implementation of fiscal measures that favor the large food industries have stimulated the increase in the production, sales, and consumption of ultra-processed products. This study also suggests that national policies have strengthened multinational companies in Latin America and, in general, throughout the south of the world. By allowing economies of scale, large processed food companies have become oligopolies.[25]

PAHO's *Plan of Action for the Prevention of Obesity in Children and Adolescents*, approved by the member states in late 2014, recognizes the influence of social, economic, and environmental factors on eating behavior. It declares that: "Price, marketing, availability, and affordability determine a person's food preferences, purchasing decisions, and eating behaviors. In turn, the policies and regulations related to trade and agricultural activity previously established influence these factors."

A. Sources of and Trends in the Production, Import, and Export of Pre-packaged Foods and Sugary Drinks in Central America, Panama, and the Dominican Republic

Since joining the World Trade Organization (WTO), the Central American countries have intensified the opening of their economies though at different rates. The sub-region's trade agreements with Mexico, CARICOM, Canada, Chile, Panama, and the Dominican Republic opened the way for Central American countries to conduct more ambitious negotiations with bigger economies with much more competitive markets, such as the United States[26] and the European Union. Also, Costa Rica has recently signed a unilateral treaty with China and is in negotiations with Panama.

For more than two decades, Central American countries have made progress in diversifying their exports. By implementing export incentive programs, such as free zone or inward processing regimes, and policies to attract foreign direct investment (FDI), the countries have attracted foreign capital. In 2016, FDI to the six Central American countries reached US$10.656 million, or

[25] Ultra-processed food and drink products in Latin America: Trends, impact on obesity, policy implications. Washington, DC: PAHO, 2015.

[26] Until the negotiation of the CAFTA-DR trade agreement between the United States, Central America, and the Dominican Republic, the Central American countries had not made any commitments to dismantle the tariffs on their sensitive agricultural sectors, except for the regime applicable to intraregional trade within Central America itself. After the CAFTA-DR, the countries within the CA-4 regional treaty (Honduras, Guatemala, El Salvador and Nicaragua**)** excluded only white corn from the reduction commitments, while Costa Rica excluded fresh potatoes and onions. In the Dominican Republic, all agricultural products will be freely traded when the transition period of their agreements ends.

US$13.063 million when the Dominican Republic is added.[27] Panama, Costa Rica, and the Dominican Republic are the main recipients of FDI in the region.

One of the great objectives of foreign investors in the region has been the search for lower labor, logistics, and transportation costs as well as more easily purchased raw materials. These advantages allow these investors to build export platforms, especially those oriented to markets with preferential access for their products, such as those in the textile sector.[28] This has been the case particularly in El Salvador, Guatemala, Honduras, and Nicaragua. Other investors have settled in the sub-region to take advantage of its geography and natural beauty (the tourism sector), or its raw materials (agro-industry and mining) or its new and growing telecommunications and energy infrastructure.

In recent years, an increasing amount of external capital has been invested in the primary agricultural and agro-industrial sectors. In parallel, a growing number of foreign companies have acquired land for the production of pineapple, bananas, palm oil, livestock, rice, and citrus.[29] Although this investment has not yet reached the levels in the industrial and service sectors, its relative importance has been increasing.

The arrival of large transnational companies in the agri-food sector (such as Cargill, Mondelez, Frito-Lay, Nestlé, and Unilever) and giant supermarket chains has put pressure on the regional agricultural sector not only as a supplier of inputs but as a competitor to the local agro-industry. Except Panama, all other countries actively encourage FDI in the agri-food sector. The advantages that the sub-region has to offer to agri-food investors are a favorable climate, fertile soil, its geographic location, a broad agricultural production base, and duty-free access to one of the world's leading processed food consumption markets, the United States.

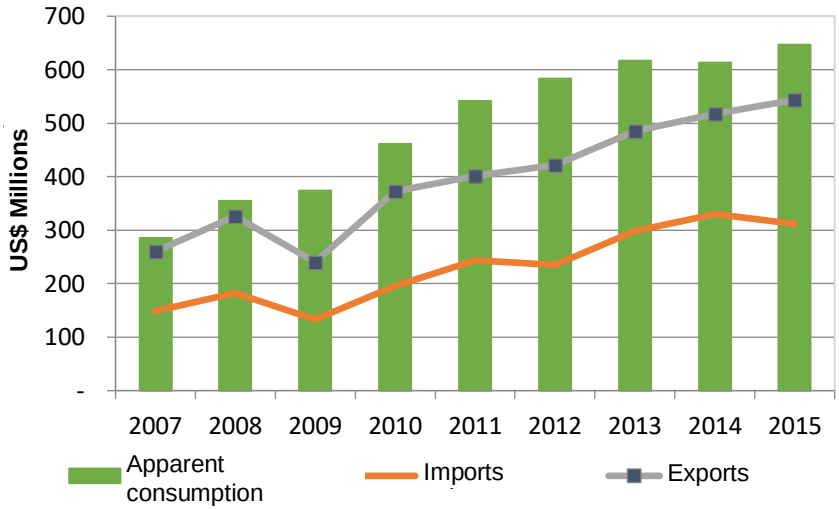
During the last decade, the share of the agricultural sector in GDP has declined in Costa Rica, Guatemala, Panama, and the Dominican Republic. In contrast, it has increased in El Salvador and Honduras, while in Nicaragua it has remained practically the same. In the first group of countries, the lower contribution of agricultural (primary) activity has been offset by significant increases in the services (tertiary) sector of the economy. In 2016, the countries where the agricultural sector made the largest contributions to national production were Honduras and Nicaragua with 17.3 percent, and 13.5 percent respectively, while it was lowest in Panama with 2.7 percent.[30] Agricultural production in the seven countries covered by this study measured at constant 2010 prices grew at an average annual rate of 3 percent over the last decade.

[27] ECLAC (2017)
[28] Specially in El Salvador, Guatemala, Honduras y Nicaragua.
[29] Perspectivas de la agricultura y del desarrollo rural en las Américas: una mirada hacia América Latina y el Caribe cepal, fao, iica – Santiago, Chile, fao, 2012. 176 pag.; 28 cm. isbn13: 978-92-5-307355-9 Publicado también en inglés: 978-92-5-107355-1 1.
[30] World Bank Annual Report (2018): http://pubdocs.worldbank.org/en/910121540568523454/worldbankannualreport2018.pdf

Costa Rica:

Low nutritional value products (PBVN in Spanish)[31] represent 14 percent of Costa Rica's agricultural trade but a third of the commercial trade of the food industry. Between 2002 and 2016, exports of this type of goods rose from US$147 million to US$532 million, multiplying 3.6 times. In the same period, imports went up from US$85 million to US$370, growing by 336 percent.[32] According to the latest figures available from the Central Bank, as of 2015, the production of the PBVN subsector had reached US$878.3 million, equivalent to 14 percent of the added value of the manufacturing industry and contributing just over 1 percent of national GDP. The presence of large companies producing processed foods and carbonated beverages for supply to the local and regional market has been a large part of this growth. In parallel with the increases in production and imports, apparent consumption of PBVN (production plus imports minus exports) rose from US$435 to US$958 million between 2007 and 2015 (Figure 8).

Figure 14: Exports, Imports, and Apparent Consumption of PBVN in Costa Rica



Source: World Bank Group, project team's estimation based on data from World Bank's World Integrated Trade Solution WITS and the Central Bank of Costa Rica.
Note: Apparent consumption = Production + Imports - Exports

[31] In the national production data, the breakdown of the PBVN follows the codes used in the International Standard Classification of all Economic Activities (ISIC 4), which are compatible with the classifications used in the Tariff System for the Designation and Codification of Merchandise (SA) as follows:

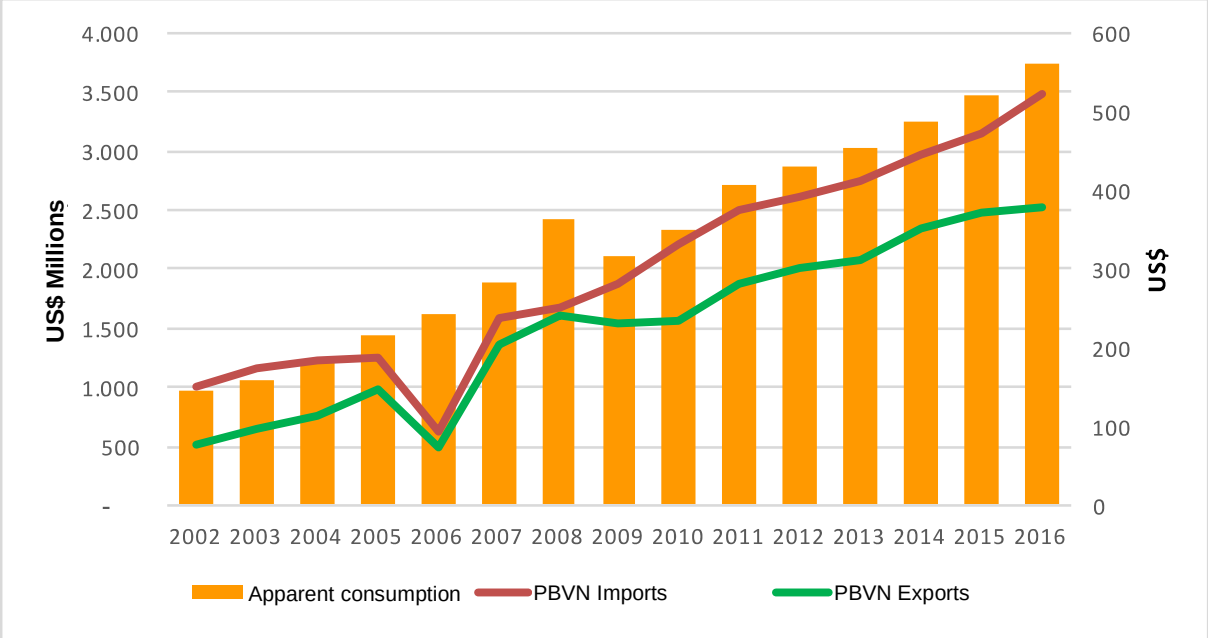
1071 Elaboration of bakery products and tortillas
1072 Sugar making
1073 Cocoa, chocolate, and sugar confectionery
1075 Preparation of meals, ready meals, and other food products
110 Distillation, rectification, mixing of alcoholic beverages and wines / Manufacture of malted, malt, non-alcoholic beverages, mineral water, and other bottled waters / Manufacture of tobacco products
107 Total food sector

[32] The databases used for our analysis of trade for the period 2002 to 2016 were taken from the World Integrated Trade Solution (WITS) of the World Bank for all countries except Nicaragua where the WITS data were not complete, nor did they agree with the official sources. Instead, we used the international trade statistics of the Central American Secretariat for Economic Integration (SIECA). The tariff databases were built from the tariff reduction programs of each free trade agreement that was in force at the time.

Guatemala:

Exports of PBVN from Guatemala reached US$379 million in 2016, less than the US$521 million imported in that same year. In other words, for every $10 of this type of product that was exported, US$14 was imported, making Guatemala a net importer of PBVNs. Guatemalan PBVN production was US$3,600 billion in 2016, which represented 48 percent of the value-added of the manufacturing industry and 5.2 percent of the country's GDP. Although it had been growing at an average annual rate of 10 percent in the period 2002 to 2016, since 2010 a slowdown has been taking place. Apparent consumption was US$3,733 million in 2016, which has almost tripled since 2002. Ninety percent of this increase in consumption has been supplied by national production, although there has been a slowdown in the growth since 2012 (Figure 9). The growth of franchising in Guatemala has expanded access to the fast food sector, especially in urban areas.

Figure 15: Exports, Imports, and Apparent Consumption of PBVN in Guatemala



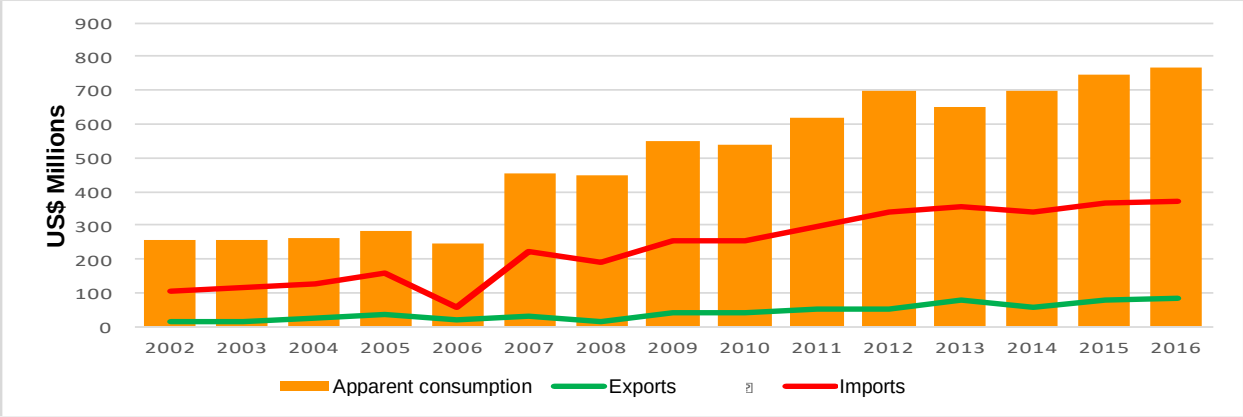
Source: Authors World Bank Group, project team's estimation based on data from WITS and the Central Bank of Guatemala
Note: Apparent consumption = Production + Imports – Exports.

Honduras:

PBVN exports represent one-tenth (11 percent) of Honduran agro-industrial exports and 34 percent of the country's imports, which is equivalent to just over US$80 million a year. Between 2002 and 2016, the average annual growth rate was 12.2 percent, although exports tended to stagnate in the last two years of the period. Imports of PBVN are 4.5 times higher than exports, although they have been growing at a slower rate (an annual average of 9.4 percent). By 2016, Honduran PBVN purchases from abroad totaled US$372 million. Imported soft drinks and sugary drinks multiplied their value by more than 10 times between 2002 and 2016, the second highest

growth in PBVN after cookies. In 2016, Honduras produced US$480 million in PBVN, 2.4 percent of the country's GDP for that year. Its apparent consumption multiplied by three between 2002 and 2016 to reach US$769 million, largely due to the volume of imports (Figure 10). However, starting in 2007, the growth in the consumption rate of PBVN began to slow down.

Figure 16: Exports, Imports, and Apparent Consumption of PBVN in Honduras



Source: World Bank Group, project team's estimation based on data from WITS and the Central Bank of Honduras
Note: Apparent consumption = Production + Imports - Exports

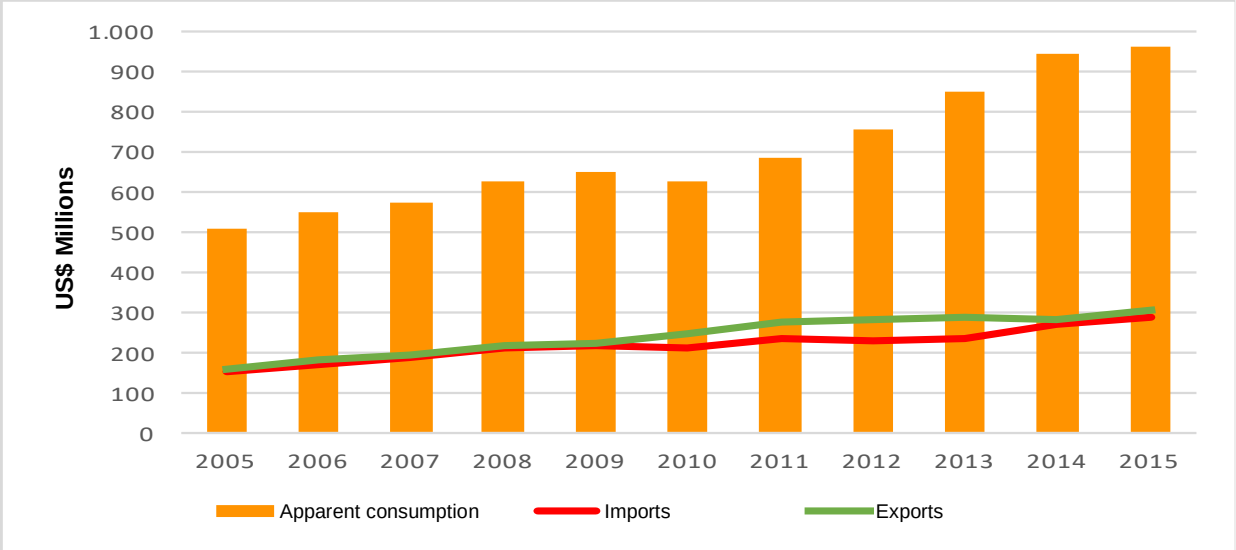
El Salvador:

Of every US$10 that El Salvador exports in agricultural goods, US$3 relate to products with low nutritional value. Although exports of PBVN showed a positive variation rate between 2002 and 2016, their rate of increase decreased except in 2014. During 2016, PBVN exports reached US$303 million (Figure 11), which was an increase of 145 percent over 2002 with an average annual growth rate of 6.6 percent.

Imports of PBVN grew by 8.3 percent annually, but, unlike exports, their growth rate shows an upward trend from 2010. A quarter of imported agro-industrial products are in the PBVN category. According to data from the Central Reserve Bank of El Salvador, the production of PBVN in the country has grown 1.9 times.[33] In 2014, PBVN contributed 27 percent of the value-added of the manufacturing industry, up from 21 percent in 2005. It represented a fairly stable 4.2 percent of GDP during the analysis period. Although the production of PBVN has been increasing during the last decade, the rate of growth began to slow down from 2012. Apparent consumption was US$961 million in 2015, well above the US$509 million in 2005. Although imports grew significantly during the study period, the greater availability of PBVN was mostly due to the growth in the locally generated supply (Figure 11).

[33] In our calculation of the production of PBVN, we considered the added value of the following items: manufacture of bakery products, macaroni, noodles, and other similar farinaceous products; sugar processing; the elaboration of other food products; and the elaboration of alcoholic and non-alcoholic beverages and mineral water.

Figure 17: Exports, Imports, and Apparent Consumption of PBVN in El Salvador

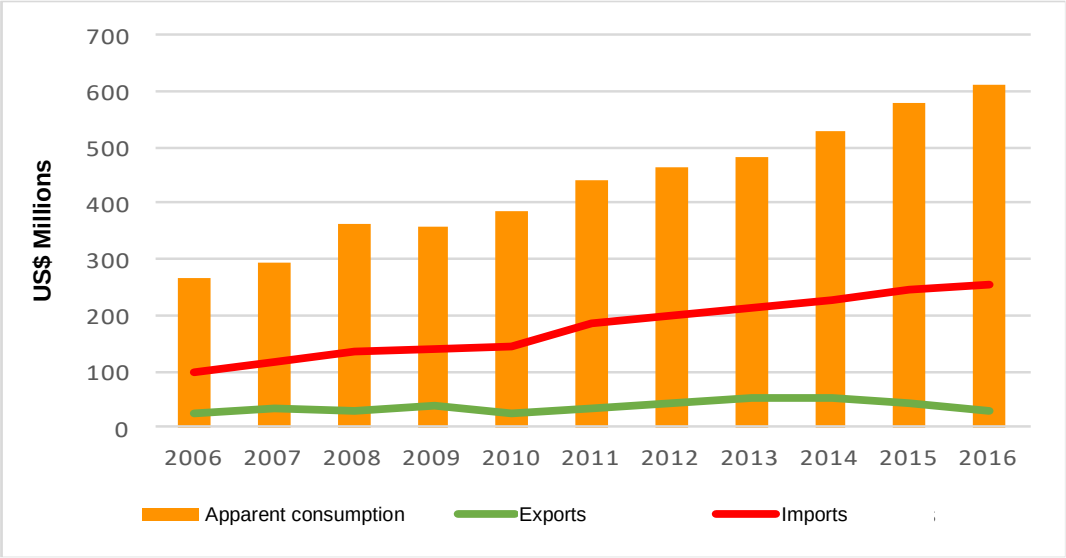


Source: Authors based on data from WITS and the Central Reserve Bank of El Salvador.
Notes: Apparent consumption = Production + Imports – Exports. PBVN production for 2015 is estimated since the Central Reserve Bank of El Salvador only has disaggregated data at the level required until 2014. Growth in the production of PBVN was assumed to equal the growth rate of GDP in that year.

Nicaragua:

Nicaragua's PBVN exports represent 1.8 percent of its agricultural and agro-industrial exports. Although during the period 2002 to 2014, they multiplied by 4.5 times, though the rate of variation decreased from 2008 onwards. Between 2015 and 2016, there was even a contraction of 17 percent. Meanwhile, imports of PBVN represented a quarter of agricultural imports into Nicaragua. By 2016, these external purchases reached US$252 million, and although this was 4.5 times higher than the amount of import in 2002, the rate of growth slowed down during the four years up to 2016**.** Domestic PBVN production reached US$391 million in 2016, which was more than double the US$190 million in 2002, an average annual increase of 7 percent. The growth in average manufacturing has been higher than food manufacturing, though each subsector represents 3 percent of Nicaraguan GDP. As in other countries in the sub-region, the growth rate of PBVN manufacturing began to slow down in 2010. Apparent consumption more than doubled from US$264 million to US$612 million in a decade, an average annual increase of 9 percent, which was higher than the rate of increase in production. This higher consumption was accompanied by the growth of both production and imports of PBVN (see Figure 12).

Figure 18: Apparent Consumption of PBVN in Nicaragua

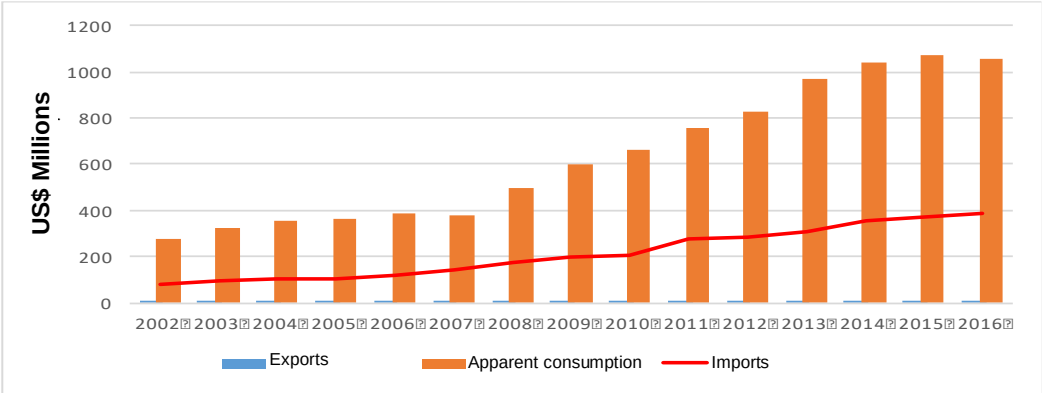


Source: World Bank Group, project team's estimation based on data from SIECA and the Central Bank of Nicaragua
Note: Apparent consumption = Production + Imports - Exports

Panama:

According to data from the Panama General Comptroller, the production of PBVN in Panama was US$676 million[34] in 2016, which was 3.4 times greater than was produced in 2002. PBVN production grew at a rate of 9.1 percent between 2002 and 2016. The fastest growing line in the budget was the manufacture of beverages and tobacco, with an average growth of 16 percent per year. Apparent consumption of PBVN was US$1,057 million, with an average annual growth rate of 10 percent, although there was a slowdown in this rate of growth from 2008 onwards. However, the annual per capita consumption of PBVN is $ 262 for the year 2016, the highest of the countries in the sub-region, from both increased production and imports (see Figure 13).

Figure 19: Apparent Consumption of PBVN in Panama



Source: World Bank Group, project team's estimation based on data from the Panama General Controller
Note: Apparent consumption = Production + Imports - Exports

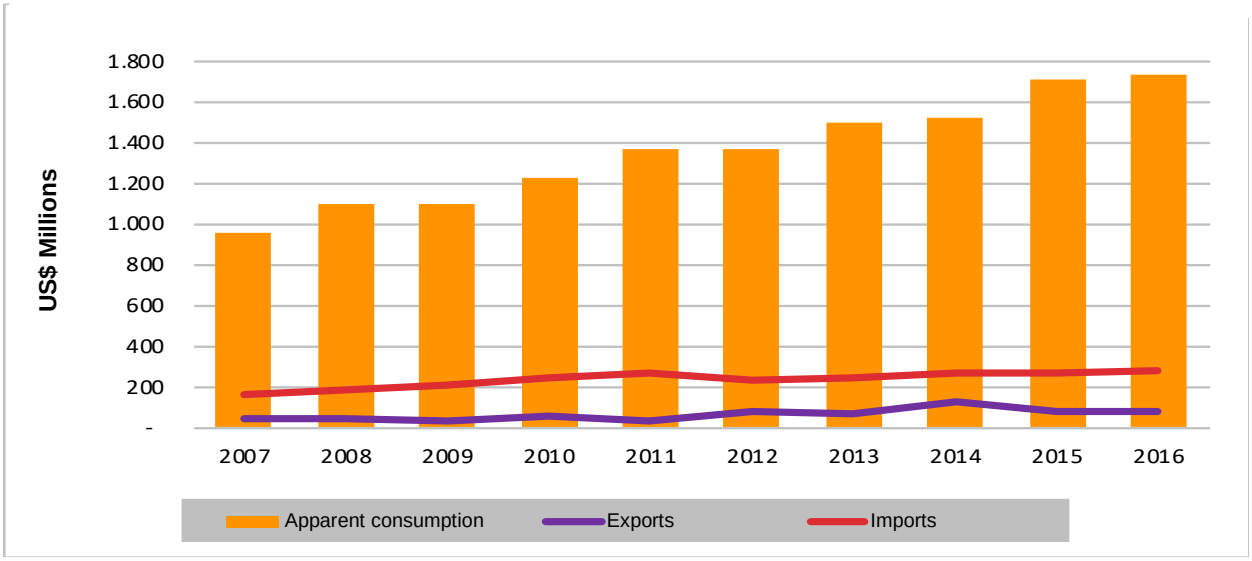
[34] The lines in the database that corresponded to the elaboration of other products and the elaboration of beverages and tobacco were both taken to belong to the manufacturing industry.

Dominican Republic:

The production of PBVN[35] in the Dominican Republic was around US$1,540 billion in 2016. Although it had been on the rise over the decade, the trend had been towards a slowdown. This subsector represents 2 percent of national GDP, but the line item covering soft drinks, mineral water, and other beverages contributed only 0.33 percent of GDP.

The apparent consumption of PBVN was estimated to have been US$1,735 in 2016, which was 1.8 times more than had been consumed ten years earlier. Its average annual growth in the last decade was 7.1 percent. Although consumption increased, the rate of growth slowed over the period, possibly influenced by a trend towards consuming less sugar and high-sugar products adopting healthier lifestyles as well as the slowdown in production (Figure 14).

Figure 20: Apparent Consumption of PBVN in the Dominican Republic



Source: World Bank Group, project team's estimation based on data from the Central Bank of the Dominican Republic
Note: Apparent consumption = Production + Imports PBVN - Exports PBVN.

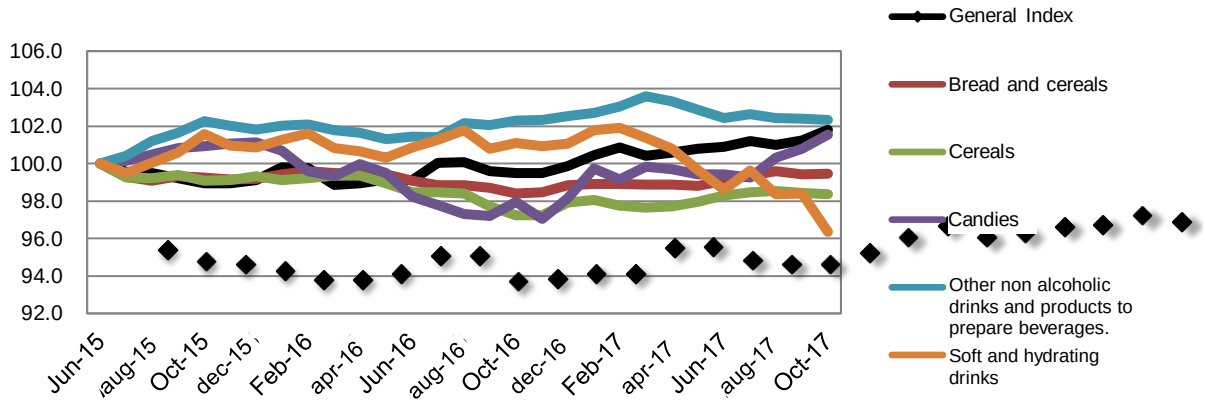
[35] To estimate the production of PBVN, we used the items in the categories of "elaboration of other food products" and "elaboration of beverages and tobacco" as defined by the ISIC classification of the Central Bank of the Dominican Republic. Both of these categories correspond to local manufacturing of PBVN as calculated by the Central Bank of the Dominican Republic for the years 2007 to 2016. The first category includes bakery products, cocoa, chocolates, and confectionery, pastries, ground, and roasted coffee, and other food products, while the second category covers rum, beer, soft drinks, other drinks, cigars, and cigarettes. In this last group, we considered only soft drinks, bottled mineral water, and other beverages according to their percentage of total production.

B. Analysis of Marketing Prices for Sugary Drinks in Central America, Panama, and the Dominican Republic

In this section, we analyze the price variation of sugary drinks in each of the different countries using trends in the consumer price index (CPI). The consumer price index (CPI) is an economic index in which the price level of a basket of consumer goods and services regularly purchased by households (determined based on the continuous survey of family budgets) is valued worldwide. This index is a percentage that can be positive (indicating an increase in prices) or negative (reflecting a fall in prices).

In Costa Rica, with the exception of the price of carbonated and hydrating drinks that have experienced a decrease of the order of 3% in the period between June 2015 and October 2017 (figure 15), other products such as sweets and sweets have experienced an increase in their prices; while in breads and pastry products no significant variations were observed.

Figure 21: Consumer Price Index (CPI) for PBVN in Costa Rica (June 2015-October 2017)

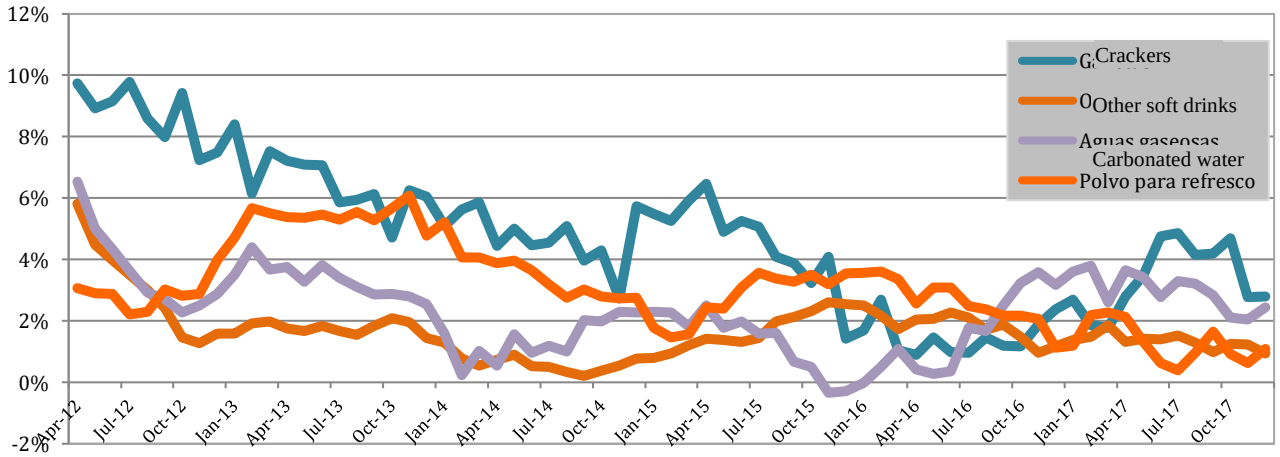


Source: World Bank Group, project team's estimation based on data from the INEC of Costa Rica.
Note: In Costa Rica, the CPI changed its base in June 2015, which implied a methodological change in the sample size, the number of articles per group, and the weights. Therefore, this new index is not compatible with the one used for previous years.

In Guatemala, although the increase in PBVN was below that observed in the general price index in the period between 2011 and 2017, the variation in the price of carbonated and sugary water and cookies was much smaller and with a tendency to grow every once again, as shown

in Figure 16. This trend was clearer from the second half of 2016, as observed in the year-on-year change in the CPI for these items (Figure 16).

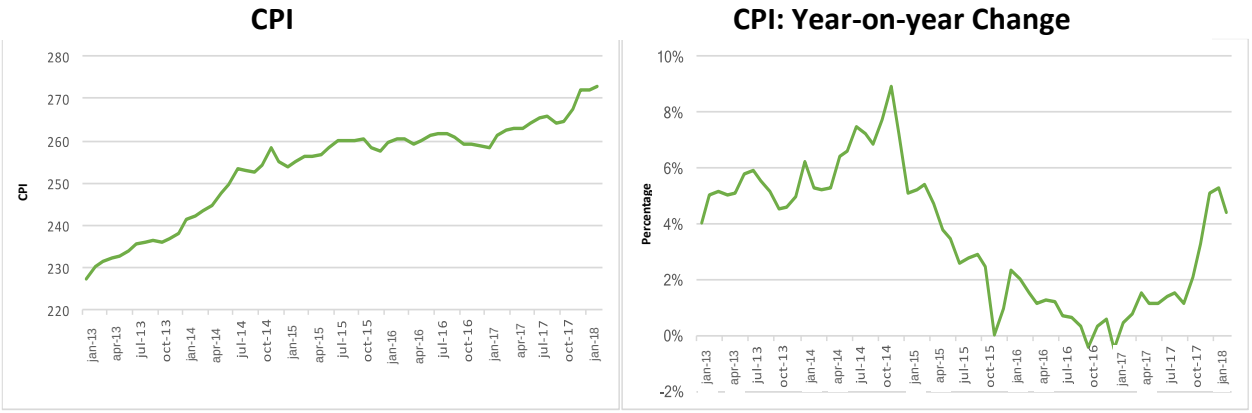
Figure 22: Monthly Year-on-year Changes in the CPI for PBVN in Guatemala



Source: World Bank Group, project team's estimation based on data from the Central Bank of Guatemala

In Honduras, the trend in the prices of food and non-alcoholic beverages was upward between 2013 and 2018, but the upward trend slowed between 2014 and the end of 2017 (Figure 17).

Figure 23: Food and Non-alcoholic Beverage Prices in Honduras

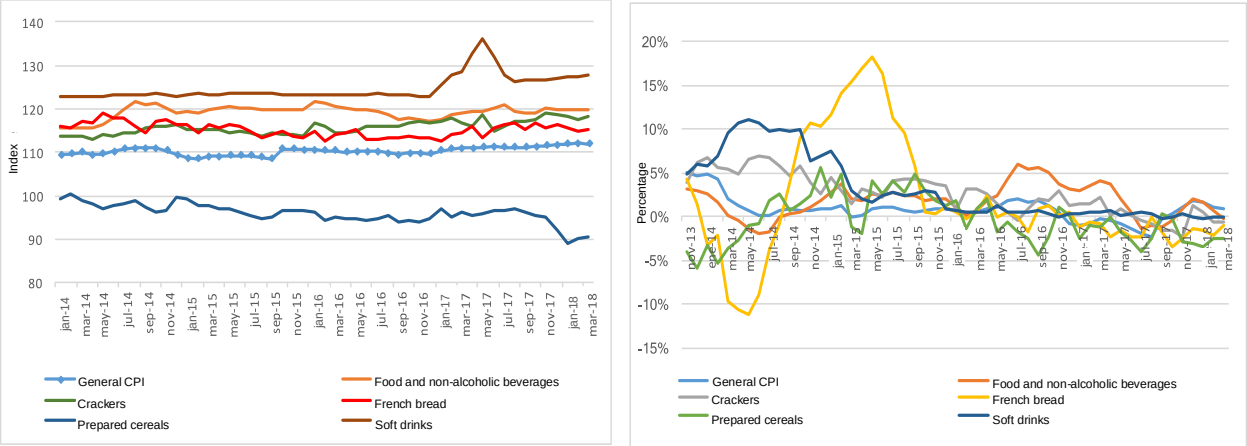


Source: World Bank Group, project team's estimation based on data from the Central Bank of Honduras, 2018

In El Salvador, the prices of PBVN, measured through the CPI, were relatively stable behavior between 2015 and 2018, according to figures from the General Directorate of Statistics and Censuses of El Salvador (DYGESTYC). The only subgroup of products that decreased in price were cereals (-4.7 percent), while the prices of soft drinks increased by 3.1 percent and cookies by 4.4 percent between December 2015 and December 2017 (Figure 18).

Figure 24: Prices of PBVN in El Salvador

CPI **CPI: Year-on-year Change**

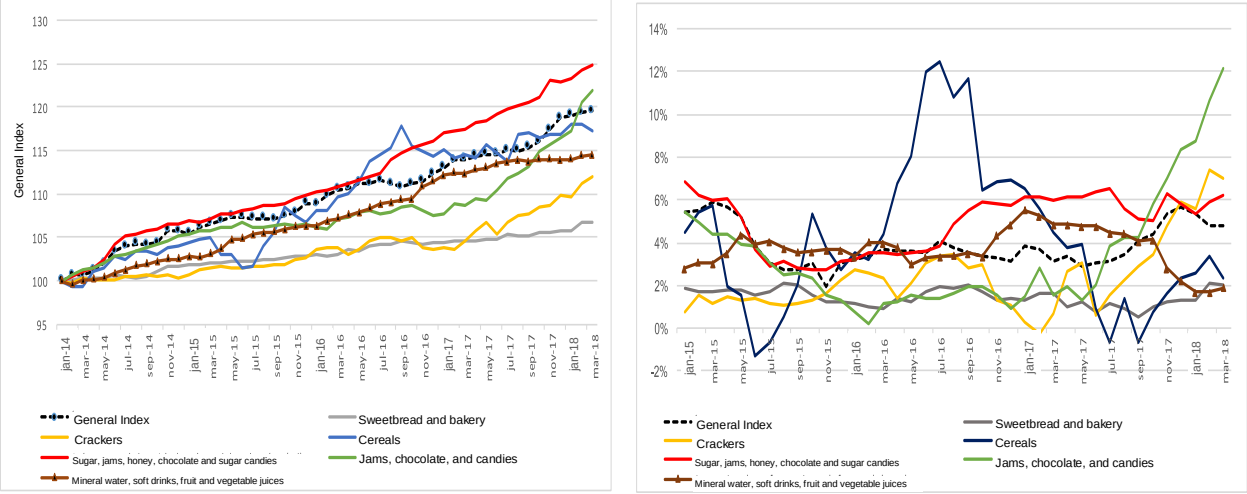


Source: World Bank Group, project team's estimation based on data from the Central Bank of El Salvador

In Nicaragua, contrary to what happened in other countries in the region, prices were on an upward trend between January 2014 and January 2018. The year-on-year variation did not exceed 6 percent after the first half of 2015, except for the price of cereals, which in 2016 grew much more than the rest of the PBVN. On the other hand, the prices of jams, chocolates, and confectionery increased faster than the rest of the PBVN from the second quarter of 2017 (Figure 19).

Figure 25: Consumer Price Index for Nicaragua

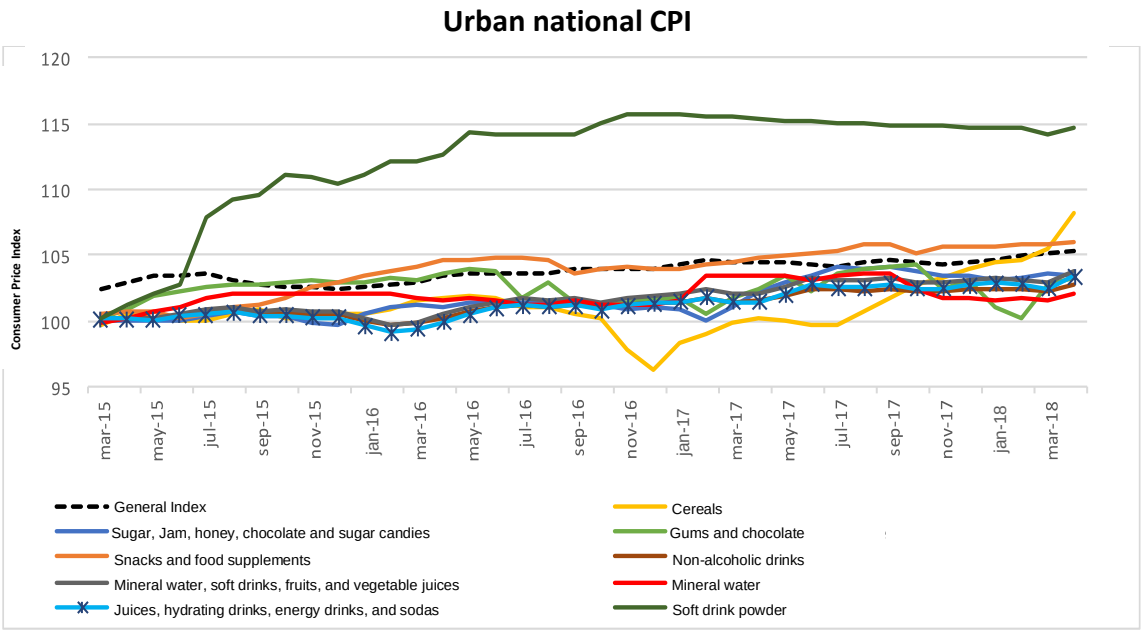
CPI, based January 2014 **Monthly interannual variation rate**



Source: World Bank Group, project team's estimation based on data from the Central Bank of Nicaragua

In Panama, the prices of PBVN were very stable behavior between March 2015 and March 2018 except for cereals and powdered soft drinks, which, since December 2016, had a clear upward trend. However, the trend in the price of juices and hydrating, energy, and soft drinks tended to be downward (Figure 20).

Figure 26: Consumer Price Index for PBVN in Panama

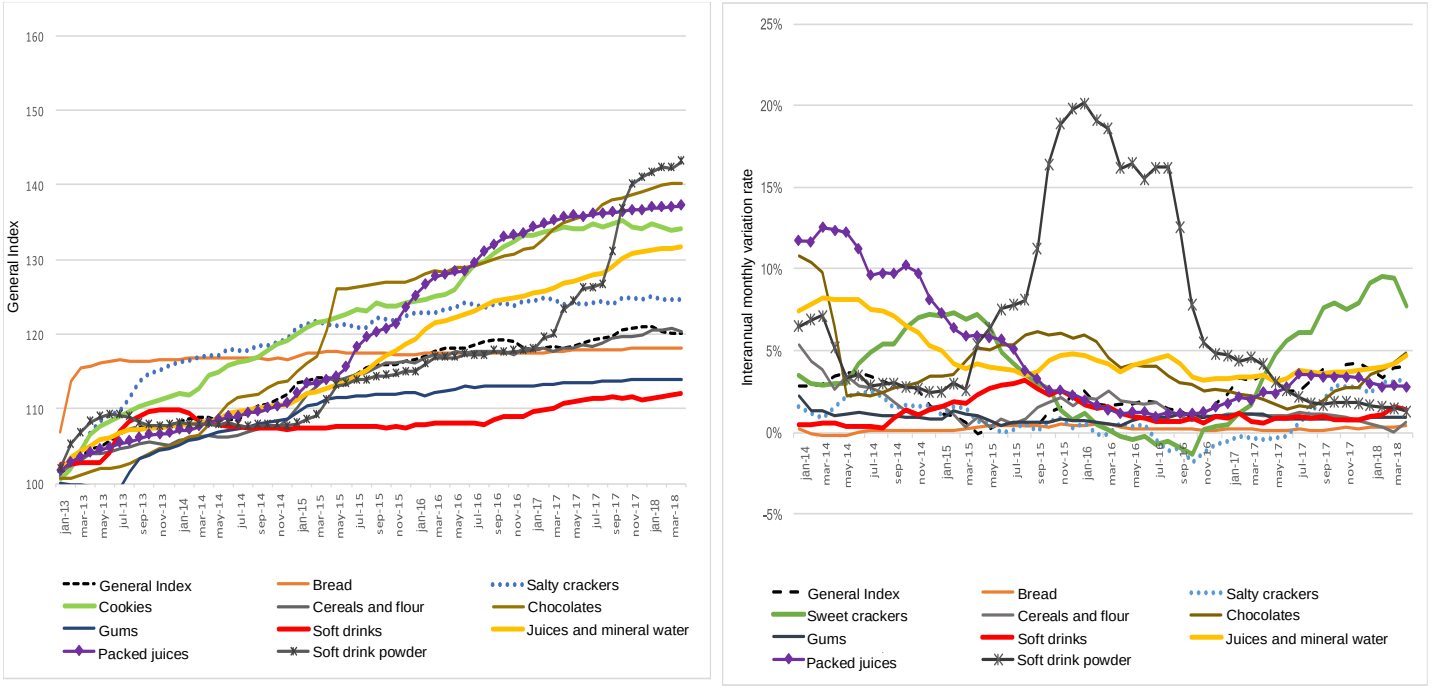


Source: World Bank Group, project team's estimation based on data from INEC, Panama

In the Dominican Republic, there was a trend towards an increase in the prices of PBVN, although no significant variations. The prices of soft drinks remained practically unchanged from 2014 to the middle of the second half of 2017, when they slightly increased and then stabilized again (Figure 21).

Figure 27: Consumer Price Index for PBVN in the Dominican Republic

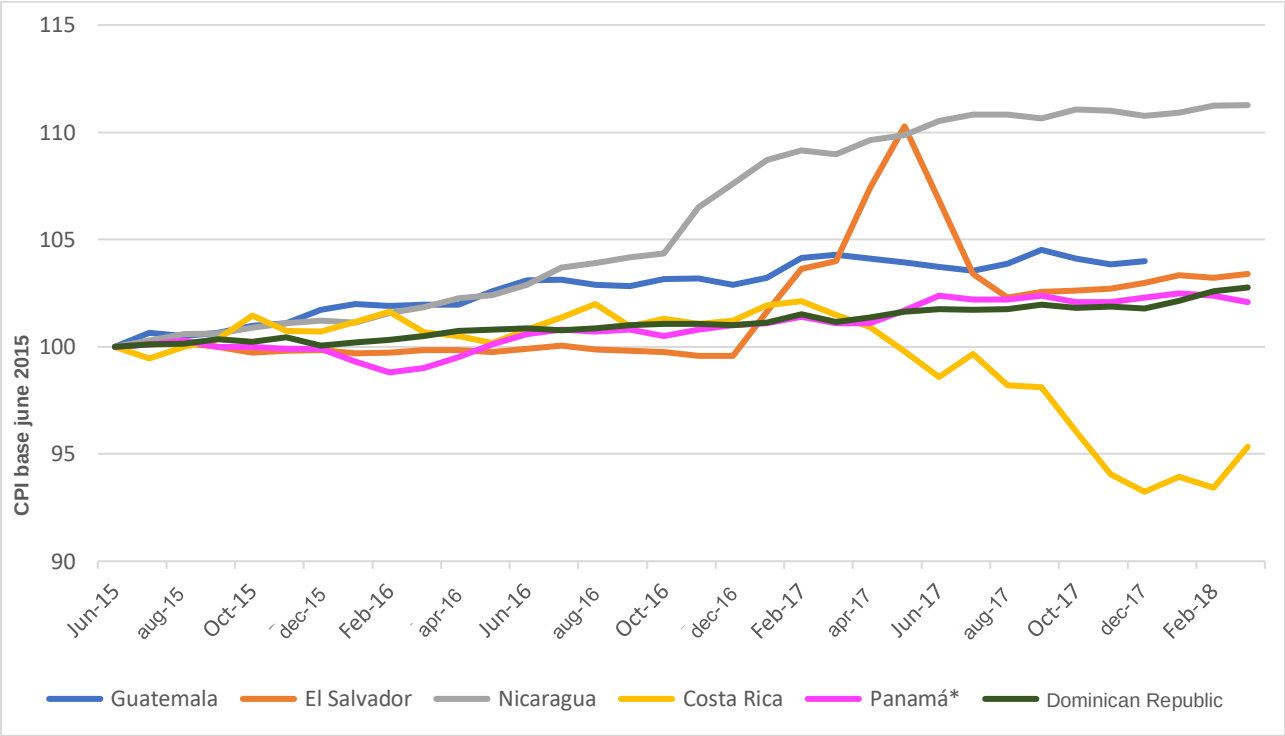
CPI, base year 2010 **CPI: monthly change year-on-year**



Source: A World Bank Group, project team's estimation based on data from the Central Bank of the Dominican Republic.

Figure 22 shows the evolution of the CPI for soft drinks (related to the same base year) in all countries except for Honduras where the data were not sufficiently disaggregated to be comparable. As can be seen from the figure, the trend was towards an increase in prices in all countries except Costa Rica, where prices decreased significantly below the rate of inflation. However, except for Nicaragua, where the price remained steady, the price in the other countries gradually increased (or jumped up and then returned to a gradual increasing trend in the case of El Salvador) at a CPI rate below 105.

Figure 28: Consumer Price Index for Soft Drinks in Central America, Panama, and the Dominican Republic



Source: World Bank Group, project team's estimation based on data from the central banks of Guatemala, Nicaragua, and the Dominican Republic and from the Statistical and Census Institutes of Costa Rica, El Salvador, and Panama.
Notes: Base = June 2015. * Also includes soft drinks, juices, hydrating and energy drinks. It was not possible to obtain information for Honduras to the level of disaggregation required.

C. Legislation, Regulations, and Control Mechanisms for the Marketing, Promotion, and Advertising of Pre-packaged Foods and Sugary drinks in Central America, Panama, and the Dominican Republic

There is a general scarcity of documented evidence on how governments regulate the exposure of children and adolescents to the marketing of pre-packaged food and beverages, and this scarcity is even more pronounced in Central America. However, we were able to find the following examples of efforts on the part of governments:

- **Guatemala**: The Ministry of Education has banned the sale of snacks and sodas in schools. A study has showed that some kiosks or booths have complied with these regulations more than others, so more stringent enforcement is needed.[36] Also, in October 2017 the School Feeding Law entered into force in Guatemala, the objective of which is to guarantee school feeding to children and adolescents and to promote health and healthy eating. Through this law, the Guatemalan state undertakes to ensure that healthy food and beverages (a list of which is defined by the law) are available in all public and private pre-elementary and elementary schools. The legislation prohibits the sale or promotion in schools of: (i) pre-packaged products with a high content of sugar, syrup, corn syrup, fat, oil, vegetable **[oil?]**, or lard; (ii) ultra-processed food products such as cold cuts: (iii) carbonated drinks, including light or diet drinks, energy drinks, rehydration or sports drinks; (iv) packaged soft drinks; (v) sweets; (vi) instant soups; (vii) breaded proteins ("nuggets"); (viii) foods prepared with partially hydrogenated butter, oils, or margarines whose label does not indicate that they are free of trans fatty acids; and (ix) any other pre-packaged product that does not have a nutritional label or proof of health registration.
- **Costa Rica**: Regulations have been implemented to increase access to healthy food and water in schools and to reduce access to foods defined as unhealthy, for example, snacks that include sugar or fat as primary ingredients and carbonated and energy drinks.[37] The Ministry of Education, together with civil organizations, has started an awareness and training process for cafeteria vendors, school principals, and other education decision-makers.[38] In Costa Rica, there are no entry barriers for PBVN other than taxation and non-tariff requirements such as those related to labeling and health records required by health authorities, all requirements which apply to any other type of processed food as well.

[36]Pehlke, Elisa L, Paola Letona, Kristen Hurley, and Joel Gittelsohn (2016). "Guatemalan school food environment: impact on schoolchildren's risk of both undernutrition and overweight/obesity." *Health Promotion International* 31, n.o 3 (September, 2016): 542-50. https://doi.org/10.1093/heapro/dav011.

[37]Rivera, Juan Ángel, Teresita González de Cossío, Lilia Susana Pedraza, Tania Cony Aburto, Tania Georgina Sánchez, and Reynaldo Martorell (2013). "Childhood and adolescent overweight and obesity in Latin America: a systematic review." *The Lancet Diabetes & Endocrinology* 2, no. 4 (s. f.): 321-32. https://doi.org/10.1016/S2213-8587(13)70173-6.

[38] Jacoby E. (2012). "Standing up for children's rights in Latin America." *Journal of the World Public Health Nutrition Association* 3, no. 11.

- **Panama**: In 2017, the National Assembly passed a law prohibiting the sale of pre-packaged food in school vending machines and cafeterias, which is being enforced by the Ministries of Education and Health.[39]
- **El Salvador**: Article 113 of the General Education Law "regulates and controls the commercialization of foods high in fat, salt, and sugar and of all **foods** that do not contribute to healthy eating in school stores and cafeterias."[40] This law went into effect in January 2018. From the point of view of protecting children's health, this law aims to create an environment conducive to the consumption of healthy foods to promote a healthy food culture and help to stem the growth of chronic non-communicable diseases derived from overweight and obesity. This legislation prohibits the trade and promotion in schools of: (i) pre-packaged products with a high content of sugar, syrup, corn syrup, fat, oil, vegetable oil, or lard; (ii) ultra-processed food products such as cold cuts, (iii) carbonated drinks, including light or diet drinks, energy drinks, and rehydration or sports drinks; (iv) packaged soft drinks; (v) sweets[41]; (vi) instant soups; (vii) breaded proteins ("nuggets"); (viii) foods prepared with partially hydrogenated butter, oils, or margarines whose label does not indicate that they are free of trans fatty acids; and (ix) any other pre-packaged product that does not have a nutritional label or proof of health registration.
- **Honduras**: There is no specific regulatory framework to regulate this type of product in Honduras, so they are covered by general regulations applicable to any other pre-packaged food and by current legislation on the protection of health and nutrition. These include the provisions contained in the Health Code, the Framework Law on Food and Nutrition Security, the School Food Law, and the applicable national or Central American regulations for the general labeling of previously packaged food products, the nutritional labeling of previously packaged food products for human consumption intended for the population aged 3 and older, the Central American Technical Regulations for Processed Food, and the Beverages and Food Additives Regulations.
- **Nicaragua**: As in Honduras, Nicaragua does not have a specific regulatory framework to regulate PBVN. Instead, these products are covered by general regulations applicable to any other pre-packaged food and by current legislation on the protection of health and nutrition. These include the provisions of the Food and Nutrition Sovereignty Act, the General Health Act, and the applicable national or Central American regulations governing the general labeling of previously packaged food products, the nutritional labeling of previously packaged food products for human consumption suitable for consumers aged 3 and older, the Central American Technical Regulations for Processed Food and the Beverages and Food Additives Regulations. There is also a Comprehensive School Nutrition Program, directed by the Ministry of Education, the purpose of which is to improve the nutrition of boys, girls, youths,

[39] La Estrella de Panamá (2017). "National Assembly passes law banning the sale of junk food in schools." September 6, 2017. http://laestrella.com.pa/panama/nacional/asamblea-aprueba-prohibe-venta-comida-chatarra-escuelas/24021364

[40] Ministry of Health (2017). "Government presents regulations for healthy school stores and cafeterias." June 25, 2017. http://www.salud.gob.sv/27-06-2017-gobierno-presenta-normativa-de-regulacion-de-tiendas-y-cafetines-escolares-saludables/.

[41] Referring to all presentation and forms of sugar candy etc.

and adolescents, in the country's schools. Specifically, this program establishes that school kiosks are authorized and regulated by the school authorities to ensure that they are offering healthy and nutritious food.

D. Lessons from Tax Changes in Mexico

In October 2013, the Government of Mexico decided to implement a tax of 1 peso (US$0.08) per liter on flavored beverages. This proposal was accompanied by a strong education campaign on the negative impact of sugary drinks on health and on the need for increased access to water sources.[42] (However, not until January 2018 was the tax linked to the adjusted inflation rate for 2014, which was 10 percent.) The tax was the government's response to the rapid increase in obesity and overweight in Mexico, where it was generally understood that one of the contributing factors to this phenomenon was the population's high consumption of sugary drinks. Sugary drinks contributed 70 percent of the added sugar to the diet of Mexicans as of 2016.[43] Nowadays, the prevalence of obesity and overweight in Mexico is close to the highest in the world, with 65 percent of adults and 30 percent of children being overweight or obese.[44]

The tax proposal had both promoters and opponents.[45] The promoters included multilateral and international organizations such as PAHO and WHO, academic and medical institutions, civil society organizations, some legislators, and members of the Executive Branch (including President Peña Nieto). The opponents included the food and beverage industry, industry associations, cane sugar producers, beverage bottlers, some members of the legislative and executive branches, and some civil society organizations. The advocacy strategy had two components: a strong media and advertising campaign on the negative effect of sugary drinks on health and formal lobbying. The success of the tax approval was attributed to the combination of several factors: (i) the use of scientific evidence to highlight the problem and design the appropriate policy; (ii) strong promotion of the cause with the formation of a coalition, a media campaign, lobbying, and the forging of relations with key actors; and (iii) an in-depth analysis of the country's political context and the participation of the global community.[46]

In 2017, researchers from the National Institute of Public Health of Mexico and the University of North Carolina at Chapel Hill studied the consumption of sugary drinks after the implementation

[42] Ministry of the Interior. (2013). Excise Tax Law for Production and Services. Mexico City: Ministry of the Interior. Accessed November 24, 2018.Available online: http: // www.dof.gob.mx/nota_detalle.php? code = 5325371 & date = 12/11/2013.
[43] Aburto TC, Pedraza LS, Sánchez-Pimienta TG, Batis C, Rivera JA. Discretionary foods have a high contribution and fruit, vegetables, and legumes have a low contribution to the total energy intake of the Mexican population. J Nutr. 2016;146(9):1881S–7S.
[44] World Bank. 2016. World Development Indicators. Accessed November 22, 2018.Available online: http://databank.worldbank.org/data/country/MEX/556d8fa6/Popular_countries
[45] Donaldson, E. (2015). Incidencia en el impuesto a las bebidas azucaradas, un estudio de caso de México. Consultado el 23 de noviembre, 2018. Disponíble en línea: https://www.jhsph.edu/departments/health-behavior-and-society/_pdf/Estudio_de_caso.pdf
[46] Donaldson, op. cit.

of the tax.[47] The purchase of sugary drinks had decreased by 5.5 percent in 2014 and by 9.7 percent in 2015, resulting in an average reduction of 7.6 percent over the analyzed period. Low-income households recorded the largest reduction in the purchase of sugary drinks in the two years of the study. The purchase of tax-free beverages increased by 2.1 percent. The researchers concluded that, two years after its implementation, the tax was still having the expected impact.[48]

Another study looked at whether the tax had a signaling effect.[49] The team of researchers analyzed the association between knowledge of and opinions about the tax with current consumption of sugary drinks to identify any self-informed changes in consumption after the implementation of the tax. They also examined the association between environmental and psychological determinants of sugary drink consumption. Their results showed that, compared to adults who had no knowledge of the tax, those who knew about the tax were more likely to report having reduced their consumption of sugary drinks. In urban areas, adults who knew about the tax reduced their consumption by 15.7 percent. Although the health consequences of consuming sugary drinks were not significantly associated with the consumption of sugary drinks, self-efficacy (the confidence that one can reduce consumption) was significantly associated. Another study that examined the effect of the tax on the employment rate in the sugary beverage manufacturing industry found no changes that were statistically significant .[50] This evidence on the impact of the tax in Mexico may motivate other countries to follow suit in adopting fiscal policies to reduce the consumption of unhealthy beverages and in turn reduce the burden of chronic diseases.[51]

E. Current Taxes and Tax Collection on Sugary Drinks in Central America, Panama, and the Dominican Republic

Of the seven countries under consideration, only the Dominican Republic does not apply specific taxes to sugary drinks (like the other countries, it applies VAT but this is a general tax). All of the other countries levy a tax on these drinks, although they tend to be low. Table 3 shows the revenue collected through this tax as a proportion of total revenue collected in each country for various periods between 2001 and 2016.

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[47] Colchero, M. A., Rivera-Dommarco, J., Popkin, B. M., y Ng, S. W. (2017). In Mexico, Evidence of Sustained Consumer Response Two Years after Implementing a Sugar-Sweetened Beverage Tax. Health Affairs (Project Hope), 36(3), 564-571. Disponíble en línea: https://www.healthaffairs.org/doi/10.1377/hlthaff.2016.1231

[48] Colchero et al., op. cit.

[49] Álvarez-Sánchez C, Contento I, Jiménez-Aguilar A, Koch P, Gray HL, Guerra LA, et al. (2018) Does the Mexican sugar-sweetened beverage tax have a signaling effect? ENSANUT 2016. PLoS ONE 13(8): e0199337. https://doi.org/10.1371/journal.pone.0199337

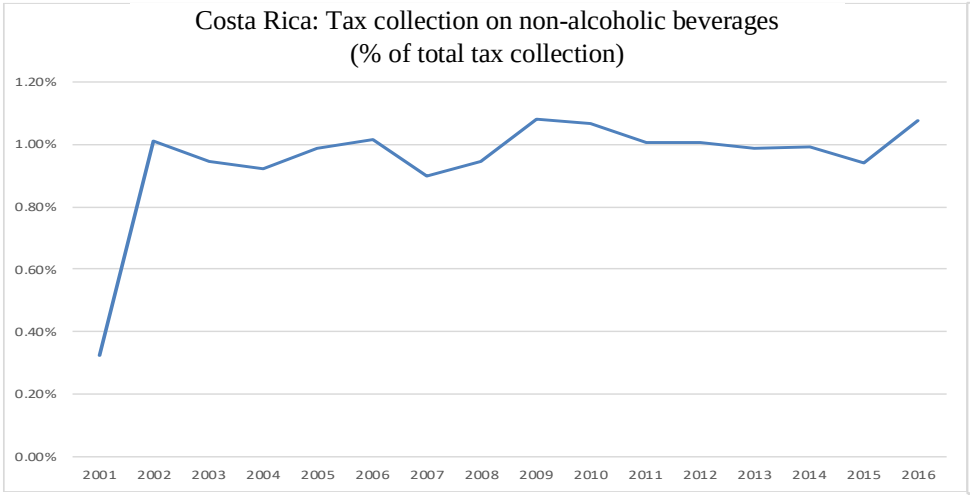
[50] Guerrero-Lopez CM, Molina M., Colchero MA. (2017). Employment changes associated with the introduction of taxes on sugar-sweetened beverages and nonessential energy-dense food in Mexico. Prev Med. (2017);105S, S43-S49. doi:S0091-7435(17)30324-9 [pii].

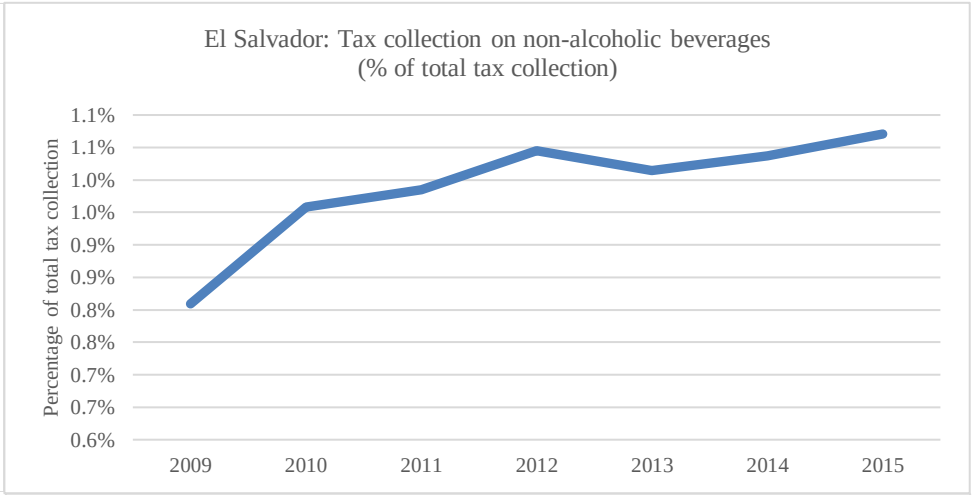
[51] Aburto TC, Pedraza LS, Sánchez-Pimienta TG, Batis C, Rivera JA. Discretionary foods have a high contribution and fruit, vegetables, and legumes have a low contribution to the total energy intake of the Mexican population. J Nutr. 2016;146(9):1881S–7S.

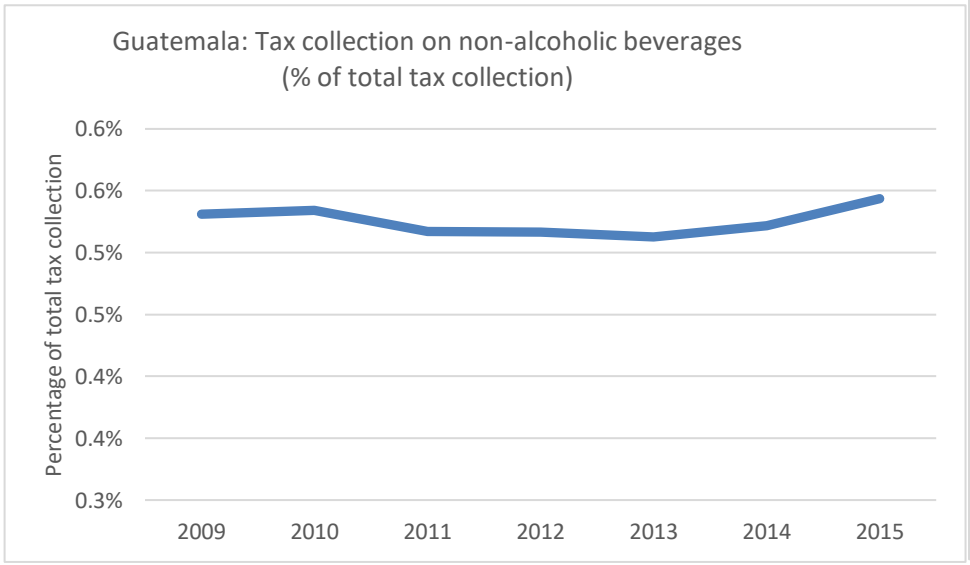
As can be seen in figure 23, the revenues collected have been relatively stable and constitute a very low share of total revenues collected:

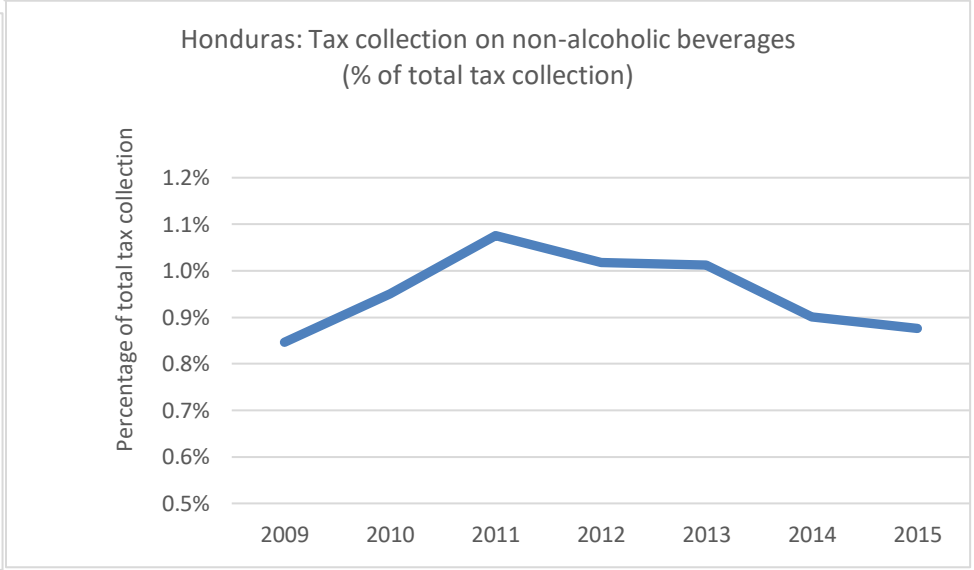
- In Costa Rica, the tax accounts for only 1 percent of total tax revenue collected.
- In El Salvador, it represents 1.1 percent of total tax revenue collected.
- In Guatemala, in no year did it exceed 0.6 percent of total tax revenue collected.
- In Honduras, it is only 0.9 percent total tax revenue collected.
- In Nicaragua, it does not exceed 0.7 percent of total tax revenue collected.
- In Panama, it does not reach 0.1 percent of total tax revenue collected.
- In the Dominican Republic, no tax is levied on sugary drinks except general taxes such as VAT or customs duties.

Figure 23: Collection of Taxes on Sugary (Non-alcoholic) Beverages in Central America, Panama, and the Dominican Republic



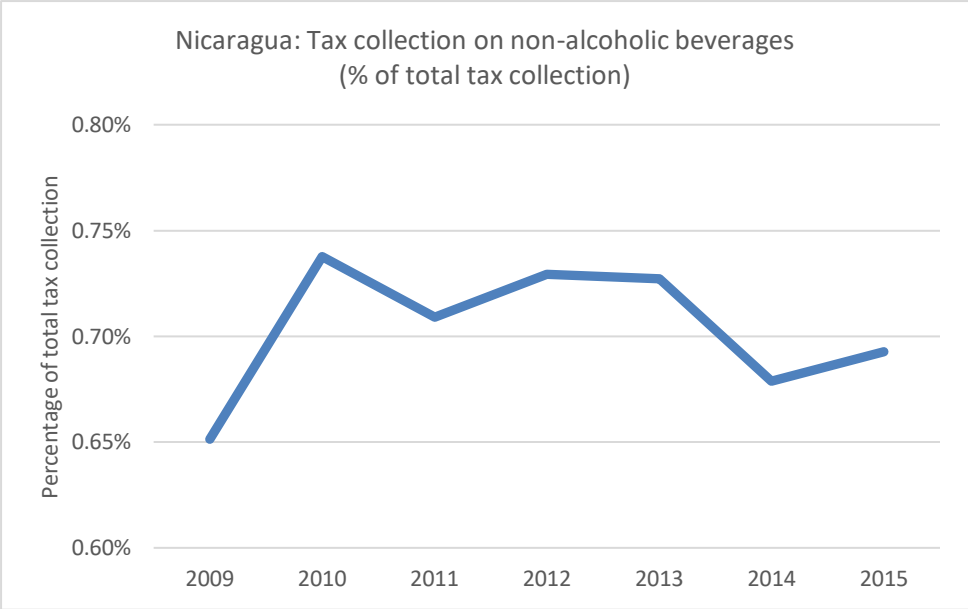


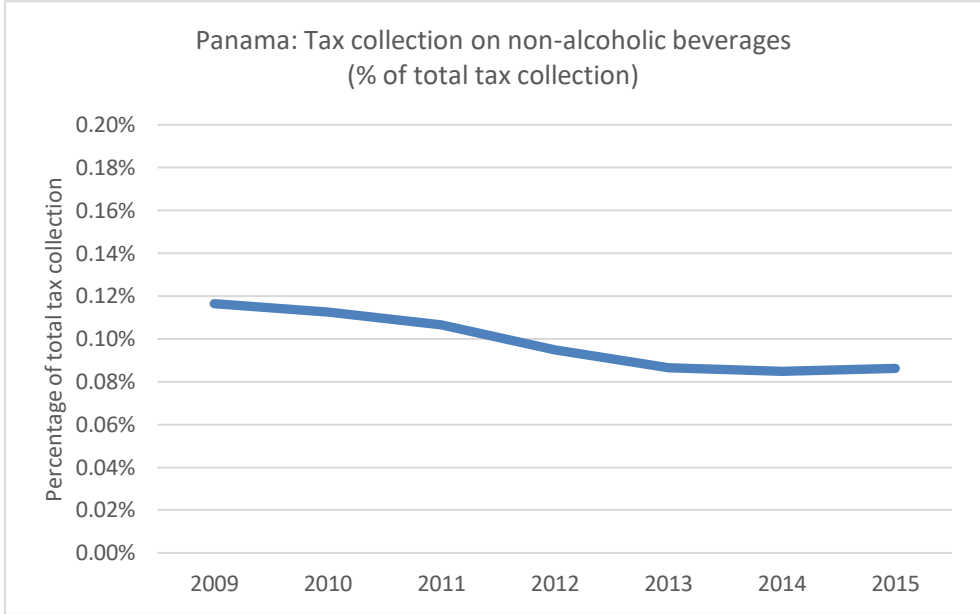




Sources: Costa Rica: Authors based on http://www.hacienda.go.cr/contener/12840-detalle-de-los-principales-ingresos-del-gobierno-central. El Salvador, Guatemala, Honduras, Nicaragua, Panama: Authors based on OCDE, CIAT, BID, ECLAC (2017). "Revenue Statistics in Latin America and the Caribbean."

Figure 23 (Cont): Tax Collection for Sugary (Non-alcoholic) Beverages in Central America, Panama, and the Dominican Republic





F. Taxes on Sugary Drinks in Central America, Panama, and the Dominican Republic

Costa Rica and Honduras apply a specific tax on the volume of sugary drinks consumed, while El Salvador, Guatemala, Nicaragua and Panama apply an ad-valorem tax, which taxes the value of the purchased good. However, in all cases, the amount of tax collected is very unlikely to be enough to cover the externalities caused by the consumption of sugary drinks. As noted in Figure 3 above, it is possible that the fall in the revenues collected from this tax in Honduras is not due to a fall in the consumption of these products (which has tended to increase sharply) but to the lack of any automatic or periodic adjustment in the tax to take account of inflation (which is not the case here).

1. Customs Tariffs on Imports

In the countries of the region, products with low nutritional value such as sugary drinks are subject to an ad valorem tax ranging from 14 percent to 20 percent (see Table 4) for import tariff duties (DAI) as required by Law 6986 Convention on the Central American Tariff and Customs Regime. This tariff (DAI) must be paid only on imported products (not those manufactured in the national territory), except for those products that enter the country covered by some free trade agreement. This tax is levied on the customs value (calculated as the sum of cost, insurance, and freight or CIF) of the imported goods at the following rates:

- **Costa Rica** (14 percent ad valorem for DAI, plus 1 percent corresponding to the Emergency Law or Law 6946, amounting to a total tariff charge of 15 percent).
- **El Salvador, Guatemala**, **Honduras**, **Nicaragua, and Panama:** 15 percent for DAI with the exception of chocolates whose DAI is 5 percent and powdered drinks that include sugar or other sweeteners whose DAI is 10 percent.
- **Dominican Republic**: PBVNs are subject to 20 percent ad valorem tax for DAI. This tariff must be paid only on imported products (not those manufactured in the national territory), which do not enter the country covered by a free trade agreement. This tax is determined on the customs value (cost, insurance, and freight) of the imported merchandise.

2. Excise Taxes

Most of the countries in the region apply an internal tax to PBVN called Value Added Tax (VAT). This tax is applied in a "cascade", that is, taking the value that results from adding the CIF price of the goods Imported, the amount of import duties and other surcharges charged due to the importation or entry of the merchandise into the territory. All PBVN included in the study are subject to VAT and other internal taxes levied as follows by each country:

- **Costa Rica** levies three kinds of taxes: (i) VAT[52] at 13 percent; (ii) a specific tax, which varies according to the product and which is calculated using the unit of measurement and the

[52]Established by Law 6826 General Sales Tax, of November 8, 1982 and its regulations thereunder.

amount in national currency (*colones*); [53] and (iii) the INDER[54] tax, the rate of which varies by product.

- **El Salvador** levies two kinds of taxes. The first is a 13 percent tax on the transfer of personal property and on the provision of VAT services. The second is a specific or ad valorem tax, the rate of which varies according to the number of units and the sale price of the product (5 percent on isotonic drinks, fortifiers, juices, nectars, soft drinks and concentrated or powdered versions and 10 percent on carbonated, energizing, or stimulant beverages and concentrated or powdered versions) or according to the number of liters sold (a US$0.20 tax on energy drinks or stimulants).
- **Guatemala** levies a 12 percent VAT.[55]
- **Honduras** levies three kinds of taxes: (i) VAT[56] at 15 percent; (ii) a production and consumption tax (PYC),[57] the rate of which varies depending on the type of product; and (iii) a Selective consumption tax (SEL),[58] the rate of which varies by the type of product (only applies to chewing gum).
- **Nicaragua** levies two kinds of taxes**: (**i) VAT[59] at 15 percent, which is cascaded except in the case of carbonated beverages with added sugar or flavors where the taxable base is the retail price, and (ii) a selective consumption tax (ISC),[60] the rate of which varies depending on the merchandise and which is also cascaded except in the case of carbonated beverages with added sugar or flavors where the taxable base is the retail price.
- **Panama** levies two kinds of taxes: (i) a 5 percent selective consumption tax on certain goods and services (ISC),[61] and (ii) the personal property transfer Tax (ITBMS in Spanish). However, the latter tax is not levied on the PBVN included in this study**.**
- **Dominican Republic** levies an internal tax on PBVN, called the Tax on Transfers of Industrialized Goods and Services (ITBIS in Spanish).[62] Its rate is 18 percent and it is cascaded to most of the PBVN included in this study.

3. Structure of Customs Duties and Internal Taxes

Table 3 presents examples of how taxes would be calculated in each country on a hypothetical soft drink whose import customs value is US$10 and which does not benefit from the tariff

[53]Established through Law No. 7972 Creation of tax burdens on liquors, beers and cigarettes to fund a comprehensive protection plan for adults, children and adolescents at risk, disabled or abandoned persons, the rehabilitation of alcoholics and drug addicts, support for the work of the Red Cross and the repeal of lower taxes on agricultural activities and their subsequent replacement of December 22, 1999, Act No. 8114 Simplification and Tax Efficiencies of July 4, 2001; as amended from time to time.
[54]Established by Law No. 6735 of March 29, 1982 and amended by Law No. 9036 of May 11, 2012
[55]Established by Decree number 27-92, of January 1, 1992 as amended from time to time.
[56]Established by Decree No. 24 from December 20, 2012, its regulations thereunder, as amended from time to time
[57]Established by Decree No. 17-2010 of April 22, 2010 as amended from time to time.
[58]Established by Decree 58 of August 2, 1982, as amended from time to time.
[59]Established by Law number 822 published on December 17, 2012 and its regulations thereunder.
[60] Established by Law number 822 published on December 17, 2012 and its regulations thereunder
[61]Established by Executive Decree number 84, of August 26, 2005 as amended from time to time.
[62]Established by Law 11, of May 16, 1992 as amended from time to time. Part III

benefits of a free trade agreement (which would only exempt the soft drink from import duty but not from other internal taxes). As can be seen in the table, once all of the import taxes have been applied, the tax burden on this type of product could vary from between US$2.07 in Panama to US$4.16 in the Dominican Republic. In other words, the taxes levied on the importation of beverages pushes up the cost of the imported product beyond its imported CIF value. Also, in most Central American countries, carbonated and sugary drinks are subject to additional ad valorem or specific taxes as well.

The cascading of VAT makes it more attractive to have tariff preferences or a reduction in DAI. The lower the import duties, the lower the tax that the merchant must pay on sales of the product.

Table 3: Estimation of Customs Duties and Internal Taxes on Sugar-sweetened Beverages in Central America, Panama, and the Dominican Republic

COUNTRY	Costa Rica (₡: colones)	El Salvador (SVC: colones)	Guatemala (Q: quetzales)	Honduras (L: lempiras)	Nicaragua (C$: colones)	Panama (PAB: balboas)	Dominican Republic (RD$: pesos)
Datos del producto							
Description	Carbonated flavored sugary drink (soda)						
Customs value (CIF)	US$10 (CIF)	US$10 (CIF)	US$10 (CIF)	US$10 (CIF)	US$10 (CIF)	US$10 CIF)	US$10 (CIF)
Exchange rate (US$)	₡575,00 Colones /US$1	SVC 8,75/US$1	Q7,41 / US$1	HNL23,59 / US$1	NIO 31,21 / US$1	PAB B1/ US$1	DOP 49,42/US$1
Quantity	Twelve bottle box (750 ml ea.)	Ten bottle box 750 ml	Ten bottle box 750 ml	Ten bottle box 750 ml	5 boxes (8 pack carriers/350 ml.	Ten bottle box 750 ml	Ten bottle box 750 ml
Import Tariff Duties (DAI)	14% [1] 1% [2]	15% [1]	15% [1]	15% [1]	15% [1]	15% [1]	20% [1]
Other taxes	INDER Tax; Specific tax	ABE tax 10% EBE tax $0,20		PYC tax (0,7177 lempiras/Liter)	ISC Tax 9%	ISC Tax 5%	
Value-added Tax (Sales/import tax)	13%	13%	12%	15%	15%	15%	ITBIS Tax 18%
Tax Formula							
Customs value (CIF) x Exchange rate (10 x local currency)	₡5,750	₡87,50	Q74,0	L235,90	C$312,10	US$10	RD$494,20
DAI = (10 x CIF) x 15%	₡805 + ₡57,50	₡13,12	Q11,11	L35,38	C$46,81	US$1,50	RD$98,84
Other taxes	INDER = ₡232,45 Specific = ₡665,64	₡13,12		PYC= L5,38	C$32,30	US$0,575	

Value-added Tax = (CIF + DAI+ OI) x VAT %	₡976,38	₡13,25	Q10,22	L41,49	C$56,68		RD$106,75
Total duties and internal taxes (total tax burden) (local currency)	₡2.737,02	₡16,51	Q21,33	L82,25	C$135,79	US$2,07	RD$205,59
Total, duties and internal taxes equivalent in US$ for ten bottle box 750 ml ea.	US$3,97	US$2,13	US$2,88	US$3,49	US$2,33	US$2,07	US$4,16

Notes: [1] CAFTA not applicable. [2] Law 6946 – preferential tariff not aplicable.

III. Availability and Quality of Freshwater and its Potential as an Alternative to Sugar-Sweetened Beverages

Increasing the tax burden on these products has some positive effects on the economy and society itself. On the consumer side, it encourages consumers to stop consuming or reduce their consumption of these goods. This implies that the tax gives them an incentive to replace these products with others with less sugar. On the production side, it incentivizes producers to reformulate their products by eliminating or reducing the amount of added sugars. Although levying taxes on sugar-sweetened beverages has been shown to reduce sugar consumption, the availability of a low-cost and safe replacement beverage such as potable water suitable for human consumption is indispensable.

Central America has a great abundance of water resources. There is over 10,000 cubic meters of fresh potable water available per inhabitant per year, which is very high according to the United Nations. Over the past 40 years, the coverage of running water in houses has risen from 57 percent to 90 percent in the sub-region. However, there are some challenges remaining regarding the management of the available water resources and in providing the population with access to safe water, mainly in rural areas. In this section, the availability, supply, and quality of water in the sub-region will be discussed, including those key challenges.

A. Water Supply and Quality

In Central America, Panama, and the Dominican Republic, as in the vast majority of developing countries, there are marked inequalities in terms of quality, access, and coverage of services between the urban and rural areas. This situation prevails in both the health and water sectors and significantly affects the rural population throughout the sub-region, particularly the extreme poor. The World Health Organization estimates that 88 percent of diarrheal diseases result from unsafe water supply and poor sanitation and hygiene. An efficient, well-managed, and safe water supply system reduces diarrhea morbidity by 6 to 21 percent, while improving water quality through chlorination at the point of consumption can reduce diarrhea episodes by 35 to 39 percent.

In some countries, water quality monitoring is the responsibility of the health sector, which usually has little information and allocates few resources to the task. Table 4 presents information on water supply and sanitation coverage in Central American countries by rural and urban areas and for the poorest households. In urban areas, the coverage of and access to water and sanitation services depend on the capacity of water operators (see Annex 1) to provide an efficient service in return for fair and adequate tariffs.[63] Institutional organization is fundamental for sustainable and sustainable water and sanitation systems. In rural areas, the problem is more complex since it generally involves the direct participation of communities and their grassroots

[63] Worldwide, it is acknowledged that the poorest pay more for the water that they consume as they have to buy it bottled or from water tankers because they lack efficient and good quality water service.

organizations. In communities with a strong indigenous presence, one of the main challenges hindering water and sanitation coverage is linked to the sustainability of water systems.

Table 4: Water Supply and Sanitation in Central America and Panama

Countries	Population in millions	Annual water availability per capita *	Water supply coverage (%)			Sanitation coverage (%)			Population living in poverty (%)	
			URBAN	RURAL	TOTAL	URBAN	RURAL	TOTAL	TOTAL	EXTREME
BELIZE	0.37	60.479	99,07	95,61	97,13	91,12	84,04	87,16		
COSTA RICA	4.90	23.502	99,75	99,53	99,70	98,02	94,27	97,5	18,6	7,4
EL SALVADOR	6.37	4.288	97,83	83,36	93,01	93,19	86,98	91,13	41,6	12,5
GUATEMALA	16.91	7.826	97,50	89,44	93,60	80,72	53,14	67,36	67,7	46,1
HONDURAS	9.26	11.413	98,67	84,33	92,18	83,67	75,07	79,78	74,3	50,5
NICARAGUA	6.21	27.047	97,38	60,69	82,26	85,84	62,81	76,35	58,3	29,5
PANAMA	4.09	35.454	98,86	87,31	95,00	85,71	59,24	76,87	21,4	11,5

Sources: World Bank Group, project team's estimation based on Worldbank.org; Global Water Partnership (GWP) Central America, August 2018; ECLAC and WHO (OMS-Unicef, 2018, WASH Data for 2018. https://washdata.org/
Note: * Annual water availability in m^3 per capita. Average annual water availability per capita of 100.000 m^3 is considered to be very high.

These drinking water and sanitation coverage figures fail to measure: (i) the problems faced by the poor in accessing water; (ii) the efficiency of water supply (whether the service is provided with no interruptions); (iii) the quality of the water delivered; and (iv) how wastewater is treated and discharged. Therefore, notwithstanding the progress made in extending water and sanitation coverage in these countries, there remains a need to measure the quality of the services being provided.

Table 5 shows the status of service levels for drinking water and sanitation in 2000 and in 2015. Water service can be classified as "at least basic," "limited," "unimproved," or "surface water." Sanitation can be categorized as: "at least basic," "limited," "unimproved," and "open defecation."

In all of the Central American countries and Panama, there was a higher percentage of "at least basic" service and an equal or greater percentage of "limited" services in 2015 than in 2000. The percentage of "surface water" service had declined since 2000, with the highest rate (3 percent) being found in 2015 in El Salvador and Nicaragua. The percentages of "unimproved" had also decreased across the board. This shows that there had been a considerable improvement in drinking water in all of the countries in those 15 years. In the case of sanitation, a similar picture emerged as for water service, in that the percentages of "at least basic" and "limited" services

had increased or at least remained the same in 2015 as in 2000, while the percentages of "unimproved" and "open defecation" had dropped. Based on these indications of progress between 2000 and 2015, we undertook a review of each country's water and sanitation situation to determine which measures could not only increase the coverage but also improve the quality of water and sanitation services.

Table 5: Service Levels and National Drinking Water and Sanitation Ladders

Country	Year	Population (thousands)	Urban	National Drinking Water Ladder					National Sanitation Ladder				
				At least basic	Limited service (>30 minutes)	Unimproved	Surface wáter	Annual rate of change to basic service	At least basic	Limited (shared)	Unimproved	Open defecatiion	Annual rate of change to basic service
Belize	2000	247	48	88	1	8	3	0,64	83	8	5	4	0,31
	2015	359	44	97	1	2	0		87	9	3	1	
Costa Rica	2000	3,925	59	94	0	2	3	0,39	94	1	4	1	0,2
	2015	4,808	77	100	0	0	0		97	1	2	0	
El Salvador	2000	5,812	59	80	3	11	5	0,85	82	6	1	11	0,61
	2015	6,127	67	93	4	0	3		91	7	1	2	
Guatemala	2000	11,689	45	85	1	10	3	0,54	59	8	19	14	0,54
	2015	16,343	52	94	1	4	2		67	9	18	6	
Honduras	2000	6,243	45	82	1	5	12	0,66	62	7	11	20	1,19
	2015	8,075	55	92	1	5	2		80	9	5	7	
Nicaragua	2000	5,027	55	81	1	14	4	0,11	60	2	21	16	1,06
	2015	6,082	59	82	1	13	3		76	3	14	7	
Panama	2000	3,029	62	88	1	7	4	0,45	64	6	22	8	0,85
	2015	3,929	67	95	1	3	1		77	7	12	3	

Definitions: *drinking water fit for consumption does not necessarily imply that it is a source free of bacterial contamination or excess minerals.

Service Level	Drinking Water	Sanitation
SAFELY MANAGED	A basic drinking water source that is located on the premises, available when needed and free of fecal and priority chemical contamination	Private improved facility where fecal wastes are safely disposed on site or transported and treated off-site
BASIC	Improved source within 30 minutes round trip collection time	Use of an improved sanitation facility that is not shared with other households
LIMITED	Improved source over 30 minutes round trip collection time	Use of an improved sanitation facility that is shared with two or more households
UNIMPROVED	Drinking water from unprotected dug wells, unprotected springs	Pit latrines without a slab or platform, hanging latrines, and bucket latrines.

SURFACE WATER	River, dam, lake, pond, stream, canal or irrigation channel	Not applicable
OPEN DEFECATION	Not applicable	Human feces disposed of in fields, forest, bushes, open bodies of water, beaches, or other open spaces or disposed of with solid waste

B. Availability of Freshwater Sources

The existence of freshwater resources in a country does not determine the drinking water coverage for the entire population. To determine how much water is available exclusively for human consumption, it is necessary to identify the sources and various uses of water, including waste. Nevertheless, it is also important to take into account the total supply of water and its quality. "Good quality water" refers to water suitable for human consumption (potable) that is supplied to the population on a continuous rather than intermittent basis. [64]

As noted in Table 6, Costa Rica has a dependency ratio of 0 percent, given that all renewable water resources originate inside the country, so it is the country with the lowest dependency ratio, while El Salvador has the highest dependency ratio at 40.5 percent. According to the United Nations categories, total annual freshwater resource per capita is high or very high in all countries except El Salvador where water availability is rated as average.

Table 6: Water Resources in Central America and Panama

Country	Total internal renewable water resources, 10^9 m^3/year	Total external renewable water resources 10^9 m^3/year	Total renewable water resources 10^9 m^3/year	Dependence (%)	Annual primary and secondary freshwater extraction 10^9 m^3/year	Total water resources per capita m/inhab/year*
Belize	15,26	6,47	21,73	29,79	0,80	60.479
Costa Rica	113,00	0,00	113,00	0,00	2,40	23.502
El Salvador	15,63	10,64	26,77	40,50	3,80	4.288
Guatemala	109,20	18,71	127,90	14,63	2,60	7.826
Honduras	90,66	1,50	92,16	1,63	1,20	11.413
Nicaragua	156,20	8,31	164,50	5,05	0,70	27.047
Panama	136,60	2,70	139,30	1,94	0,30	35.454
*						
Sources: Global Water Partnership, FAO, 2014, http://www.fao.org/nr/water/aquastat/data/query/index.html?lang=es **Notes: *** Disaggregated data. Annual water availability is given in m^3 per capita. Average annual water availability per capita of 100.000 m^3 is considered very high						

[64] http://www.undp.org/content/undp/es/home/sustainable-development-goals.html

Despite this high level of water availability, one of the main reasons why water is wasted or lost is because of the occurrence of extreme events such as droughts and floods, which may also be exacerbated by climate change. To deal with this problem, countries need forecasting, adaptation, and prevention capacity to avert or minimize any negative social, economic, and environmental effects. The sub-region is subject to hurricanes between May and November and occasionally to droughts from January to April, as in 2014 when its lack of capacity to deal with climate-related emergencies and of water-collecting infrastructure became evident. These climate events together with the fact that 70 percent of the population lives in the Pacific basin where they have access to only 30 percent of the available freshwater resources create spatial and temporal imbalances in the water supply. The sub-region has a rather rugged topography with a mountainous landscape, which makes communication and access to services difficult for the population, especially indigenous peoples living in the highlands. Because of their vulnerability to climate variability and change, these countries are assessed as being at high risk. It should be noted that 40 percent of Central America's territory is characterized by water basins that cross national borders (see Figure 24).

Figure 24: Map of Central America and Panama, with Countries and Cross-border Water Course Basins

Sources: WHO (2017), OMS, 2017. Progresos en materia de agua potable, saneamiento e higiene. Las tasas anuales de cambio en puntos porcentuales por año, calculadas como la diferencia entre las estimaciones del 2015 y el 2000, divididas por 15. http://apps.who.int/iris/bitstream/handle/10665/260291/9789243512891-spa.pdf?sequence=1

The global effort to achieve the clean water and sanitation targets under the Sustainable Development Goals by 2030 implies that this effort must take into account not only households

but also institutional settings, schools, health centers, and workplaces. This has also been reinforced by Education for All strategies that highlight how providing water, sanitation, and hygiene (WASH) in schools increases enrollment rates and improves learning outcomes, especially for girls, by providing a safe, inclusive and equitable learning environment for all.[65]

IV. Fiscal Impact of Imposing Taxes on Sugar-sweetened Beverages in Central America, Panama, and the Dominican Republic

The effects of sugar-sweetened beverages (SSBs) on health have led to a growing interest in various measures intended to curtail their consumption. Given the effectiveness of taxation in curbing the consumption of other harmful substances, such as tobacco[66/67] and alcohol,[68] the imposition of taxes on SSBs is one of the most frequently discussed measures. A recent systematic review including meta-analyses of articles published between 2000 and 2013[69] showed that SSBs would exhibit a price elasticity (in other words, a percentage reduction in consumption due to a percentage price increase of, for example, 10 percent) equal to -1.3 percent. This would indicate that the reduction in consumption of SSBs would be higher in percentage terms than any rises in their price in response to the taxes.

A. Simulation of a Tax on Sugar-sweetened Beverages and its Impact on Prices, Consumption, and Tax Revenues

1. Household Expenditure on Sugar-sweetened Beverages (SSBs)

Based on each country's Consumer Expenditure Surveys, it is possible to determine the percentage of average total household expenditure ("budget share") devoted to SSB consumption. The Consumer Expenditure Surveys for each country are as follows (see details in Annex 2).

- Costa Rica: “National Survey of Household Income and Expenditure 2013”
- El Salvador: “National Survey of Household Income and Expenditure 2005-2006”
- Honduras: “Encuesta Nacional de Condiciones de Vida 2004”
- Nicaragua: “Nicaragua Living Standard Measurement Survey 2001”
- Panama: “Standard of Living Survey 2008”
- Dominican Republic: “National Survey of Household Income and Expenditure 2007.”

Figures 25, 26, and 27 present a breakdown of the budget share of sugar-sweetened beverages in for Costa Rica, El Salvador, Honduras, and the Dominican Republic by quintile of total expenditure, place of residence, and sex of the household headship respectively. Nicaragua and

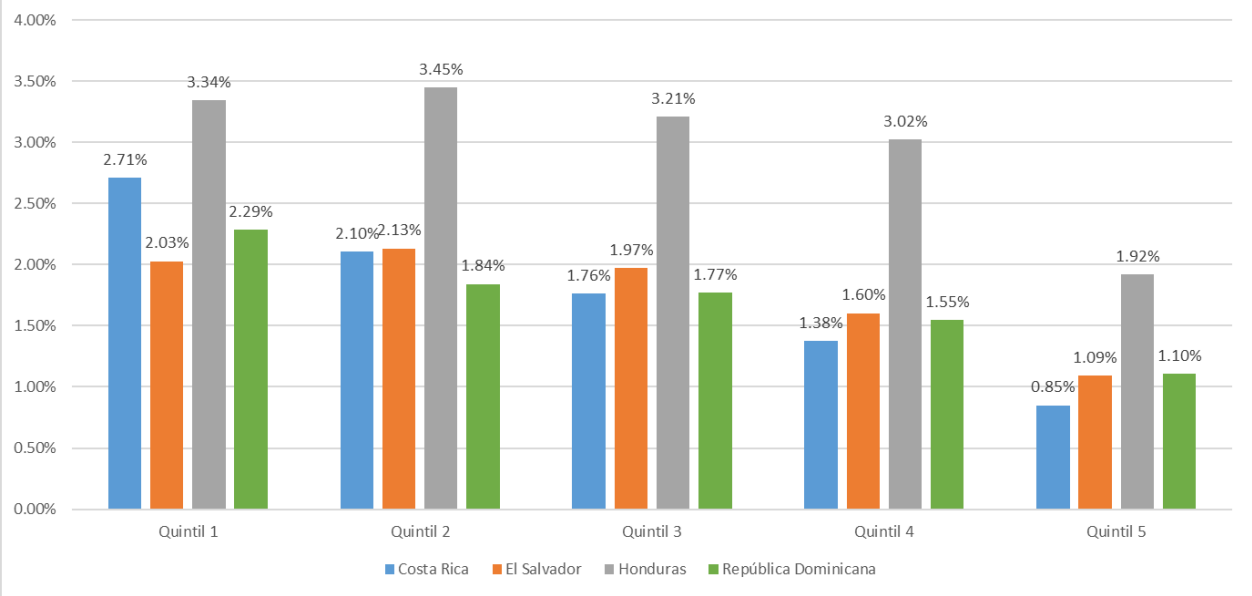
[65] http://unesdoc.unesco.org/images/0023/002322/232205e.pdf
[66] Patricio V. Márquez, Blanca Moreno-Dodson, et al (2017). Reforma del impuesto al tabaco. EN LA ENCRUCIJADA FRENTE A LA SALUD Y EL DESARROLLO, GBM, Washington, DC, septiembre 2017.
http://documents.worldbank.org/curated/en/docsearch/report/119792
[67] Patricio V. Marquez, Blanca Moreno-Dodson, et al Washington, D.C, March 2018.
[68] Deaton A., and J. Muellbauer (1980). An Almost Ideal Demand System. *The American Economic Review*. 1980;70(3):312-26.
[69] Cabrera Escobar, M.A., J.L. Veerman, S.M. Tollman, M.Y. Bertram, and K.J. Hofman **.** “Evidence that a tax on sugar-sweetened beverages reduces the obesity rate: a meta-analysis.” *BMC public health*. 2013;13:1072.

Panama are not included since their surveys are not comparable with the others because they rely on the respondent's memory of expenditures rather than on the reporting of expenditures as they are incurred.

Similarly, in the document: "The impact of the price on the consumption of sugary drinks in six countries of Central America and the Caribbean"[70], which is one of the base documents for this regional summary, the consumption of sugary drinks from all countries, including Nicaragua and Panama.

Figure 25 shows that households in the lowest total expenditure quintiles report spending the highest shares of their budget on sweetened beverages. In Costa Rica and the Dominican Republic, households with the highest budget share are in the quintile with the lowest total expenditure, which drops down to the quintile with the highest expenditure. In El Salvador and Honduras, the highest budget share is registered by households in quintile 2.

Figure 25 Sugar-Sweetened Beverage Budget Share by Quintile of Total Expenditure

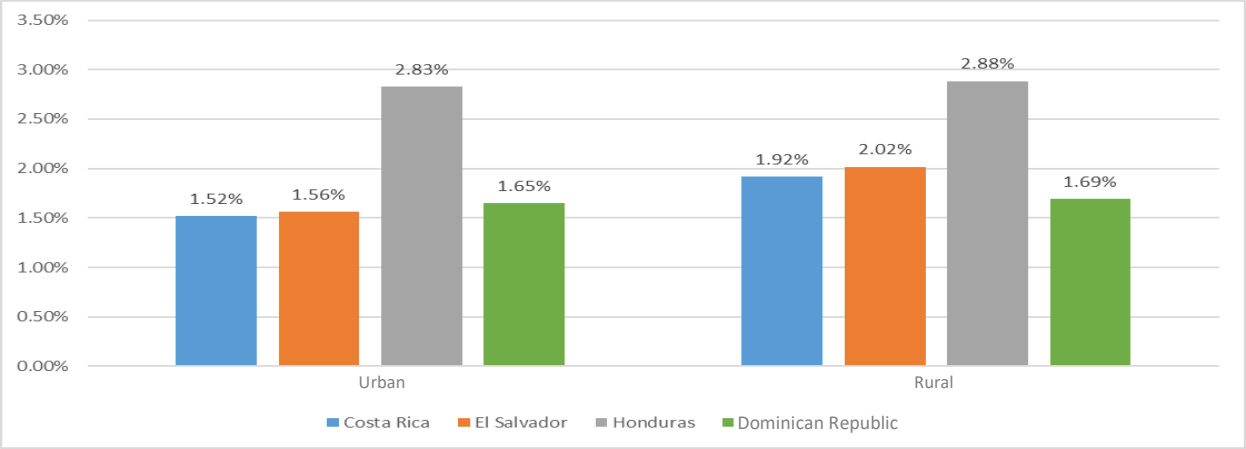


Source: World Bank Group, project team

Figure 26 shows the average budget share by place of residence. It shows that urban households allocate a lower budget share to sweetened beverages than rural households. The largest differences between rural and urban areas can be seen is in Costa Rica and El Salvador.

[70] Paraje, G. The impact of the price on the consumption of sugary drinks in six countries of Central America and the Caribbean, 2018

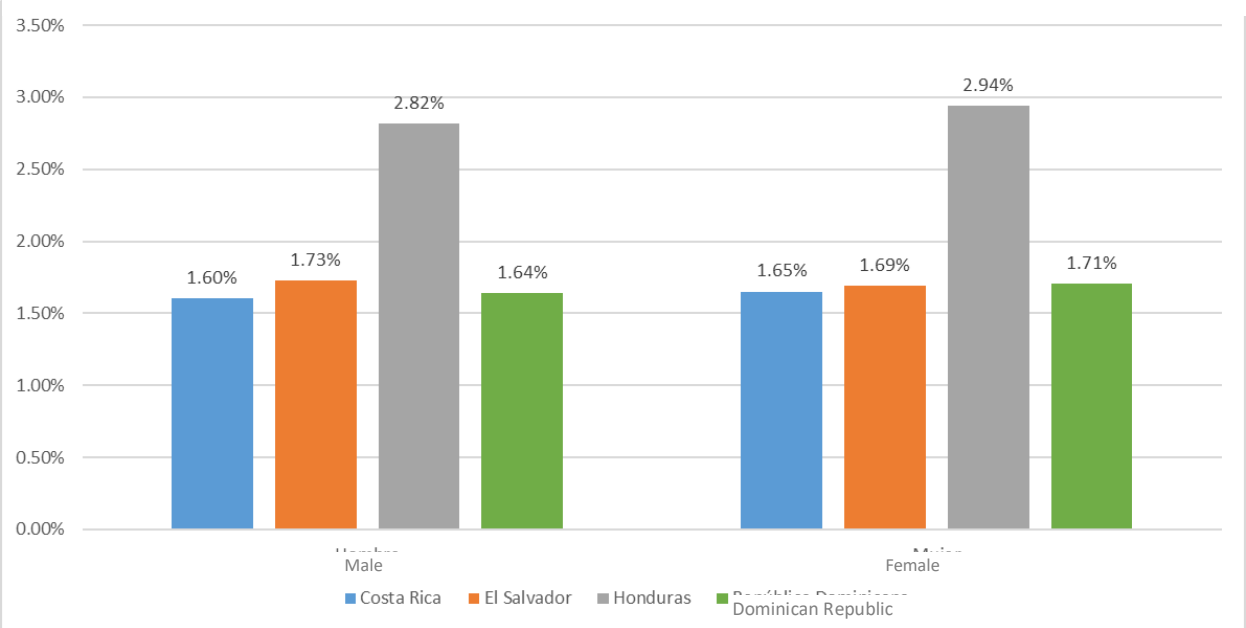
Figure 26 Sugar-Sweetened Beverage Budget Share by Place of Residence



Source: World Bank Group, project team's estimation.

Finally, Figure 27 shows the average share of household budgets spent on sugar-sweetened beverages by the gender of the household head. In Costa Rica, Honduras, and the Dominican Republic, female-headed households reported spending a higher share of their budgets on SSB than male-headed households, while in El Salvador, the opposite was the case.

Figure 27: Sugar-Sweetened Beverage Budget Share by Gender of Household Head



Source: World Bank Group, project team.

2. Price Elasticity of Demand and Income Elasticity of Demand

We made the following assumptions about the price elasticity of demand and the income elasticity of demand in simulating the impact of SSB tax increases, their effect on prices at the point of sale, and on consumption:

- The price elasticity of demand implies that the greater the price elasticity, the greater the decline in SSB consumption in response to a given percentage change in price (the price elasticity falls in the inelastic range, but closer to -1 than to zero, it is negative).
- The income elasticity of demand implies that the higher the income elasticity, the greater the SSB consumption in response to a given percentage change in income as income elasticity tends to be elastic (positive) or somewhat more elastic.

In this section, we outline the price elasticity and total expenditure/elasticity estimations made for the sub-region. For those countries for which information was available, we present estimates on the impact of a proposed SSB tax according to the estimated elasticities. The consumption quantities reported by Euromonitor International (EI) in the previous section [71] are also used here.

The first striking thing that emerges is the robustness of findings against different data sources such as national surveys (with varying degrees of quality). For all countries, their own price elasticities were negative and total expenditure (as a proxy for income) was positive. In all cases the findings were statistically significant.

As shown in Table 7, the price elasticities range from -1.404 to -0.657. In other words, all of the countries except Honduras fall within the range of -1.2 and -0.6 shown by other similar studies. The (unweighted) average of the elasticities is around -1.

Table 7: Summarized Price Elasticity for Sugar-Sweetened Beverages in Central America, Panama, and the Dominican Republic

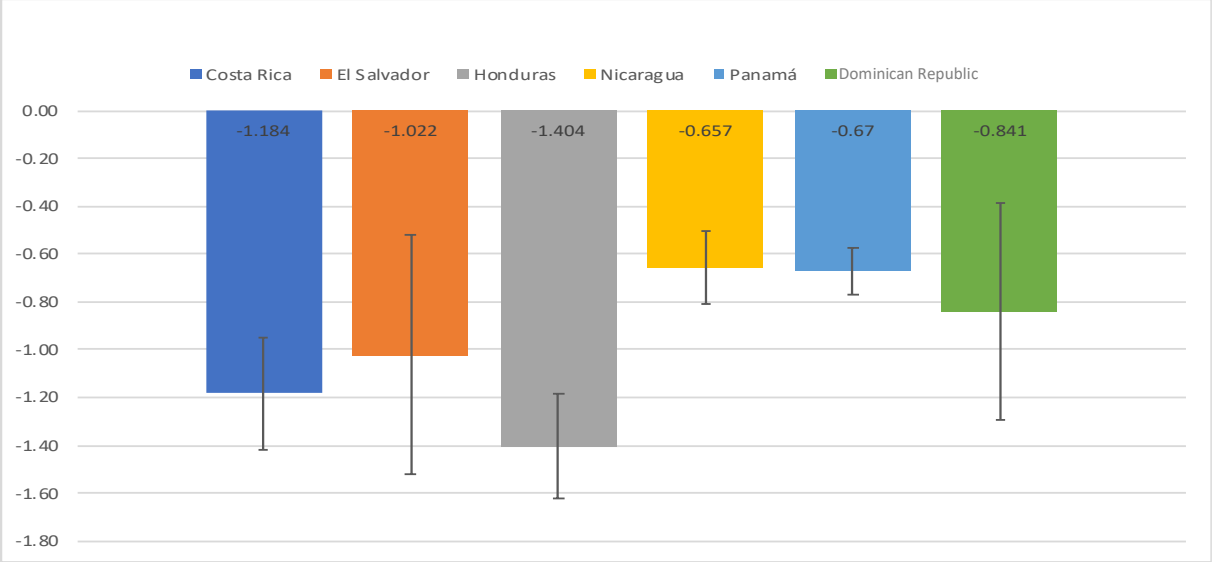
Country	Estimation Method	Own price elasticity	Elasticity/total expenditure
Costa Rica	AIDS per quality	-1,184	0,867
El Salvador	AIDS	-1,022	1,032
Honduras	QUAIDS	-1,404	1,039
Nicaragua	QUAIDS	-0,657	0,759
Panama	AIDS	-0,574	0,654
Dominican Republic	QUAIDS	-0,841	1,167
Average (unweighted)		-0,964	0,920

[71] This analysis includes Guatemala using data from a similar study not released by the author.

Fuente: Paraje, G (2018). The impact of the price on the consumption of sugary drinks in six countries of Central America and the Caribbean.
Nota: AIDS: almost ideal demand system; QUAIDS: quadratic almost demand system.

Figure 28 illustrates these findings and shows that the only cases where price elasticities are significantly less than 1 (in absolute value) are those of Nicaragua and Panama, the two countries with household surveys that report expenditures differently (the figure shows, in addition to the point estimate, the 99 percent confidence intervals). Therefore, it is probable that the elasticities in these cases are less than 1 (in absolute value) because of the type of survey that they used. The dispersion between the elasticities may be due to a range of different factors such as advertising in different countries, the demographic structure of the population, or the degree of access there is to safe water sources. Also, for the countries with the poorest data quality in terms of units of measurement (El Salvador, Honduras and the Dominican Republic), the attribution decision could affect the estimate, so these particular results should be interpreted with some caution.

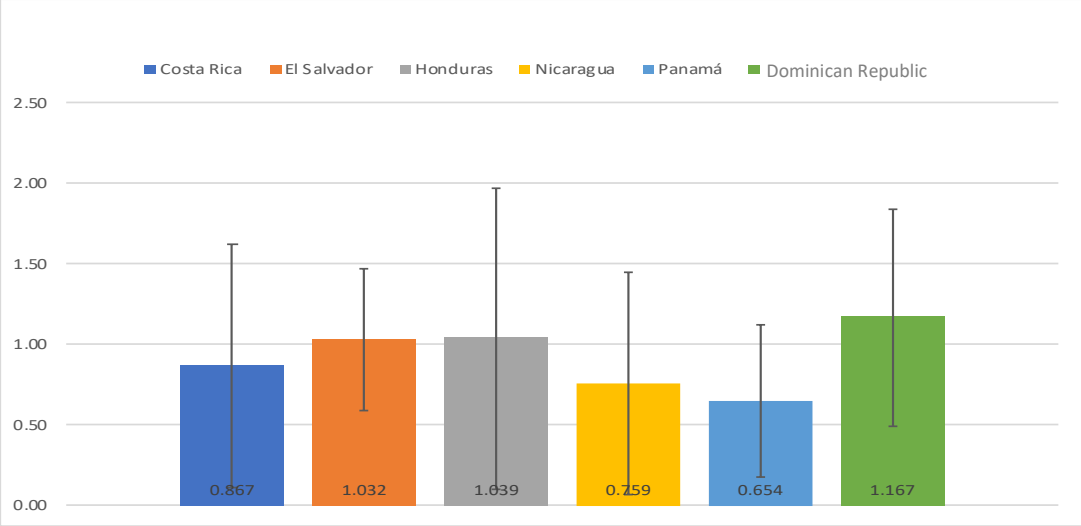
Figure 28: Price Elasticity for Sugar-Sweetened Beverages in Central America, Panama and the Dominican Republic



Source: *World Bank Group, project team.*

In the case of elasticity expenditure, this average is around 1, which indicates that this is a normal commodity (for example, when total household expenditure increases, demand for the commodity increases, provided that all other things remain constant). Figure 29 shows that, even for countries with price elasticity and expenditure less than 1, the null hypothesis that such estimates are different from 1 cannot be ruled out (the 99 percent confidence intervals include 1 in all cases). This would imply that a rise in household expenditure (or income, since both are correlated) could cause a rise in the demand for SSBs by the same proportion as the rise in household expenditure or income provided that all other variables affecting demand remain constant.

Figure 29: Price Elasticities of and Total Expenditure on Sugar-Sweetened Beverages in Central America, Panama, and the Dominican Republic



Source: *World Bank Group, project team.*

3. Basic Assumptions and Results of Tax Changes by Country

We took the price elasticities and total expenditure (as income proxies) presented above as the basic assumptions for simulating tax changes in Central America, Panama, and the Dominican Republic.

Costa Rica: According to Table 8, an increase in the specific tax that implies a 20 percent price rise would yield SSB excise tax revenue ranging between 75.2 billion and 79.7 billion *colones* in the mid-point scenario (average elasticity).

Table 8: Simulating a Tax Increase in Costa Rica

Specific tax increase (equivalent to a 20% price rise in average)								
Price elasticity of demand	Pass-through	Off-trade consumption (million liters)	Average price per liter (in CRC)	Price increase (%)	New Price (average)	Consumption change (%)	Consumption change (million liters)	Tax revenue (million CRC)
Average price elasticity -1.115	0.9	392.0	1271.7	18%	1350.5	-20.1%	78.7	79690
	1.0	392.0	1271.7	20%	1526.0	-22.3%	87.4	77467
	1.1	392.0	1271.7	22%	1706.6	-24.5%	96.2	75244
Lower bound –0.939	0.9	392.0	1271.7	18%	1350.5	-16.9%	66.2	82856
	1.0	392.0	1271.7	20%	1526.0	-18.8%	73.6	80984
	1.1	392.0	1271.7	22%	1706.6	-20.6%	80.9	79113
Upper bound –1.291	0.9	392.0	1271.7	18%	1350.5	-23.2%	91.1	76525
	1.0	392.0	1271.7	20%	1526.0	-25.8%	101.2	73949
	1.1	392.0	1271.7	22%	1706.6	-28.4%	111.4	71374

In terms of reduced consumption (which is the ultimate goal of this public policy), decreases ranging between 20 percent and 24.5 percent would occur in the mid-point scenario. Outside this mid-point scenario, reductions would vary between 17 percent and 28 percent. In short, an increase in the specific tax that raises the current price by 20 percent would shrink SSB consumption by between 0 percent (zero price elasticity) and 24.5 percent (infinite price elasticity and 1.1 pass-through[72]). It is possible that, in the short run, the reduction will be closer to the inelastic supply scenario (zero elasticity) and over time will tend towards a more elastic supply scenario.

This simulation has a major constraint that must be considered. The average initial price on which we performed the simulations embedded the tax that is currently in force in Costa Rica. It is not known what percentage of the final price represents this tax (because it is a weighted average price and the tax varies by type of beverage) so it was not possible to subtract the current tax to reach a pre-tax price. Thus, it is highly likely that the simulations displayed overestimate the impact of the simulated tax in terms of a price increase, a decrease in SSB consumption, and growth in tax revenues.

Guatemala:

The simulation results for Guatemala are listed in Table 9. In the mid-point scenario (average price elasticity and pass-through equal to 1), a specific tax that pushed up the price by 20 percent would reduce consumption by 27 percent (109 million liters of soft drinks would not be consumed, excluding bottled water). Tax revenue would be between 503 and 543 million *quetzals*.

Table 9: Simulating a Tax Increase in Guatemala

Specific tax increase (equivalent to a 20% price rise in average)								
Price elasticity of demand	Pass-through	Off-trade consumption (million liters)	Average price per liter (in QTZ)	Price increase (%)	New Price (average)	Consumption change (%)	Consumption change (million liters)	Tax revenue (million QTZ)
Average price elasticity -1.390	0,9	1506,0	9,2	18%	9,8	-25,0%	376,8	2088,5
	1,0	1506,0	9,2	20%	11,1	-27,8%	418,7	2011,1
	1,1	1506,0	9,2	22%	12,4	-30,6%	460,5	1933,6
Lower bound –1.135	0,9	1506,0	9,2	18%	9,8	-20,4%	307,7	2216,2
	1,0	1506,0	9,2	20%	11,1	-22,7%	341,9	2153,0
	1,1	1506,0	9,2	22%	12,4	-25,0%	376,1	2089,8
Upper bound –1.645	0,9	1506,0	9,2	18%	9,8	-29,6%	445,9	1960,7
	1,0	1506,0	9,2	20%	11,1	-32,9%	495,4	1869,1
	1,1	1506,0	9,2	22%	12,4	-36,2%	545,0	1777,5

[72] When determining the potential effect of a tax rise, it is necessary to determine not only the pass-through rate (which depends, inter alia, on the market structure) but also the price elasticity of supply, which is unknown. The pass-through is key to determining the impact of such tax, in other words, how much the price will go up with the new tax and how much below the initial price the supplier will receive. Although this parameter is not known for Costa Rica, it is known that it ranges between 0 and infinite.

As in Costa Rica, the simulations have a major constraint, since the average initial price on which the simulations are run incorporated the tax that is currently in force in Guatemala. It is unclear what percentage of the final price would correspond to this tax (because it is a weighted average price and the tax varies by type of beverage), so it was not possible to subtract the current tax to obtain a pre-tax price. Thus, it is highly likely that the simulations displayed overestimate the impact of the simulated tax in terms of a price increase, a price increase, a decrease in SSB consumption, and growth in tax revenues.

Dominican Republic:

Table 10 lists the results of different simulations. Using the exact estimation of price elasticity and a pass-through equal to 1, we found that a specific tax raising the average price by 20 percent would result in a drop in consumption of some 145 million liters and an increase in tax revenue amounting to 7.3 billion Dominican *pesos*. In general, the different pass-through scenarios for the average elasticity show that the reduction in SSB consumption would be between 130 and 159 million liters.

Table 10: Simulating a Tax Increase in the Dominican Republic

Specific tax increase (equivalent to a 20% price rise in average)								
Price elasticity of demand	Pass-through	Off-trade consumption (million liters)	Average price per liter (in DOP)	Price increase (%)	New Price (average)	Consumption change (%)	Consumption change (million liters)	Tax revenue (million DOP)
Average price elasticity -0.841	0.9	860.9	51.4	18%	54.5	-15.1%	130.3	7505
	1.0	860.9	51.4	20%	61.6	-16.8%	144.8	7356
	1.1	860.9	51.4	22%	68.9	-18.5%	159.3	7208
Lower bound –0.498	0.9	860.9	51.4	18%	54.5	-9.0%	77.2	8051
	1.0	860.9	51.4	20%	61.6	-10.0%	85.7	7963
	1.1	860.9	51.4	22%	68.9	-11.0%	94.3	7875
Upper bound –1.184	0.9	860.9	51.4	18%	54.5	-21.3%	183.5	6959
	1.0	860.9	51.4	20%	61.6	-23.7%	203.9	6750
	1.1	860.9	51.4	22%	68.9	-26.0%	224.2	6540

Unlike the other countries above, the Dominican Republic does not levy any taxes on sugar-sweetened beverages, so the simulations presented are more plausible than those for the previous cases. Nevertheless, it should be remembered that, in all cases, this is a statistical exercise subject to statistical errors, which we have tried to minimize.

B. Summary of Tax Change Simulation Findings

Our simulation findings for Central America, Panama, and the Dominican Republic show that the demand for sugar-sweetened beverages in this sub-region behaves in accordance with internationally known evidence for both developed and developing countries. This would suggest that these SSBs satisfy similar needs in countries with similar markets in terms of competitive structure and the type and use of advertising, for example. The fact that the price elasticities of

these beverages are negative would imply that a well-designed tax policy would be effective in decreasing the consumption of these goods. On the other hand, the fact that the elasticities are close to or, in some cases, greater than 1 (in absolute value) has two important implications. First, a price increase (caused by a tax rise) could proportionally or more than proportionally decrease their consumption, which is desirable from a public health perspective. The second consequence is that taxation on these goods is not regressive since households are willing to cut down their spending on these goods when the price goes up. This would apply even to poorer households, which spend a higher proportion of their budget on these goods. We found that rural households and poorer households have higher price elasticities than wealthier ones, which is further evidence that these taxes would not be regressive and may be most effective in reducing consumption among the poor (who are often the most vulnerable in terms of health).

The health-related costs associated with the consumption of sugar-sweetened beverages, some of which are paid for from the public budget plus the indirect costs (such as the loss of human capital due to premature deaths and the loss of productivity from illness) constitute a typical case of negative externalities. These arise when the agents who implement an action (in this case SSB consumers) fail to consider all of the costs involved in that action because the price of such good in question does not reflect those costs. When there are negative externalities in consumption (in this case), the most effective policy from a social welfare perspective should be the imposition of a corrective levy.

Our findings on price elasticities and spending are in line with the international evidence. In all cases, these price elasticities show that the goods have a normal response and therefore an increase in the family budget would increase their demand for these goods, most of the time in a direct proportional manner. From a public policy viewpoint, this has important implications since it would be expected that as the economy grows (which implies increased family purchasing power over time), the demand for sugar-sweetened beverages would rise (assuming that the real price of these beverages and the rest of the variables remain constant). Thus, policymakers should consider introducing automatic adjustments of tax rates or amounts to compensate for such increases in purchasing power.

Our tax change simulations run show that, in all cases (sensitizing by price elasticity and pass-through), the SSB tax increases lead to significant decreases in the consumption of sugar-sweetened beverages and increases in tax revenues. However, in this case, the tax policy would

also have health-related objectives so the policy should be designed to lower consumption of sweetened beverages and, specifically, of calories (see Box 3).

Box 3: Effects of Sugar-Sweetened Beverages on Daily-Adjusted Life Years (DALYs)

According to data from the Institute for Health Metrics and Evaluation (IHMC), 645 daily adjusted life years (DALYs) were lost in Costa Rica; 778 in El Salvador; 1,497 in Guatemala; 654 in Honduras; 416 in Nicaragua; 516 in Panama; and 715 in the Dominican Republic due to the consumption of sugary drinks in 2016. In total, these countries lose 5,230 DALYs annually. These figures are expected to increase significantly over time, given the trends in overweight and obesity in these countries.

Source: Institute for Health Metrics and Evaluation, 2016

This is why the tax should be based on the caloric content of SSBs. This can be done by designing an SSB tax that has a specific charge per gram of added sugars. Thus, not only would consumers be encouraged to stop consuming these beverages or to prefer those with fewer calories, but producers would also be incentivized to reformulate their products so as to make them less calorie-dense.

Demand-side studies have shown that demand for sugar-sweetened beverages is price-sensitive (Table 11), so a well-designed SSB tax would be effective in reducing their consumption. The price elasticity of demand shows that, when the price of sweetened beverages is increased by 10 percent, demand decreases, provided that everything else remains constant (see Table 11).

Table 11: Expected Decrease in Demand for Sugar-sweetened Beverages after a 10% Tax Increase

Country	Expected decrease %
Costa Rica	**11.8%**
El Salvador	**10.2%**
Guatemala	**13.9%**
Honduras	**14.0%**
Nicaragua	**6.6%**
Panama	**6.7%**
Dominican Republic	**8.4%**

As suggested by the World Health Organization, SSB taxes should be designed to raise the price of sweetened beverages by at least 20 percent. Such taxes should also be levied on the caloric content of each type of beverage. In other words, they should be increased above the original 20 percent according to the amount of free sugars that they contain, for example, a tax of US$0.10 for every gram of free sugar per 100 milliliter of fluid**.**

C. Assessing the Impact of a Tax Increase on Sugar-sweetened Beverages in Selected Countries

To assess the impact of sugar-sweetened beverage taxation on the sales price and consumption of SSBs and the resulting tax revenues raised in Central America, Panama, and the Dominican Republic, we modeled multi-year simulations for the period 2018 to 2020 and assumed either that the implementation of the tax increase was staggered (scenario 1) or was a one-off increase of 20 percent (scenario 2). The price elasticity, income elasticity, and pass-through assumptions were the same as those used in Table 8 (Costa Rica), Table 9 (Guatemala), and Table 10 (Dominican Republic). Scenario 2 has been formulated in such a way that it can be compared with the tax change simulations presented in those tables.

The base year data are from either 2016 or 2017 depending on what data were available from the countries' Ministries of Finance and Economic Development, tax collection authorities, Customs, and national tax statistics services. We also consulted the World Bank Group[73] and International Monetary Fund[74] databases (see Annex 3).

Contrary to the simulations in Tables 8 and 9 for Costa Rica and Guatemala for which the initial pre-tax average price was not available, these simulations include the specific taxes and ad valorem taxes applicable to sugar-sweetened beverages in each country. The parameters and assumptions made under the simulation model adapted to the tax structures prevailing in each country are consistent with those used in Table 10 above.

1. Costa Rica:

Costa Rica, where the consumption of sugar-sweetened and soft drinks grew by 12.6 percent between 2003 and 2016, has an average annual growth rate of 0.9 percent, which is lower than other countries in the sub-region. However, between 1975 and 2016, Costa Rica had the greatest increase in the adult prevalence of overweight and obesity (defined as a BMI of over 25) among the sample countries, rising from 25 percent in 1975 to over 60 percent in 2016.Meanwhile, in an opposite trend to most countries in the sub-region, the price of carbonated and hydrated beverages dropped by 3 percent between June 2015 and October 2017 (Figures 15 and 22).

Table 12 presents the assumptions of price elasticity and income-elasticity comparable to the simulations presented in Table 8 (Costa Rica) but also includes in scenario 1 the effect of annual variations in per capita GDP as a proxy for consumer income. A pass-through equal to 1 is assumed.

[73] http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators; ;
[74] IMF World Economic Outlook Database: http://www.imf.org/external/pubs/ft/weo/2018/01/weodata/weorept.aspx

Table 12: Costa Rica –Price and Income Elasticity Assumptions

Price elasticities for sugar-sweetened beverages		Scenario 1	Scenario 2 [3]
Price elasticity for imported SSBs [1]	Value (should be negative)	-0.822	-1,291
Price elasticity for domestic SSBs [2]	Value (should be negative)	-1,115	-1,291
Income elasticity for imported SSBs [1]	Value (typically positive)	0.447	0
Income elasticity for domestic SSBs [2]	Value (typically positive)	0.867	0

Source: Paraje, G (2018). The impact of the price on the consumption of sugary drinks in six countries of Central America and the Caribbean.

1] Own price elasticities are assumed for households belonging to the top 20 percent of expenditure

2] Own/average price elasticities of the total sample are assumed

3] To make them comparable with the simulations in Table 2, an upper bound price elasticity is assumed without considering income elasticity.

Table 13 below shows the revenues that would be generated in Costa Rica under the two scenarios and how these would affect SSB excise tax revenue and total government revenue from all taxes on SSB, including their possible contribution to the country's GDP compared to the 2017 baseline with projections for the period 2018 to 2020.

Scenario 1- Tax change policy: This would increase the SSB excise tax by 20 percent (base year 2016) on the consumer price in line with the WHO recommendation phased in over 2018 to 2020:

- **2018**: The 2017 SSB excise tax rate would be increased by 100 percent up to ₡ 148 per liter
- **2019**: The 2018 SSB excise tax rate would be increased by 50 percent up to ₡ 222 per liter
- **2020**: The 2019 excise SSB tax rate would be increased by 20 percent up to ₡ 266 per liter.

Good international practice dictates that excise taxes should be adjusted annually to take into account general increases in prices (inflation) and in average consumer incomes (for example, using increases in per capita GDP as a proxy).

Scenario 2- Tax change policy: This would increase the SSB excise tax by nearly 20 percent (base year 2016) on the consumer price in a single year. This scenario is comparable with the simulation in Table 8 (Costa Rica).

Under scenario 1, if the SSB excise tax were increased by 100 percent in the first year to impose a levy equivalent to 148 *colones* per liter and all other taxes were to remain unchanged (see Table 4), estimated SSB excise tax revenue would equal 56.3 billion *colones* (US$97.9 million). Total government revenue from all taxes on SSB would grow from an estimated US$173.5 million in 2017 (0.30 percent of GDP) to US$224.1 million (or 0.37 percent of GDP) in 2018. This would represent an increase of US$50.6 million (equivalent to 0.07 percent of GDP) and would lead to an estimated reduction of some 5 percent in the consumption of SSB. In addition, the decrease in SSB consumption would cut down the health costs of this consumption, some of which are

paid for by public funds, as well as indirect costs in terms of loss of health, human capital, and productivity.

By 2019, with the 2018 excise tax having been increased again, this time by 50 percent, to reach 222 *colones* per liter, SSB excise tax revenue was estimated to equal 80.5 billion *colones* (US$137.6 million). Total government revenue from all taxes on SSB would amount to US$262.2 million (0.40 percent of GDP), leading to an estimated 4.7 percent reduction in SSB consumption.

By 2020, having increased the excise tax a third time, this time by 20 percent, to reach 266 colones per liter, SSB excise tax revenue was estimated to equal 93.8 billion *colones* (US$155.2 million). Total government revenue from all taxes on SSB would amount to US$277 million (0.40 percent of GDP), leading to an estimated 3 percent reduction in SSB consumption.

Under Scenario 2, a price increase would be introduced in 2016 of 1,271.70 *colones* per liter or about 20 percent, which would cause the price to reach an average of 1,526 *colones* per liter, as in the Costa Rica simulation in Table 8. The tax would be equivalent to 235.2 *colones* per liter, provided that all other taxes remain constant (see Table 10). Under these assumptions, SSB excise tax revenues would amount to 76.6 billion *colones,* a 3.6 percent increase over the 74 billion *colones* in Table 8.

If this more radical tax policy were to be pursued, total government revenue from all taxes on SSB would increase from 102 billion *colones* (US$173.5 million or 0.30 percent of GDP) in 2016 to 155.250 billion *colones* (US$270 million at 2018 exchange rates or 0.44 percent of GDP) in 2018. This would represent an increase of US$96.5 million (equivalent to 0.14 percent of GDP) and would lead to an estimated reduction of about 17 percent in the consumption of sugary drinks

Table 13: Costa Rica: Impact of SSB Tax on GDP, Results of Simulations 1 and 2 for 2018-2020

Costa Rica: Sugar-Sweetened Beverage Tax Revenue Simulation			Scenario 1			Scenario 2
Summary of Simulation Results	Today (2016)	Baseline scenario 2017 excise tax 73,96 colones per liter	Scenario 1 - 2018: excise tax increased by 100% up to 148 colones per liter.	Scenario 1 - 2019: The 2018 excise tax increased by 50% up to 222 colones per liter	Scenario 1- 2020: The 2019 excise tax increased by 20% up to 266 colones per liter	Scenario 2- 2018: Excise tax increased by 218% (average sales price up to 1.526 col.) with no income elasticity
Total SSB consumption (million liters) [1]	392,0	400.0	380.5	362,8	352,1	325,9
Average SSB price (colones per liter)	1.271,70	1.302,67	1.388,43	1.477,05	1.545,05	1.526,37
Average tax burden (sales tax as % of consumer price)	5,8	5,7	10.7	15,0	17,2	15,4
Average tax burden (total tax as % of price)	19,8	19,.6	24,.4	28,6	30.8	31,2
SSB tax revenues (million colones)	28.992	29.584	56.288	80.490	93.750	76.644
SSB tax revenues (US$ million)	$53,23	$52,13	$97,89	$137,59	$155,21	$133,26
Contribution to GDP (%)	0.09%	0.09%	0.16%	0.21%	0.23%	0.22%
Total government tax revenue from sugar-sweetened beverages (DAI, excise tax, SINDER, VAT, and import duties under law 6946, million colones) [2]	98.466	101.950	128.871	153.384	167.344	155.242
Total government tax revenue from sugar-sweetened beverages (US$ million)	$ 180.77	173,51	224,12	262,20	277,06	269,99
Contribution to GDP (%)	0.31%	0.30%	0.37%	0.40%	0.40%	0.44%
Percentage change in:						
Total SSB consumption (%)		2,0	-4,9	-4,7	-2,9	-16,9
Average SSB price (% increase)		2,0	6,6	6,4	4,6	20.0

Source: Authors' estimations

[1] Total off-trade volume as proxy for consumption (Source: 2016 = Figure 2; 2017 projections based on 2013-2016 trends)

[2] The model was calibrated based on revenues from soft drink production and consumption tax budget (2016 = 809.5 million lempiras; 2017 = 978.3 million lempiras) imposed by tariffs, amounting to 2.782 billion colones reported for soft drinks and juice concentrates in 2016 by the Tax Statistics Department/ General Directorate of Finance*, compared to 2.758 billion simulated by the model or about 1% difference. Total indirect taxes of 39,764 million colones reported by the MoF** for non-alcoholic soft drinks, are comparable to 41,115 million colones, with a difference of 3.4%, which can be explained by possible error in estimating the national production quantities (VAT includes the "cascade" application in the distribution and sales chain).

* Analysis of tax revenue performance : 2016

** Source: Technical Secretariat of the Budgetary Authority /Ministry of Finance

http://www.hacienda.go.cr/contenido/12840-detalle-de-los-principales-ingresos-del-gobierno-central

2. El Salvador:

In El Salvador, per capita SSB consumption grew by 6.4 percent between 2013 and 2016, equivalent to an average annual rate of 2.1 percent (Figure 2). As seen in Figure 5, the prevalence of adult overweight and obesity (defined as a BMI over 25) grew dramatically between 1975 and 2016 from less than 26 percent to close to 57 percent, and prevalence among minors reached nearly 30 percent in 2016. Again, this strong growth pattern is common to all countries in the sub-region. According to El Salvador's General Directorate of Statistics and Census (DYGESTYC), the CPI for soft drinks (adjusted for inflation) in El Salvador increased by 3.1 percent between 2015 and 2018 (Figure 18), which means that. the current price of sugar-sweetened beverages has not prevented consumption from rising.

Table 14 outlines the same price elasticity and income elasticity assumptions that were made in our earlier simulations, although Scenario 1 also includes the effect of annual variations in per capita GDP as a proxy for consumer income. A pass-through equal to 1 is assumed.

Table 14: El Salvador: Price Elasticity and Income Elasticity Assumptions

Price elasticities for sugar-sweetened beverages		Scenario 1	Scenario 2 [3]
Price elasticity for imported SSBs [1]	Value (should be negative)	-1,087	-1,087
Price elasticity for domestic SSBs [2]	Value (should be negative)	-1,094	-1,094
Income elasticity for imported SSBs [1]	Value (typically positive)	1,170	0
Income elasticity for domestic SSBs [2]	Value (typically positive)	1,230	0

Source: Paraje, G (2018). The impact of the price on the consumption of sugary drinks in six countries of Central America and the Caribbean.
[1] Own price elasticities are assumed for households belonging to the top 20% of expenditure
[2] Own/average price elasticities of total sample are assumed
[3] To make them comparable with the simulations in Tables 2-4, Scenario 2 does not consider income elasticity.

As indicated in Table 10, like Costa Rica, El Salvador has a 10 percent ad valorem tax (ABE) on carbonated, energy, or stimulating drinks and concentrated preparations plus an excise tax (EBE) of $0.20 per liter applicable only to energy or stimulating drinks.

Scenario 1- Tax change policy: Under this scenario, it is proposed to maintain the US$0.20 excise tax on energy drinks and to increase it progressively until it reaches 20 percent of the consumer price (base year 2016) in line with the WHO's recommendation. The increases would be phased in between 2018 and 2020 as follows:

- **2018:** Increase the 2017 EBE excise tax on SSB by 50 percent up to US$0.10 per liter
- **2019:** Increase the 2018 EBE excise tax by 30 percent up to US$0.13 per liter
- **2020:** Increase the 2019 EBE excise tax by 25 percent up to US$0.16 per liter.

Scenario 2- Tax change policy: Under this scenario, the SSB excise tax would be increased by nearly 20 percent of the consumer price (base year 2016) in a single year. This scenario is comparable with the previous simulation for El Salvador in Section IV where income elasticity effect was not taken into account. Instead, this simulation uses the point estimation of average price elasticity (-1,087 for imported SSBs and -1,094 for domestic SSBs) and a pass-through equal to 1.

Table 15 summarizes the revenues generated under the two scenarios in El Salvador and the impact that they have on total SSB excise tax revenue and on total government revenue from all taxes on SSB, including their possible contribution to the country's GDP compared to the 2017 baseline with projections for the period 2018 to 2020.

Scenario 1: Under this scenario, it is proposed to increase the EBE excise tax on all sugary drinks at the point of sale up to 20 percent[75] (in accordance with the WHO recommendation). This increase would be phased in gradually but would factor in the effect of annual variations in per capita GDP as a proxy for income elasticity). According to information available from the IMF and the World Bank (see Annex 3), per capita GDP in El Salvador grew by 2.3 percent, 2.4 percent, and 2.4 percent in 2015, 2016, and 2017 respectively.

Under Scenario 1, the SSB excise tax would be increased in the first year (2018) by US$0.10 per liter, while all other taxes would remain constant (see Table 10). This scenario includes the effect of income elasticity referred to in Table 14. Under these assumptions, the simulation estimated SSB excise tax revenue to be 1.317 billion *colones* (US$150 million)[76]), equivalent to a contribution to GDP of 0.51 percent. Total government revenue from all taxes on SSB would grow from the projected US$101 million in 2017 (0.36 percent of GDP) to US$203 million (0.69 percent of GDP) in 2018, an increase of nearly US$102 million (equivalent to 0.35 percent of GDP), with an estimated reduction of some 0.6 percent in the consumption of SSB. This would help to improve the health of El Salvador's population, especially compared with the average growth of 2.1 percent between 2013 and 2016 according to estimates from Euromonitor International.

[75] The average consumer price was estimated to increase from 3.82 *colones* per liter in 2016 to 4.58 *colones* per liter in 2020, although these average prices were obtained from a small sample and are subject to review.
[76] 8.75 SV colones = US$1

Table 15. El Salvador: Impact of SSB Tax on GDP, Results of Simulations 1 and 2 for 20182020

El Salvador: Sugar-Sweetened Beverage Tax Revenue Simulation			Scenario 1			Scenario 2
Summary of Simulation Results	Today (2016)	Baseline scenario 2017 excise tax (EBE) US$0.20/liter energy drinks only	Scenario 1 - 2018: EBE excise tax increased by 50% (US$0.10/l) on sugar sweetened beverages	Scenario 1 - 2019: The 2018 EBE excise tax increased by 30% up to US$0.13/l	Scenario 1- 2020: The 2019 EBE excise tax increased by 25% up to US$0.16/l	Scenario 2- 2018: EBE Excise tax increased by US$0.17 on all sugary drinks, with no income – elasticity
Total SSB consumption (million liters) [1]	1.098.4	1.121.5	1.114.4	1.041.9	982.4	920.7
Average SSB price (colones per liter) [2]	3.82	3.82	3.92	4.26	4.58	4.58
Average tax burden (sales tax as % of consumer price)	31.8	31.8	33.2	36.7	40.1	40.3
Average tax burden (total tax as % of price)	43.8	43.8	45.2	49.1	52.4	53.0
SSB tax revenues (ABE and EBE) (million colones)	426	435	1.317	1.495	1.667	1.582
SSB tax revenues (US$ million) [3]	$ 48.69	$ 49.72	$ 150.55	$ 170.89	$ 190.54	$180.78
Contribution to GDP (%)	0.18%	0.18%	0.51%	0.56%	0.59%	0.61%
Total government tax revenue from sugar-sweetened beverages (DAI, excise tax (EBE), ad valorem (ABE) and VAT/ million colones) [2]	863	881	1.772	1.957	2.475	2.070
Total government tax revenue from sugar-sweetened beverages (US$ million)	$98.65	$100.72	$202.56	$223.64	$282.87	$236.60
Contribution to GDP (%)	0.37%	0.36%	0.69%	0.73%	0.88%	0.80%
Percentage change in:						
Total SSB consumption (%)		2.1	-0.6	-6.5	-5.7	-16.2

Source: World Bank Group, project team's estimation.

[1] Total off-trade volume as proxy for consumption (Source: 2016 = Figure 2; 2017 projections based on 2013-2016 trends)

[2] Source: suggested retail price list, Ministry of Finance, General Directorate of Internal Revenue.

[3] The model was calibrated based on revenues from: Selective Consumption Tax on soft drinks and other non-carbonated beverages (2016 = US$48,8 million; 2017 = US$48,9 million) *. These data compared with US$48,7 for 2016 and US$49,7 for 2017, simulated by the model, results in a less than 2% difference, found statistically acceptable;

* http://www.transparenciafiscal.gob.sv/ptf/es/Ingresos/#_vTab2152

[3] Total SSB tax (soft drinks and other non-carbonated beverages) includes DAI, ABE, EBE and VAT (VAT includes the "cascade" application in the distribution and sales chain) **

** DAI was calibrated with tax data from foreign trade, import duties, manufacturing industry and economic business: non-alcoholic beverages. Ministry of Finance (2016 = US$1.56 million; 2017 = US$1.72 million).

In 2019, when the 2018 excise tax on SSB would increase by 30 percent up to US$0.13 per liter, SSB excise tax revenue would amount to US$171 million, while total government revenue from all taxes on SSB would amount to US$224 million (0.73 percent of GDP), reducing SSB consumption by 6.5 percent. In 2020. when the excise tax would be increased by 25 percent up to US$0.16 per liter, SSB excise tax revenue would amount to US$190 million, while total government revenue from all taxes on SSB would reach US$283 million (0.88 percent of GDP), reducing SSB consumption by 5.7 percent.

Under Scenario 2, the excise tax would be increased by 20 percent (in accordance with the WHO recommendation) over the 2016 price in a single year, while all other taxes would remain constant. The average consumer price of a liter of SSB would go up from 3.82 *colones* per liter to 4.58 *colones* per liter.[77] This more radical tax policy, which would not take into account the per capita GDP growth effects, would result in SSB excise tax revenue of US$181 million and total government revenue from all taxes on SSB of US$237 million or 0.80 percent of GDP, and would reduce SSB consumption by 16.2 percent. , would raise

The tax revenues projected to be raised under the two scenarios would contribute significantly to the success of El Salvador's Five-Year Development Plan (PQD),[78] which aimed to increase "the tax-to-GDP ratio, so that more fiscal resources are available to meet the population's development and basic needs."

[77] The average consumer price was estimated to increase from 3.82 *colones* per liter in 2016 to 4.58 *colones* per liter in 2020, although these average prices were obtained from a small sample and are subject to review.

[78] Ministry of Finance (2018). *Analysis of Expenditure by Area of Management of the National Budget and Special Budgets 2018.* El Salvador, General Directorate of Budget. http://www.transparenciafiscal.gob.sv/downloads/pdf/700-DGP-IF-2018-00010.pdf

3. Guatemala:

In Guatemala, per capita SSB consumption grew by 27.3 percent between 2003 and 2016, equivalent to an average annual rate of 1.9 percent (Figure 1). As noted in Figure 5, the prevalence of adult overweight and obesity (defined by a BMI over 25) doubled from 25 percent to 50 percent between 1975 and 2016. The prevalence of obesity among children rose from 5 percent to nearly 30 percent in the same period (Figure 6). The significant growth in obesity in Guatemala follows a pattern common to all the other countries of the sub-region. The price of carbonated and sugar-sweetened drinks rose for much of the period between 2012 and 2017 but showed a downward trend (of about 2 percent) towards the second half of 2016, as seen in the annual variation of the CPI for these commodities in Figure 16. When comparing the 1.9 percent annual growth in SSB consumption with price variations, it is possible to conclude that this consumption growth was not affected by the 2 percent annual increase in the CPI.

In Table 16, our price elasticity and income elasticity assumptions are presented and compared to the simulations in Table 9 (Guatemala), with the difference being that in Scenario 1 the effect of annual variations in per capita GDP are used as a proxy for consumer income. A pass-through equal to 1 is assumed.

Table 16: Guatemala - Price Elasticity and Income Elasticity Assumptions

Price elasticities for sugar-sweetened beverages		Scenario 1	Scenario 2 [3]
Price elasticity for imported SSBs [1]	Value (should be negative)	-1,135	-1,645
Price elasticity for domestic SSBs [2]	Value (should be negative)	-1,390	-1,645
Income elasticity for imported SSBs	Value (typically positive)	0.990	0
Income elasticity for domestic SSBs [2]	Value (typically positive)	1,060	0

Notes: [1] To make these estimates comparable with the simulations in Table 3, a lower bound price elasticity is assumed (Table 3)
[2] Own/average price elasticities of total sample are assumed (Table 3).
[3] To make them comparable with the simulations in Table 3, an upper bound price elasticity is assumed without considering income elasticity.

Table 17 summarizes the revenues generated under the two scenarios in Guatemala, and the impact that the tax increase has on SSB excise tax revenue and on total government revenue from all taxes on SSB. The simulations also estimate the potential contribution of the tax to the country's GDP compared to the 2017 baseline with projections for the period 2018 to 2020.

Table 17: Guatemala: Impact of SSB Tax on GDP, Results of Simulations 1 and 2 for 2018 -2020

Guatemala: Sugar-Sweetened Beverage Tax Revenue Simulation			Scenario 1			Scenario 2
Summary of Simulation Results	Baseline scenario (2016)	Baseline scenario 2017 – No excise tax	Scenario 1 - 2018: Excise tax introduced QTZ 0.80/l	Scenario 1 - 2019: The 2018 excise tax increased by 25% up to QTZ 1,00/l	Scenario 1- 2020: The 2019 excise tax increased by 25% up to QTZ 1,25/l	Scenario 2 - 2018: Introduction of excise tax QTZ 1,58/l with no income – elasticity
Total SSB consumption (million liters)	1.505,5	1.571,3	1.394,3	1.331,9	1.284,5	1.166,5
Average SSB price (quetzales per liter)	9,06	9,07	9,99	10.46	10.88	10.88
Average tax burden (sales tax as % of consumer price)	-	0.0	8,0	9,6	11,5	14,5
Average tax burden (total tax as % of price)	11,1	11,1	19,2	20.9	22,8	25,8
SSB tax revenues (million quetzales) [2]	519,8	531	1.769	2.037	2.357	2.540
SSB tax revenues (US$ million)	$ 69,12	$ 72,29	$ 233,63	$ 266,26	$ 301,82	$ 335,57
Contribution to GDP (%)	0.10%	0.10%	0.28%	0.30%	0.32%	0.41%
Total government tax revenue from sugar-sweetened beverages (DAI, excise tax, VAT, million quetzales) [2]	1.513	1.565	2,624	2,835	3.108	3.200
Total government tax revenue from sugar-sweetened beverages (US$ million)	$201,24	$ 213,22	$ 346,58	$ 370.54	$ 398,01	$ 422,67
Contribution to GDP (%)	0.29%	0.28%	0.42%	0.42%	0.43%	0.51%
Percentage change in:						
SSB consumption (%)		4,4	-11,3	-4,5	-3,6	-22,5

Source: World Bank Group, project team's estimations

[1] Total off-trade volume as proxy for consumption (Source: EI)

[2] The model was calibrated based on revenues from Import Tariff Duties (DAI under Central American Tariff System - SAC), Section IV for 2016 = 171,8 million quetzales compared with the 172,5 million quetzales projected by the simulation model, resulting in a 0.4% difference, as well as tax revenue – internal revenues from beverage distribution in 2016, amounting to 347,9 million quetzales, which compared with the 349,7 million quetzales, projected by the simulation model, results in a +/- 0.5% difference, found statistically acceptable. (Source: Food Industry Products; beverages, reported as soft and isotonic drinks and juices. Tax Administration Superintendence (SAT). *SAT Tax Statistics. tax revenue – internal revenues from beverage distribution**

* *Source*: https://portal.sat.gob.gt/portal/estadisticas-tributarias-sat/#1506903647232-dff79679-679a

Scenario 1- Tax change policy: In this scenario, it is proposed to impose an SSB excise tax that would gradually increase the average price of a liter of sugar-sweetened beverage at the point of sale up to 20 percent (consistent with the WHO recommendation) as follows:

- **2018:** An excise tax would be introduced to increase the price up to QTZ 0.80 per liter.
- **2019:** The 2018 excise tax would be increased by 25 percent up to QTZ 1.00 per liter.
- **2020:** The 2019 excise tax would be increased by 25 percent up to QTZ 1.25 per liter.

This increase would include the effect of annual variations in per capita GDP as a proxy for income elasticity. According to information available from the World Bank,[79] per capita GDP growth in Guatemala was 2.03 percent, 1.04 percent and 0.75 percent in 2015, 2016 and 2017 respectively (see Annex 3).

According to data from Euromonitor International (Figure 1), off-trade consumption of SSB (excluding bottled water) grew by 5.1 percent and 4.7 percent in 2015 and 2016 respectively. In 2017, the same data revealed an increase of 4.4 percent over the 2016 SSB consumption. The rise in consumption between 2015 and 2017 took place concurrently, as already mentioned, with the variation in the price of carbonated and sugary drinks at the point of sale, including a tendency to become even smaller (about 2 percent).

Scenario 2- Tax change policy: Similar to scenario 1, under this scenario, an SSB excise tax would be introduced to increase the average price of a liter of sugar-sweetened beverage at the point of sale by 20 percent (in accordance with the WHO recommendation) in a single year (2018). Like the simulation in Table 9 above (Guatemala),[80] the income elasticity effect is not taken into account, but the point estimate of average price elasticity (-,841) and a pass-through equal to 1 are used.

Under scenario 1, if the SSB excise tax is enforced in the first year and all other taxes remain unchanged (see Table 10), it would yield an estimated SSB excise tax revenue of 1.769 million quetzales (US$233,6 million), equivalent to 0.28 percent of GDP over the 2017 projections (0.10 percent GPD). Total government revenue from all taxes on SSB would grow from US$213 million (0.28 percent of GDP as estimated by the authors) in 2017 to US$346 million (or 0.42 percent of GDP), representing an increase of US$133 million (equivalent to 0.18 percent of GDP), with an estimated reduction of some 11 percent in the consumption of sugar-sweetened beverages.

By 2019, after the 2018 excise tax was increased by 50 percent to QTZ 1,00 per liter, SSB excise tax revenue was estimated to be 2.037 billion quetzales (US$266.3 million), while total government revenue from all taxes on SSB would amount to US$370.5 million (0.42 percent of GDP), with an estimated 4.5 percent reduction in SSB consumption.

[79] https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG?locations=GT

[80] Este escenario es comparable a la simulación de la tabla 2, de la sección IV.A.3 de este documento

By 2020, After the 2019 excise tax was increased by 25 percent to QTZ 1.25 per liter, SSB excise tax revenue was estimated to be 2.357 billion quetzales (US$301.8 million, equivalent to 0.32 percent of GDP), while total government revenue from all taxes on SSB would amount to US$398 million (0.43 percent of GDP), with an estimated 3.6 percent reduction in SSB consumption.

Under scenario 2, assuming an SSB excise tax of QTZ 1.58 per liter leading to a 20 percent price increase per liter, provided that all other taxes remain constant (see Table 10), SSB excise tax revenues would amount to 2,540 million quetzales, of which 1,843 million would come from the SSB tax (which is comparable to the 1,869 million quetzales shown in Table 3).

If this more radical tax change is implemented rather than scenario 1, total government revenue from all taxes on SSB would rise from 1,565 million quetzales in 2017 (US$213.2 million or 0.28 percent of GDP as estimated by the authors) to 3,200 million quetzales (US$422.7 million at 2018 exchange rate or 0.51 percent of GDP). This represents an increase of US$209.5 million (equivalent to 0.28 percent of GDP), with an estimated reduction of about 22.5 percent in the consumption of sugary drinks.

4. Honduras:

Per capita consumption of SSB increased between 2003 and 2016 by an average annual rate of 3.7 percent (Figure 2). As noted in Figure 17, the price of food and non-alcoholic beverages (for which no disaggregated data are available just for SSB) has showed an upward trend in the past few years, although with these rises decreasing between 2014 and the end of 2017.

Meanwhile, specialist health organizations, both national and international, have been warning of the exponential growth in the population's overweight and obesity levels. In Honduras, nearly half of the population is overweight, and just under one-fifth is obese. Although Honduras had the lowest adult prevalence of overweight and obesity (defined as a BMI over 25) among the study countries, this prevalence rose from just over 22 percent in 1975 to about 52 percent in 2016 (a 136 percent growth between peaks, or an average annual growth rate of 2.2 percent) (Figure 5).

In Table 18, our price elasticity and income elasticity assumptions are presented and compared to the simulations in Section VI.A, with the difference being that in Scenario 1 the effect of annual variations in per capita GDP are used as a proxy for consumer income. A pass-through equal to 1 is assumed.

Table 18: Honduras - Price Elasticity and Income Elasticity Assumptions

Price-elasticities for sugar-sweetened beverages		Scenario 1	Scenario 2 [3]
Price-elasticity for imported SSBs [1]	Value (should be negative)	-1,245	-1,245
Price-elasticity for domestic SSBs [2]	Value (should be negative)	-1,404	-1,404
Income – elasticity for imported SSBs [1]	Value (typically positive)	1,243	0
Income – elasticity for domestic SSBs [2]	Value (typically positive)	1,039	0

Source: Paraje (2018)
[1] Own price elasticities are assumed for households belonging to the top 20% of expenditure (Tables 60 and 63)
[2] Own/average price elasticities of the total sample are assumed (Tables 58 andd 63)
[3] To make them comparable with the simulations in Tables 2 through 4, Section IV, Scenario 2 are not considering income – elasticity.

As indicated in Table 10, Honduras, just like Costa Rica and El Salvador, levies an excise tax (the Production and Consumption Tax (P&C) on the import, production, and consumption of carbonated drinks. This tax is 0.7177 lempiras per liter (equivalent to US$0.03). However, as seen in Box 3, revenue from this tax as a share of total revenue was greatest in 2011 at approximately 1.1 percent. Since it was not adjusted for inflation or for increased consumer purchasing power, this percentage had fallen to under 0.9 percent by 2015.

Scenario 1- Tax change policy: In this scenario, it is proposed to increase the P&C excise tax for sugary drinks gradually between 2018 and 2020 until the average consumer price of an SSB reaches 17.50 lempiras per liter, equivalent to a 20 percent increase on the consumer price in line with the WHO recommendation (base year 2016).

- **2018:** The 2017 P&C excise tax would be increased by 50 percent from 0.7177 lempiras per liter (US$0.03l) up to 1.08 lempiras per liter (US$0.045).
- **2019: The** 2018 P&C excise tax would be increased by 50 percent up to 1.61 lempiras per liter (US$0.067).
- **2020:** The 2019 P&C excise tax would be increased by 50 percent up to 2.42 lempiras per liter (US$0.10).

Scenario 2- Tax change policy: Under scenario 2, the SSB excise tax would be increased by nearly 20 percent (base year 2016) on the consumer price in a single year. This scenario is comparable to the simulation in Section IV.A.3, where the income elasticity effect is not taken into account, but the point estimate of average price elasticity (-1,245 for imported SSBs and -1,404 for domestic SSBs, see Table 13) and a pass-through equal to 1 are used.

Table 19 summarizes the revenues generated in the two scenarios in Honduras and the impact that this tax increase would have on SSB excise tax revenue and on total government revenue from all taxes on SSB.[81] The simulations also estimate the potential contribution of the tax to the country's GDP compared to the 2017 baseline with projections for the period 2018 to 2020.

Scenario 1: The P&C excise tax on all sugary drinks would be phased in gradually, although it would include the effect of annual variations in per capita GDP as a proxy for income elasticity. According to data from the IMF and the World Bank (see Annex 3), per capita GDP in Honduras grew by 2.8 percent, 2.02 percent, and 3.06 percent in 2015, 2016, and 2017 respectively.

Under scenario 1, the P&C excise tax is increased by 50 percent in the first year (2018) up to 1.08 *lempiras* per liter (US$0.045/liter), while all other taxes remain constant (see Table 10). This scenario includes the effect of income elasticity referred to in Table 18.

[81] Calculated using Production and Consumption Excise Tax on Soft Drinks/Production, Consumption and Sales Tax Budget data. National Budget of the Republic. Central Administration Revenue Estimates. The Legislative Branch. Published by the Court of Auditors - The Official Gazette.

Table 19: Honduras: Impacts of SSB Tax on GDP - Results of Simulations 1 and 2 for 2018 -2020

Honduras: Sugar-Sweetened Beverage Tax Revenue Simulation			Scenario 1			Scenario 2
Summary of Simulation Results	Today (2016)	Baseline scenario 2017: excise tax (P&C) 0.7177 lempiras per liter (US$0.03/l).	Scenario 1 - 2018: The 2017 P&C excise tax increased by 50% up to 1.08 lempiras per liter (US$0.045/l)	Scenario 1 - 2019: The 2018 P&C excise tax increased by 50% up to 1.61lempiras per liter (US$0.067/l).	Scenario 1- 2020: The 2019 P&C excise tax increased by 50% up to 2.42 lempiras per liter (US$0.10/l).	Scenario 2-2018 P&C Excise tax increased up to by 2.95 lempiras per liter (US$0.12), with no income – elasticity
Total SSB consumption (million liters) [1]	780.0	802.7	773.6	721.6	668.9	624.4
Average SSB price (lempiras per liter)	14.54	14.59	15.22	16.28	17.51	17.52
Average tax burden (sales tax as % of consumer price)	4.9	4.9	7.1	9.9	13.8	16.8
Average tax burden (total tax as % of price)	18.7	18.7	21.0	24.3	28.2	31.2
SSB tax revenues (million lempiras) [2][*]	802	942	986	1.319	1.773	1.981
SSB tax revenues (US$ million)	$ 34.87	$ 39.84	$ 41.23	$ 54.43	$ 71.22	$ 82.85
Contribution to GDP (%)	0.16%	0.17%	0.17%	0.22%	0.28%	0.34%
Total government tax revenue from sugar-sweetened beverages (DAI, excise tax (P&C), and VAT/ million lempiras) [3]	2.105	2.255	2.521	2.851	3.301	3.407
Total government tax revenue from sugar-sweetened beverages (US$ million)	$ 91.58	$ 95.35	$ 105.45	$117.68	$132.58	$142.51
Contribution to GDP (%)	0.42%	0.41%	0.44%	0.47%	0.52%	0.59%
Percentage change in:						
Total SSB consumption (%)		2.9	-3.6	-6.7	-7.3	-19.9

Source: World Bank Group, project team' estimations

[1] Total off-trade volume as proxy for consumption (Source: 2016 = Figure 2; 2017 projections based on 2013-2016 trends)

[2] The model was calibrated based on the revenues from: soft drink production and consumption tax budget (2016 = 809.5 million lempiras; 2017 = 978.3 million lempiras) *. These data compared to 802 million lempiras for 2016, 773 for 2017 simulated by the model, result in a range of +/- 1% and 3.8% difference or less than 4% error.

[3] Total taxes levied on sugar-sweetened beverages (soft drinks and other non-carbonated beverages) include DAI, P&C excise tax and VAT (VAT includes the "cascade" application in the supply and sales chain).

[*] *Source:* Production and Consumption Excise Tax on Soft Drinks/Production, Consumption and Sales Tax Budget data. National Budget of the Republic. Central Administration Revenue Estimates. The Legislative Branch. Published by the Court of Auditors - The Official Gazette

Based on these assumptions, the simulation estimated that SSB excise tax revenues would reach 986 million *lempiras* (US$41.2 million), equivalent to a contribution to GDP of 0.17 percent. Total government revenue from all taxes on SSB would amount to 986 million *lempiras* (US$41.2 million), contributing to 0.17 percent of GDP. Total government revenue from all taxes on SSB would grow from a projected US$95.4 million in 2017 (0.41 percent of GDP 2017, see Annex 3) to US$105.5 million (0.44 percent of GDP) in 2018, representing an increase of nearly US$10 million (equivalent to 0.04 percent of GDP), with an estimated reduction of some 3.6 percent in the consumption of SSB.

In 2019, by increasing the P&C excise tax on sugar-sweetened beverages by 50 percent up to 1.61 *lempiras* per liter (US$0. 067 per liter), SSB excise tax revenue would amount to US$54.4 million, while total government revenue from all taxes on SSB would total US$117.7 million (0.47 percent of GDP), decreasing consumption by 6.7 percent. In 2020, raising the P&C excise tax by 50 percent up to 2.42 *lempiras* or US$0.10 per liter, SSB excise tax revenues were estimated to be US$71.2 million, with total government revenues from all taxes on SSB reaching US$132.6 million (0.52 percent of GDP), reducing consumption by 7.3 percent.

Under scenario 2, the P&C excise tax would go up from 0.7177 *lempiras* per liter (US$0.03) to 2.95 *lempiras* per liter (US$0.12). As a result, the 2016 price of SSB (14.4 *lempiras* per liter) would also rise by 20 percent to reach an average consumer price of 17.50 *lempiras.* Assuming all other taxes remained constant, the SSB tax was estimated to raise US$142.5 million, equivalent to 0.6 percent of GDP. This more radical tax change would raise total government revenue from all taxes on SSB by approximately US$47.3 million (0.20 percent of GDP as estimated by the authors) of the revenue estimated for 2017, reducing SSB consumption by 19.9 percent.

5. Nicaragua:

In Nicaragua, there is no available information on the growth of per capita SSB consumption. However, unlike other countries in the sub-region, prices have been showing an upward trend (see Figure 19). The prevalence of adult overweight and obesity (defined as a BMI over 25) is around the average for the countries in the study. The prevalence of overweight and obesity among children between 5 and 19 years of age put Nicaragua at the top of the list of countries in the sub-region in the 1970s before falling to below the average by 2016. However, despite recording annual consumption growth lower than the other countries of the sub-region in 2016, Nicaragua has a prevalence around 30 percent (Figure 5).

Table 20 outlines our price elasticity and income elasticity assumptions. Scenario 1 includes the effect of annual variations in per capita GDP as a proxy for consumer income (Table 21). A pass-through equal to 1 is assumed.

Table 20: Nicaragua - Price Elasticity and Income Elasticity Assumptions

Price-elasticities for sugar-sweetened beverages		Scenario 1	Scenario 2 [3]
Price-elasticity for imported SSBs [1]	Value (should be negative)	-0.733	-0.657
Price-elasticity for domestic SSBs [2]	Value (should be negative)	-0.657	-0.657
Income – elasticity for imported SSBs [1]	Value (typically positive)	1,078	0
Income – elasticity for domestic SSBs [2]	Value (typically positive)	0.759	0

Source: Paraje, G (2018). The impact of the price on the consumption of sugary drinks in six countries of Central America and the Caribbean.
[1] Own price elasticities are assumed for households belonging to the top 20% of expenditure
[2] Own/average price elasticities of total sample are assumed (Tables 76 and 81)
[3] To make them comparable with the simulations in the Section, the price-elasticity is assumed without considering income – elasticity

Table 21 summarizes the revenues generated under the two scenarios in Nicaragua, and the impact that this tax would have on SSB excise tax revenue and on total government revenue from all taxes on SSB (using data from the Ministry of Finance). The simulations also estimate the potential contribution of the tax to the country's GDP compared to the 2017 baseline with projections for the period 2018 to 2020.

Scenario 1- Tax change policy: it is proposed to impose an excise tax on all sugary drinks, thus increasing the average price of a liter of sugar-sweetened beverage at the point of sale up to 20 percent (in accordance with the WHO recommendation). This increase would be phased in gradually but would take into account the effect of annual variations in per capita GDP as a proxy for income elasticity. According to data from the World Bank,[82] per capita GDP growth in Nicaragua was 3.6 percent, 3.5 percent, and 3.7 in 2015, 2016 and 2017 respectively (see Annex 3).

[82] https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG?locations=NI

Table 21: Impact of SSB Tax on GDP - Results of Simulations 1 and 2 for 2018 -2020 (PRELIMINARY)

Nicaragua: Sugar-Sweetened Beverage Tax Revenue Simulation **Summary of Simulation Results**	Actual (2016)	Baseline scenario 2017 no excise tax	Scenario 1			Scenario 2
			Scenario 1 - 2018: Introduced excise tax of 1.55 cordobas per liter	Scenario 1 - 2019: The 2018 excise tax increased by 30% up to 2.02 cordobas per liter	Scenario 1 - 2020: The 2019 excise tax increased by 30% up to 2.62 cordobas per liter	Scenario 2 - 2018: Excise tax increased by 2..85 cordobas per liter with no income – elasticity
Total SSB consumption (million liters)	615.5	635.0	613.2	611.5	608.5	562.8
Average SSB price (cordobas per liter)	18.76	18.76	20.58	21.48	22.51	22.50
Average tax burden (sales tax as % of consumer price)	-	0.0	7.5	9.4	11..6	12.7
Average tax burden (total tax as % of price)	18.2	18.5	25.8	28.1	30.3	30.8
SSB tax revenues (million cordobas) [2]	530	591	950	1.232	1.594	1.604
SSB tax revenues (US$ million)	$ 18.52	$ 19.66	$ 28.25	$ 34.50	$ 39.61	$47.68
Contribution to GDP (%)	0.14%	0.14%	0.19%	0.22%	0.24%	0.33%
Total government tax revenue from sugar-sweetened beverages (DAI, ISC, excise tax, VAT) – million cordobas) [3]	2.178	2.295	3.320	3.690	4.146	3.942
Total government tax revenue from sugar-sweetened beverages (US$ million)	$ 76.10	$ 76.36	$ 98.69	$ 103.34	$ 103.04	$ 117.18
Contribution to GDP (%)	0.58%	0.56%	0.68%	0.67%	0.62%	0.81%
Percentage change in:						
Total SSB consumption (%)		3.2	-3.4	-0.3	-0.5	-8.6

Source: World Bank Group, project team's estimations

[1] Total off-trade volume as proxy for consumption (Authors' estimations, to be reviewed once official data is available)

[2] The model was calibrated based on million cordobas revenue data reported in the Income Budget by line item, soft drinks (until 2017, renamed soda drinks as of 2018), Ministry of Finance (in 2016 = 530.97 million cordobas; and 2017= .592,64 million cordobas). * These data compared with those simulated by the model (530 million cordobas for 2016; and 591 million for 2017), results in a +/- 0.3% difference, found statistically acceptable.

[3] Total taxes levied on sugar-sweetened beverages (soft drinks) include DAI, ISC, excise tax and VAT (VAT includes the "cascade" application in the supply and sales chain).
* http://www.hacienda.gob.ni/documentos/presupuesto/presupuesto-gral.-de-la-republica

Under Scenario 2- Tax change policy, as in scenario 1, an SSB excise tax would be introduced to increase the average price of a liter of sugar-sweetened beverage at the point of sale up to 20 percent (in accordance with the WHO recommendation) in a single year (2018). This scenario is comparable with the simulations in Tables 8 through 10 in Section IV in that the income elasticity effect is not considered but the point estimate of average price elasticity (-.657) and a pass-through equal to 1 are used.

Under scenario 1- Tax change policy, the SSB excise tax equivalent to 1.55 *cordobas* per liter would be adopted in the first year (2018), while all other taxes would remain unchanged (see Table 10). This scenario includes the income elasticity effect (Table 20). Based on our assumptions, the simulation estimated that SSB excise tax revenue would be 950 million *cordobas* (US$28,2 million dollars)[83], equivalent to 0.19 percent of GDP. Total government revenue from all taxes on SSB would grow from US$76.4 million in 2017 (0.56 percent of GDP – see Annex 3) [84] to US$98.7 million (or 0.68 percent of GDP) for 2018, representing an increase of US$22.3 million, with an estimated reduction of 3.4 percent in the consumption of sugar-sweetened beverages. This would help to improve the health of the Nicaraguan population.

In 2019, after the 2018 excise tax was increased by 30 percent to 2.02 *cordobas* per liter, SSB excise tax revenue was estimated to be US$34,5 million, while total government revenue from all taxes on SSB would amount to US$103.3 million (0.67 percent of GDP), with an estimated 0.5 percent reduction in consumption.

Under scenario 2, an excise tax of 1.55 *cordobas* per liter would be levied on SSB, while the level of all other taxes would remain constant. The 2016 sales price (18.76 *cordobas* per liter) would increase by 20 percent to hit an average price of 22.50 *cordobas* per liter. As a result, SSB excise tax revenues would amount to US$47.7 million (0.33 percent of GDP in 2018), while total government revenue from all taxes on SSB would amount to US$117 million, equivalent to 0.81 percent of GDP.

This more radical tax policy would increase total government revenue from all taxes on SSB by US$41 million or 0.28 percent of GDP in 2017, with an estimated reduction of about 8.6 percent in the consumption of sugary drinks.

6. Panama:

In Panama, per capita SSB consumption grew by 4.1 percent between 2013 and 2016 (Figure 2). Between 1975 and 2016, just like adults, the prevalence of overweight and obesity (defined as a

[83] The exchange rate used for 2018 was 33,64 *cordobas* = US$1.

[84] The model was calibrated by comparing available DAI and ISC revenue data in million *córdobas*, reported as SSB consumption by the Ministry of Finance.

BMI over 25) among children aged 5 to 19 years grew too but at a faster rate than adults. As seen in Figures 5 and 6, the prevalence of overweight and obesity in Panama shows a favorable inflection with a slower rate of increase for both adults and children. However, between 2015 and 2017, despite the upward trend in prices, the soft drink CPI fluctuated between 99 (below inflation) and 102 (Figure 21). When compared with per capita consumption growth, it can be concluded that these price increases did not constrain the rapid growth in SSB consumption.

In Table 22, our price elasticity and income elasticity assumptions are presented and compared to the simulations in Section IV Tables 8 through 10, although Scenario 1 includes the effect of annual variations in per capita GDP as a proxy for consumer income. A pass-through equal to 1 is assumed.

Table 22: Panama - Price Elasticity and Income Elasticity Assumptions

Price-elasticities for sugar-sweetened beverages		Scenario 1	Scenario 2 [3]
Price-elasticity for imported SSBs [1]	Value (should be negative)	-0.727	-0.674
Price-elasticity for domestic SSBs [2]	Value (should be negative)	-0.674	-0.674
Income – elasticity for imported SSBs [1]	Value (typically positive)	0.987	0
Income – elasticity for domestic SSBs [2]	Value (typically positive)	0.654	0

Source: Paraje, G (2018). The impact of the price on the consumption of sugary drinks in six countries of Central America and the Caribbean.

[1] Own price elasticities are assumed for households belonging to the top 20% of expenditure

[2] Own/average price elasticities of total sample are assumed

[3] To make them comparable with the simulations in Tables 2 through 4, Section IV, an upper bound-price-elasticity is assumed without considering income – elasticity.

Table 23 summarizes the revenues generated under the two scenarios in Panama, and the impact that the tax increase has on SSB excise tax revenue and on total government revenue from all taxes on SSB.[85] The simulations also estimate the potential contribution of the tax to the country's GDP compared to the 2017 baseline with projections for the period 2018 to 2020.

Scenario 1- Tax change policy: In this scenario, it is proposed to impose an excise tax that will increase the average price of a liter of SSB at the point of sale by up to 20 percent (in accordance with the WHO recommendation). this tax increase would be phased in gradually but would take into account the effect of annual variations in per capita GDP as a proxy for income elasticity. According to data from the World Bank,[86] per capita GDP growth in the Republic of Panama was 3.8 percent, 3.3 percent, and 3.7 in 2015, 2016 and 2017 respectively.

[85] Dirección General de Ingresos, Ministerio de Economía y Finanzas. Boletín estadístico tributario 2016. Panamá.

[86] https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG?locations=PA

Table 23: Panama: Impact of SSB Tax on GDP - Results of Simulations 1 and 2 for 2018 -2020

Panama: Sugar-Sweetened Beverage Tax Revenue Simulation **Summary of results**	Today (2016)	Baseline scenario 2017 no excise tax	Scenario 1			Scenario 2
			Scenario 1 - 2018: introduction of excise tax of 0.15 balboas per liter	Scenario 1 - 2019: 2018 excise tax increased by 25% up to 0.19 balboas per liter	Scenario 1 - 2020: 2019 excise tax increased by 25% up to 0.23 balboas per liter l	Scenario 2-2018 Introduction of 20% excise tax (0.29 balboas per liter) with no income elasticity
Total SSB consumption (million liters) [1]	358.6	367.9	352.8	349.9	348.7	318.1
Average SSB price (balboas per liter)	1.50	1.50	1.65	1.72	1.79	1.79
Average tax burden (sales tax as % of consumer price)	-	0.0	9.1	10.9	13.1	16.2
Average tax burden (total tax as % of price)	2.1	2.1	11.1	13.1	15.3	18.1
SSB tax revenues (million balboas) [2]	6.4	6.6	56.2	68.6	84.0	92..7
SSB tax revenues (US$ million)	$ 6.39	$6.55	$56.22	$68.64	$ 83.99	$92.66
Contribution to GDP (%)	0.01%	0.01%	0.08%	0.09%	0.11%	0.14%
Total government tax revenue from sugar-sweetened beverages (DAI, excise tax, ISC/million balboas) [2]	7.1	7.3	56.9	69.4	84.7	93.3
Total government tax revenue from sugar-sweetened beverages (US$ million)	$7.09	$7.27	$56.92	$69.35	$84.72	$93.30
Contribution to GDP (%)	0.01%	0.01%	0.09%	0.10%	0.11%	0.14%
Percentage change in:						
Total SSB consumption (%)		2.6	-4.1	-0.8	-0.4	-11.3

Source: World Bank Group, project team.

[1] Total off-trade volume as proxy for consumption (Source 2016: *EI*; 2017 was projected based on tendencies observed – Figure 2)

[2] Assuming that only 15 percent of imports are subject to import tariffs, the model was calibrated by comparing available revenue data on DA, and the Selective Consumption Tax on Goods and Services (ISC) in million balboas reported by the General Revenue Service, Ministry of Economy and Finance, Tax Statistical Bulletin 2016. When comparing the US$6.37 million reported by 2016, with US$6.39 million simulated by the model, we obtain a difference of approximately 0.2 percent, which is found statistically acceptable.

Data from Euromonitor International (Figure 2) show that off-trade consumption of SSB (excluding bottled water) grew by 2.6 percent and 1.8 percent in 2015 and 2016, respectively. Euromonitor International projected an increase of 2.6 percent in 2017 over SSB consumption in 2016. The increases between 2015 and 2016 occurred while the average price per liter at the point of sale (in constant value and adjusted for the annual CPI) varied from -1 to +2 between 2015 and 2018 (Figure 18).

Under Scenario 2, as in scenario 1, a SSB excise tax would be introduced to increase the average consumer price of a liter of SSB by 20 percent (from the base year of 2016) in a single year. This scenario is comparable to the simulations in Tables 8 through 10 in Section IV, where the income elasticity effect was not considered, but in this case, the point estimate of average price elasticity (-.674 – see Box 15) and a pass-through equal to 1 were used.

Under scenario 1, the SSB excise tax of 1.15 *balboas* per liter would be adopted in the first year (2018), while all other taxes would remain unchanged (see Box 4). This scenario includes the income elasticity effect (Box 15). Based on these assumptions, the simulation estimated SSB excise tax revenue at 956.2 million balboas,[87] equivalent to 0.08 percent of GDP. Total government revenue from all taxes on SSB would grow from US$7.3 million in 2017[88] (0.01 percent of GDP in 2017 – see Annex 3) to US$56.9 million (or 0.09 percent of GDP) in 2018. This would represent an increase of US$50 million (equivalent to 0.075 percent of GDP), with an estimated reduction of 4.1 percent in the consumption of SSB. This reduction in consumption would help to improve the health of the Panamanian population, especially compared to growth rates of 2.6 percent and 1.8 percent in 2015 and 2016 according to the Euromonitor International data.

In 2019, the 2018 excise tax on sugary drinks would increase by 25 percent up to 0.19 *balboas* per liter. This would increase SSB excise tax revenue to US$68.6 million, while total government revenue from all taxes on SSB would amount to US$69.4 million (0.10 percent of GDP), reducing consumption by 0.8 percent. In 2020, the excise tax would be increased by 25 percent up to 0.23 *balboas* per liter, and SSB excise tax revenue would amount to US$84 million, and total government revenue from all taxes on SSB would total US$85 million (0.11 percent of GDP), reducing consumption by 0.4 percent.

Under scenario 2, an excise tax of 0.29 *balboas* per liter would be introduced while all other taxes would remain constant. This would increase the 2016 sales price (1.5 *balboas* per liter) by 20 percent to reach an average price of 1.79 *balboas* per liter. As a result, SSB excise tax revenues would amount to US$92.7 million, while total government revenue from all taxes on SSB would

[87] 1 *balboa* = US$1 dollar.

[88] The model was calibrated by comparing available DAI and ISC revenue data in million balboas, reported as SSB consumption by the General Revenue Service, Ministry of Economy and Finance, Tax Statistical Bulletin 2016.

total US$93.3 million, equivalent to 0.14 percent of GDP. This more radical tax policy would increase total government revenue from al taxes on SSB by US$86.0 million or 0.13 percent of GDP in 2017, with an estimated reduction of about 11.3 percent in the consumption of sugary drinks.

7. Dominican Republic:

Per capita consumption of SSB in the Dominican Republic grew by 27.8 percent between 2003 and 2016, equivalent to an average annual rate of 1.9 percent (Figure 1). This consumption growth occurred in parallel with the significant growth in BMI and the associated prevalence of overweight and obesity among the population. Of the seven countries studied, the Dominican Republic had the highest average annual growth in SSB consumption (2.4 percent) among people over 18 years of age between 1975 and 2018. , (see Figure 5). In 2016, there was a 33 percent prevalence of overweight and obesity among children aged 5 to 19 years old, again, the highest among the seven countries (Figure 6). Against this backdrop and taking into account that the Dominican Republic is the only country in the study that does not levy a direct tax on the consumption of sugar-sweetened beverages, we formulated two scenarios.

Scenario 1: It is proposed to introduce an excise tax that raises the average price of a liter of sugar-sweetened beverages at the point of sale by 20 percent (in accordance with the WHO recommendation). This increase would be phased in gradually but would include the effect of annual variations in per capita GDP as a proxy for income elasticity.

According to data from the World Bank,[89] per capita GDP growth in the Dominican Republic was 5.8 percent and 5.4 percent in 2015 and 2016 respectively. In parallel, according to data from Euromonitor International, off-trade consumption of SSB (excluding bottled water) grew by 3.4 percent and 2.6 percent in the same years. In 2017, Euromonitor International estimated that consumption of SSB had increased by 2.5 percent over 2016 consumption. This consumption increases between 2015 and 2017 occurred while the average price per liter at the point of sale (in constant value adjusted for the annual CPI) had barely increased since 2011.[90] Figure 8 confirms this growth in apparent consumption of both domestic and imported SSB.

Scenario 2: As in scenario 1, an excise tax would be introduced to gradually increase the average price of a liter of SSB between 2018 and 2020 by 20 percent[91] (in accordance with the WHO recommendation). As in the simulation in Table 10, the income elasticity effect is not considered, but the point estimate of average price elasticity (-.841) and a pass-through equal to 1 are used.

[89] https://data.worldbank.org/indicator/NY.GDP.PCAP.KD.ZG?locations=DO

[90] As noted above, a good international practice consists of adjusting excise taxes annually to take into account general increases in prices (inflation) and in average consumer incomes (using per capita GDP as a proxy).

[91] The simulation in Table 4 would model a fall in consumption of approximately 145 million liters and a rise in tax revenues of up to 7.3 billion Dominican *pesos*.

Table 24 presents our assumptions of price elasticity and income elasticity comparable to the simulations presented in Section IV, Table 10 (Dominican Republic), although the effect of annual variations in per capita GDP is used as a proxy for consumer income. A pass-through equal to 1 is assumed.

Table 24: Dominican Republic - Price Elasticity and Income Elasticity Assumptions

Price elasticities for sugar-sweetened beverages		Scenario 1	Scenario 2 [3]
Price elasticity for imported SSBs [1]	Value (should be negative)	-0.813	-0.841
Price-elasticity for domestic SSBs [2]	Value (should be negative)	-0.841	-0.841
Income elasticity for imported SSBs [1]	Value (typically positive)	1.200	0
Income elasticity for domestic SSBs [2]	Value (typically positive)	1.167	0

Source: Paraje, G (2018). The impact of the price on the consumption of sugary drinks in six countries of Central America and the Caribbean.

[1] Own price elasticities are assumed for households belonging to the top 20% of expenditure (Tables 78 and 81)

[2] Own/average price elasticities of total sample are assumed (Tables 76 and 81)

[3] To make them comparable with the simulations in Table 4, Section VAT.3, an average price elasticity is assumed without considering income elasticity

Tables 25 and 26 summarize the revenues generated in the two scenarios in the Dominican Republic and the impact that the tax increase is likely to have on SSB excise tax revenue and on total government revenue from all taxes on SSB, including their possible contribution to the country's GDP compared to the 2017 baseline with projections for the period 2018 to 2020.

Under scenario 1, the SSB excise tax of 4.00 Dominican *pesos* per liter would be introduced in the first year (2018), while all other taxes would remain unchanged (similar to the simulations in Table 4 although this scenario includes the income elasticity effect. Based on these assumptions, the simulation estimated SSB excise tax revenue to be 3,450 million Dominican *pesos* (US$65.9 million), equivalent to 0.08 percent of GDP. Total government revenue from all taxes on SSB would grow from US$147 million in 2017 (0.25 percent of GDP at 2017 exchange rates – see Annex 3)[92] to US$208.6 million (or 0.34 percent of GDP) in 2018. This would represent an increase of US$59.6 million (equivalent to 0.09 percent of GDP), with an estimated reduction of 2.4 percent in the consumption of SSB. This would help to improve the population's health in the Dominican Republic, especially when compared to the 2.4 percent growth in consumption in 2017.

In 2019, when the 2018 excise tax on sugary drinks would increase by 25 percent up to 5.00 Dominican *pesos* per liter, SSB excise tax revenue would amount to 4,300 million Dominican *pesos* (US$78.5 million), exceeding the 2018 projections close to US$12.5 million. Total government revenue from all taxes on SSB would amount to US$69.4 million (0.10 percent of

[92] Since no up-to-date data on SSB tax revenues are available, it was impossible to calibrate the simulation model, and it will be reviewed once this information is available.

GDP), reducing consumption by 0.8 percent. In 2020, when the excise tax would be increased by 25 percent up to US$0.23 *balboas* per liter, SSB excise tax revenue would amount to US$84 million, while total government revenue from all taxes on SSB would total US$221.3 million (0.34 percent of GDP). However, since the income elasticity effect is close to 1.20 (see Figure 23)[93] and per capita GDP growth has been estimated at 4 percent,[94] the impact of the tax change on consumption is neutralized, meaning that consumption in 2020 would be equal to or slightly greater than in 2018 (estimated at 0.3 percent).

[93]This would imply that an increase in household expenditure (or income, since they are correlated) could raise demand proportionally to such an increase, provided that all other demand-side variables remained constant.
[94] IMF projections – see Annex 3.

Table 25: Dominican Republic: Impact of SSB Tax on GDP – Results of Simulation 1 for 2018 -2020

Dominican Republic: Sugar-Sweetened Beverage Tax Revenue Simulation **Summary of Simulation Results**	Today (2016)	Baseline scenario 2017. No excise tax	Scenario 1		
			Scenario 1 - 2018: Excise tax introduced by levying 4.00 Dominican pesos per liter	Scenario 1 - 2019: 2018 Excise tax increased by 25%, up to 5.00 Dominican pesos per liter	Scenario 1 -2020: 2019 Excise tax increased by 25%, up to 6.25 Dominican pesos per liter
Total SSB consumption (million liters)	860.9	882.0	861.1	863.4	871.5
Average SSB price (Dominican pesos per liter)	51.45	51.47	56.24	59.11	61.64
Average tax burden (sales tax as % of consumer price)	-	0.0	7.1	8.5	10.1
Average tax burden (total tax as % of price)	15.4	15.4	22.5	23.9	25.5
SSB tax revenues (million Dominican pesos)	-	-	3.445	4.317	5.447
SSB tax revenue (US$ million)	$ -	$ -	$ 65.91	$ 78.47	$ 89.29
Contribution to GDP (%)	0.00%	0.00%	0.08%	0.09%	0.10%
Total government tax revenue from sugar-sweetened beverages (DAI, ITBIS, excise tax, million Dominican pesos) [2]	6.820	6.992	10.902	12.175	13.718
Total government tax revenue from sugar-sweetened beverages (US$ million)	$ 148.03	$ 146.95	$ 208.60	$ 221.28	$ 224.88
Contribution to GDP (%)	0.26%	0.25%	0.34%	0.34%	0.33%
Percentage change in:					
Total SSB consumption (%)		2.5	-2.4	0.3	0.9

Source: World Bank Group, project team's estimations

[1] Total off-trade volume as proxy for consumption (Source: *EI)*

[2] The model was not calibrated because no tax revenue data are available for the Import Tariffs (DAI), nor for ITBIS in million Dominican pesos for soft drinks and concentrate juices, in 2016 or 2017.

In 2020, when excise tax would be increased by 25 percent up to 6.25 Dominican pesos per liter in comparison with 2019, the desired 20 percent increase in average price (61.6 Dominican pesos per liter) would be reached. Based on this tax increase, SSB excise tax revenues were estimated at 5,500 million Dominican *pesos* (US$89.3 million), while total government revenues from all taxes on SSB reached US$225 million (0.33 percent of GDP). Despite the tax increase, just like in 2019, with a projected per capita GDP of 4 percent (see Annex 3 IMF), the impact would not be sufficient to reduce consumption. Thus, the consumption projected for 2019 would be either stable or would increase by less than 1 percent. This implies that a tax burden of only 10 percent of the sales price per liter (see Table 8) is not enough to alter provides a window of opportunity to further expand the Dominican Republic's fiscal space by increasing the tax burden to over 20 percent within a three-year period, thus contributing to the expected health benefits for the Dominican Republic's population.

Under scenario 2 (Table 26), in order to compare the simulation results (excluding income elasticity) with those outlined in Table 4 above, it is assumed that everything remains constant for 2017, including consumption. As in Scenario 1, the excise tax would be introduced progressively (4.00 Dominican *pesos* per liter in 2018, 5.00 Dominican *pesos* per liter in 2019, and 6.25 Dominican *pesos* per liter in 2020) to reach an average price of 6.63 Dominican *pesos* per liter. In 2020, that price would be equivalent to a 20 percent increase over the 2016 baseline price, provided that all other taxes remained unchanged (see Table 10).

Table 26. Dominican Republic: Impacts of SSB Tax on GDP – Results of Simulation 2 for 2018 - 2020

Dominican Republic: Sugar-Sweetened Beverage Tax Revenue Simulation **Summary of Simulation Results**	Today (2016)	Baseline scenario 2017. No excise tax	Scenario 2		
			Scenario 2 - 2018: Excise tax introduced by levying 4.00 Dominican pesos per liter	Scenario 2 - 2019: 2018 Excise tax increased by 25%, up to 5.00 Dominican pesos per liter	Scenario 2 - 2020: 2019 Excise tax increased by 25%, up to 6.25 Dominican pesos per liter
Total SSB consumption (million liters) [1]	860.9	860.9	799.1	766.5	740.0
Average SSB price (Dominican pesos per liter)	51.45	51.47	56.23	59.10	61.63
Average tax burden (sales tax as % of consumer price)	-	0.0	7.1	8.5	10.1
Average tax burden (total tax as % of price)	15.4	15.4	22.5	23.9	25.5
SSB tax revenues (million Dominican pesos)	-	-	3.197	3.832	4.625
SSB tax revenues (US$ million)	$ -	$ -	$ 61.17	$ 69.65	$ 75.81
Contribution to GDP (%)	0.00%	0.00%	0.08%	0.08%	0.08%
Total government tax revenue from sugar-sweetened beverages (DAI, ITBIS, excise tax, million Dominican pesos) [2]	6.820	6.825	10.115	10.805	11.645
Total government tax revenue from sugar-sweetened beverages (US$ million)	$ 148.03	$ 143.43	$ 193.56	$ 196.39	$ 190.91
Contribution to GDP (%)	0.26%	0.25%	0.32%	0.30%	0.28%
Percentage change in:					
Total SSB consumption (%)		0.0	-7.2	-4.1	-3.5

Source: World Bank Group, project team's estimations
[1] Total off-trade volume as proxy for consumption (Source: *EI*), it is assumed that in 2017 there are no changes in consumption
[2] The model was not calibrated because no tax revenue data are available for the Import Tariffs (DAI), nor for ITBIS in million Dominican pesos for soft drinks and concentrate juices, in 2016 or 2017.

A 20 percent increase (assuming average elasticity of -0.841 and a pass-through of 1.0) would reduce consumption – by 14 percent compared with a 16.8 percent reduction under the simulation in Table 10. This would yield SSB excise tax revenue of 4,600 million Dominican *pesos* (lower than the 7,400 million Dominican *pesos* projected in Table 4) and total government revenue from all taxes on SSB of 11,600 million Dominican *pesos.*

V. Sugar-Sweetened Beverages Tax Impacts in Mexico

The sharp surge in obesity and overweight in Mexico has become a critical public health issue. Today, Mexico has one of the highest prevalence of obesity and overweight in the world, where 65 percent of adults and 30 percent of children are overweight or obese (World Bank, 2016). Overweight and obesity can cause chronic diseases such as diabetes or cardiovascular disease, which have an impact on mortality, morbidity and the national economies. Although the causes of obesity and related chronic diseases are multi-factorial, a number of scientific studies have shown that sugar-sweetened beverage consumption is associated with weight gain, type 2 diabetes, and other chronic diseases (Donaldson, 2015). In addition, populations with low socioeconomic status are particularly at risk (Donaldson, 2015).

In Mexico, sugar-sweetened beverages make up 70 percent of the sugar added to the diet (Aburto et al., 2016). In October 2013, the Government of Mexico decided to impose an excise tax of one peso (US$ 0.08) per liter on flavored drinks, effective on January 1, 2018 (Government of Mexico, 2013). The regulation allows the tax to be adjusted if the adjusted inflation rate compared to 2014 reaches 10 percent. The tax implementation was accompanied by an intensive educational campaign addressing the impact of sugar-sweetened beverages on health and increasing access to water sources (Government of Mexico, 2013). Researchers examined two different aspects of the SSB tax experience: the impact on SSB consumption and the tax promotion strategy.

The proposed tax implementation had advocates and opponents (Donaldson, 2015). The advocates included multilateral and international organizations such as PAHO and WHO, academia and medical institutions, Civil Society Organizations (CSOs), some lawmakers, and the Executive Branch (such as President Peña Nieto). Opponents to the tax included the food and beverage industry, trade associations, cane sugar producers, beverage manufacturers, some members of the Legislative and Executive Branches, and CSOs. It was a two-pronged strategy: an intense educational media and advertising campaign about the effect of sugar-sweetened beverages on health, and formal lobbying. The successful passage of the tax was attributed to a combination of several factors: 1) use of scientific evidence to highlight the problem and formulate appropriate policymaking; 2) strong advocacy through coalition building, a media campaign, lobbying, and building alliances with key stakeholders; and 3) in-depth analysis of the country's political context and involvement of the global community (Donaldson, 2015).

In 2017, several researchers from the National Institute of Public Health of Mexico and the University of North Carolina at Chapel Hill conducted a second study on the post-tax consumption of sugar-sweetened beverages (Colchero et al., 2017). In this study, they estimated changes in sugar-sweetened beverage purchases in 2014 and 2015. They used purchase data covering 6,645 households from January 2012 through December 2015, and looked at changes in beverage

purchases with and without the tax. Sugar-sweetened beverage purchases decreased by 5.5 percent in 2014 and 9.7 percent in 2015, with an average reduction of 7.6 percent. Families with low socioeconomic status displayed the largest reduction in the purchase of SSBs over the two-year study period. The purchase of beverages without tax increased by 2.1 percent. The researchers concluded that, two years following the tax effectiveness, it still had the expected impact.

A third study, published in 2018, assessed whether the tax had health warning effects (Alvarez-Sanchez et al., 2018). To evaluate the health warning effect of the SSB tax in Mexico, the research team analyzed the association between awareness and opinions about its effectiveness on current consumption of sugar-sweetened beverages and on a self-reported change in consumption since the tax introduction. They also examined the link between environmental and psychological determinants of sugary drink consumption. In their analyses, they used the results of the Mexican National Health and Nutrition Survey 2016. The findings showed that, when comparing adults who were not knowledgeable, those who were aware of the tax were more likely to report a decrease in consumption of sugar-sweetened beverages. In urban areas, adults who were aware of the tax reduced their consumption by 15.7 percent. Although the SSB consumption effects on health were not significantly associated with consumption of sugary drinks, self-efficacy (confidence that one can reduce consumption) was significantly associated.

In conclusion, all SSB tax studies in Mexico found that the tax implementation, combined with educational campaigns addressing the risks of SSBs, has been effective. All studies have found an increased price of these beverages, a reduced consumption, and an increased consumption of healthier beverages. Two years following the implementation of the SSB tax, and the results are still in effect. Another study looking at the effect of the SSB tax on employment found no statistically significant employment changes in the employment rate in sugar-sweetened beverage manufacturing industries (Guerrero-López et al., 2017). Globally, the impact of SSB tax in Mexico may encourage other countries to follow its lead and adopt tax policies to reduce consumption of unhealthy beverages and decrease the burden of chronic diseases.

VI. Conclusions and Short and Long-term Monitoring

The tax change simulations presented in this report demonstrate that, in all cases (sensitized by price elasticity and "pass-through" value), a higher tax leads to greater tax revenue and significantly lower consumption of sugary drinks. International experience has shown that taxes are the most effective tools for curbing the consumption of these goods. It has also shown that excise taxes need to be adjusted annually to take into account general increases in prices (inflation) and in average consumer incomes (using per capita GDP increases as a proxy).

The effective implementation of these taxes will also require complementary measures such as adequate front-of-package labeling not only of sugar-sweetened beverages but of all highly processed foods. It is also desirable to implement measures that will protect children and adolescents from being exposed to these products, such as restrictions on manipulative advertising based on Disney characters or others familiar to children or on manipulative advertising based on self-esteem and social acceptance targeted to adolescents, restrictions on sales of these goods in and around schools, and education campaigns in schools about their lack of nutritional value**.**

The presence of large processed food manufacturers in the sub-region has stimulated the growth of the food industry in general and of low nutritional value products (PBVN) in particular. Most of these companies have identified potential for establishing a production base in some countries of the sub-region and for supplying local and regional markets. In this, they have been encouraged by the policies of the governments of these countries who have been actively seeking investment and taking advantage of existing free trade agreements.

While trade liberalization has stimulated imports and helped to increase the availability of PBVN on the regional market, the existence of tariffs has not constrained the inflow of these products. Over the past 15 years, while most trade growth in the sub-region has been with the sub-region's traditional trading partners (companies based in Mexico and the United States), there has also been considerable growth in imports from countries that do not benefit from preferential tariffs, in other words, some South American and Asian economies, especially China. Thus, it is clear that tariff barriers in Central American countries have not deterred the growth in imports of PBVN.

Most countries in the sub-region are net PBVN importers. For every dollar exported of this type of goods, US$1.4 is imported. At the aggregate level, exports grew more rapidly than imports between 2002 and 2016, with exports growing by an average annual growth rate of around 10 percent and imports growing at a rate of 8 percent.

The leading PBVN suppliers in Central America are the countries of the sub-region themselves, from where 57 percent of total imports originate, while Mexico and the United States supply an additional 31 percent. All of these countries are exempt from import duties or enjoy preferential access to the regional market. However, imports from non-preferential countries have also increased significantly. Thus, while tariff liberalization has helped to stimulate imports, it has not been the only factor behind the growing availability of PBVN in the sub-regional market.

The main factor behind the greater availability of PBVN on the market has been the presence of foreign capital companies in the sub-region, attracted by its trade openness, fiscal incentive regimes, and access under favorable conditions to a high consumption market. The presence of large supermarket chains throughout the subregion as well as the proliferation of franchises, especially for fast food, has also facilitated access to and the variety and availability of this type of food.

In some countries, such as El Salvador and Guatemala, local production has also been making a contribution, especially in the production of confectionery, biscuits, and snacks.

Apparent consumption of PBVN has also grown considerably in all countries in the sub-region, although at faster rates in some countries (such as Guatemala) than in others. However, in practically all Central American countries, these growth rates have been decelerating over the past five years. The prices of PBVN have also shown a downward trend, except in Nicaragua.

In a sub-region where 50 to 60 percent of the population of some countries live in poverty, unemployment levels hover around 7 percent and schooling levels remain low,[95] the price and availability of foods are decisive factors in a family's ability to meet its basic food needs. Under these conditions, the factor that takes precedence over any other variable is undoubtedly price. Therefore, the introduction of taxes that raises the price of a product can be expected to suppress demand for that product.

Interventions that seek to shape a person's behavior and preferred day-to-day choices, as well as those interventions that go beyond an individual's knowledge or ability to make choices (including individuals from academia, civil society, health professionals, and executive and legislative branches of government) must be implemented consistently within a multi-sectoral approach to be effective.

Based on the available evidence, we make the following recommendations for reducing the consumption of PBVN and SSBs in Central America, Panama, and the Dominican Republic:

Over one to three years:

[95] FEREMA (2017)

- Review the profile of acceptable nutrients in highly processed foods and sugary drinks to determine which foods are eligible for advertising and which are not using the PAHO Nutrient Profile Model, which defines products that have excessive calories, total sugar, added sugar, sodium, and fat.
- Based on this definition, revise or develop national regulations for pre-packaged food and beverages as well as sub-regional agreements that strengthen these regulations throughout the sub-region.
- Create guidelines to inform consumers of the negative effects that processed foods and beverages can have on health.
- Use front-of-packaging to inform consumers of excessive calories, saturated fat, sodium, and sugar in food products.
- Create incentives for mass media and non-traditional media to feature the existing regulations and to disseminate educational messages about the dangers of consuming foods with poor nutritional value.
- Actively recruit mainstream media such as radio and television and non-traditional media such as the internet and social networks to encourage the consumption of nutritionally valuable traditional foods and physical activity.

Over four years:

- Consolidate the taxation of ultra-processed food and beverages and subsidize fruits and vegetables, especially in schools.
- Ensure that tax enforcement interventions are accompanied by other actions such as nutritional education and increased access to healthy food in social settings.
- Emphasize the implementation of nutritional messages on food packaging, regulate the provision of prizes or toys with the purchase of highly processed foods and introduce regulations for school cafeterias and school buildings throughout the sub-region.
- Invest in research that explores the health effects attributable to specific food groups and the price elasticity relationships to address challenges posed by multiple regulations, such as taxation, front-of-package labeling, and marketing. This research should also generate evidence for decision-makers by defining and recommending appropriate quantities, frequencies, and forms of food for different age groups (children, pregnant women, and adults) and different levels of physical activity.
- Evaluate the effectiveness of policies and interventions to regulate pre-packaged foods and beverages (such as dietary guidelines to reduce negative health effects, restrictions on the marketing of PBVN, front-of-package labeling, or taxation) and share knowledge among countries about their impact.

Some of the actions that we are recommending governments to take jointly within the context of a sub-regional commission are:

Food production and availability:

- Analyze local food production conditions
- Examine the content of pre-packaged food for their health effects
- Review local trade supply conditions
- Regulate the domestic production of PBVN in terms of both quality and quantity
- Develop incentives to encourage the agricultural sector to offer more fruits and vegetables to the market
- Revise free trade agreements to clearly define the health implications arising from the consumption of certain foods
- Review tariff barriers for countries with non-preferential tariffs
- Analyze which products enter through the sub-region from countries with non-preferential tariffs and evaluate their impact on health
- Review the importance of price reductions and the margin they would create for introducing tax rates
- Prepare dietary guidelines to inform consumers of the negative effects that consuming processed foods and beverages can have on their health.

To induce behavioral changes among consumers:

- Introduce and/or increase excise duty or increase existing excise tax by 20 percent (as recommended by the WHO) on the average price of a liter of sweetened beverages at the point of sale, either all at once or gradually.
- Regulate the advertising of highly processed food and SSB through TV, radio, cinema, internet, and social networks,
- Review the rules regulating food packaging advertising and the inclusion of prizes and toys aimed at children and adolescents.
- Regulate the supply of food in and around schools.
- Review existing guidelines on which foods can be advertised and which are not allowed.
- Share results of research on the negative health effects of consuming PBVN and SSBs with academia, civil society, health professionals, and executive and legislative government bodies in each country and across the sub-region.
- Implement a front-of-package warning scheme to inform consumers of excessive calorie, saturated fat, sodium, and sugar content.
- Encourage public debate about the taxation of ultra-processed foods and beverages and about the implementation of fruit and vegetable subsidies, especially for school feeding programs.

- Assess the water quality in every urban and rural area.
- Promote public policies that ensure that funds are allocated for water supply and maintenance and for wastewater treatment.
- Pursue bilateral or multilateral international agreements for managing international waters and cross-border aquifers.

Annex 1: Availability of Water Resources and Water and Health Agencies in Central America and Panama

	Governing Entity	Water Supply Entity	Other Institutions
Belize	No governing entity	Belize Water Services Limited (BWS) urban áreas and Village Water Boards (VWB)	Ministry of Natural Resources and Environment and Ministry of Health
Costa Rica	Ministry of Health (Minsa); Ministry of Environment and Energy (Minae); and Costa Rican Water and Sanitation Institute (AyA)	Costa Rican Water and Sanitation Institute (AyA), Public Services Company of Heredia (ESPH) and Rural Community-based Water Boards (ASADAS), Administrative Committees of Rural Water Systems (CAARs) and municipalities.	Ministry of Environment, Energy, Waters, and Seas (MINAEM), and Ministry of Agriculture and Livestock (MAG), assisted by the National Underground Water, Irrigation and Drainage Service (SENARA)
El Salvador	Ministry of Environment and Natural Resources (MARN) and Ministry of Health (MINSAL)	National Administration of Water and Sewer (ANDA), divided in cooperatives, private/public entities and municipalities.	Ministry of Agriculture (MAG), Ministry of Environment and Natural Resources (MARN), and Water Boards and Watershed Associations
Guatemala	INSIVUMEH	Ministry of Health and the Municipal Social Assistance and Development Institute	Ministry of Energy and Mines (MEM), Ministry of Agriculture, Livestock and Food (MAGA), Water Cabinet (GEA), Ministry of Health and Welfare (MSPAS) and Ministry of Environment and Natural Resources (MARN) and National Council for Protected Areas (CONAP)
Honduras	National Water and Sanitation Council (Conasa). Ministry of Energy, Natural Resources, Environment and Mines (Mi Ambiente).	Municipalities, National Autonomous Water and Sewerage Service (SANAA), Community Organizations	General Directorate of Water Resources (DGRH), Permanent Contingency Commission of Honduras (COPECO), Ministry of Health, Center for the Study and Control of Pollutants (CESCCO) and National Regulatory Institution for Water Supply and Sanitation (ERSAPS)
Nicaragua	Nicaraguan Water and Sewerage Institute (INAA)	Nicaraguan Water and Sewerage Company (ENACAL) serving urban areas and Emergency Social Investment Fund (FISE) serving rural areas.	National Water Authority (ANA), Nicaraguan Water and Sewerage Institute (INAA), Emergency Social Investment Fund (FISE), Community-based Water and Sanitation Committees (CAPS).
Panama	Ministry of Environment (MiAmbiente)	Ministry of Health (MINSA), National Authority of Public Services (ASEP) and National Water and Sanitation Institute (IDAAN).	Ministry of Agriculture Development (MIDA) and National Environmental Authority (ANAM). National Council for Sustainable Development (CONADES).

Source: Authors based on country information and information from the IADB Technical Note (IADB-TN-1439) IADB, 2018. https://publications.iadb.org/bitstream/handle/11319/8937/Ejecutar-proyectos-de-agua-y-saneamiento-en-el-sector-rural-Retos-y-desafios-en-America-Latina-y-el-Caribe.pdf?sequence=1&isAllowed=y

Annex 2: Methodology

A. Demand Estimation

Different methods were used to estimate demand depending on which were most feasible for each country, including the Almost Ideal Demand System (AIDS), [96] the Quadratic Almost Ideal Demand System (QUAIDS),[97] and the AIDS quality-adjusted method.[98/ 99/100]

First, estimates were made for all countries using QUAIDS. If the data structure did not yield a satisfactory estimate (because of insufficient census tracts or no uniform price variation between census tracts), the estimates were then calculated using either AIDS or QUAIDS, depending on which option was the best in each case. In all countries, estimations were made for sub-samples of the 40 percent of households with the lowest total expenditure (as a proxy for income), the 20 percent of households with the highest total expenditure, and for urban and rural households. Once the elasticity matrices were estimated, the standard deviations were calculated using a 1,000 clustered non-parametric bootstrap.

B. Household Surveys

Costa Rica: The National Survey of Household Income and Expenditure 2013 (ENIGH 2013) was conducted between October 2012 and October 2013 by the National Institute of Statistics and Census (INEC) of Costa Rica. It was intended to collect detailed information on household income and expenditure, which was later employed to update the weights of the goods and services that make up the consumer price index (CPI), in addition to the construction of the basic food basket (BFB). In other words, data from the Costa Rican ENIGH play a key role in enabling researchers to understand the consumption structure of Costa Rican households and their quality of life, as well as in updating economic price indicators.

The survey used a replicated, two-stage stratified random sampling of areas, where the sampling frame was used to select the sample was made up of geographical census tracts called primary

[96] Deaton, A. and J. Muellbauer (1980). "An Almost Ideal Demand System." *The American Economic Review*.70(3):312-26.
[97] Banks, J., R. Blundell, and A. Lewbel (1997). "Quadratic Engel Curves and Consumer Demand." *Review of Economic Statistics* 79(4):527–39.
[98] Deaton, A. (1997). *The analysis of household surveys: a microeconometric approach to development policy*. Baltimore, MD: Published for the World Bank by Johns Hopkins University Press; 1997. viii, 479 p. p.
[99] Paraje, G. (2016). "The Effect of Price and Socio-Economic Level on the Consumption of Sugar-Sweetened Beverages (SSB): The Case of Ecuador." PloS one. 11(3): e0152260
[100] Deaton, A. (1990). "Price elasticities from survey data: Extensions and Indonesian results." *Journal of Econometrics* 44(3):281-309.

sampling units (PSUs).[101] In total, 7,020 households were selected, with 5,705 households arranged in 468 PSUs. The household survey response rate was 83 percent nationwide.

El Salvador: The National Survey of Household Income and Expenditure 2005-2006 (ENIGH 2006) was conducted between September 2005 and August 2006 by the General Directorate of Statistics and Census (DIGESTYC). Its goal was to gather detailed information on the income and expenditures of Salvadoran households, which was then used to update the CPI market basket and estimate private consumption for inclusion in the national accounts. El Salvador's administrative structure consists of 14 departments which are divided into 262 municipalities. The survey's sample design divided the municipalities into 13,948 tracts that each contained about 87 houses in urban areas and 113 houses in rural areas. The tracts served as primary sampling units (PSUs) in a stratified (by urban and rural) two-stage design. In total, 4,576 households distributed among 468 PSUs were selected for the survey. The household survey response rate was 95.2 per cent.

Honduras: The National Survey of Living Conditions (ENCOVI) is conducted by the National Institute of Statistics to gather information on gender, unemployment issues, child and youth labor, household income and expenditure, poverty, and other important issues.[102]

The sample design makes it possible to obtain estimates of the socio-demographic characteristics of the target population with urban and rural representation of the different strata or domains of interest. The sample is based on a sub-sample of sectors from the master sample that was recently designed and developed for the Continuous Household Survey, featuring probabilistic, area-based, stratified, multi-stage and independent characteristics in each study domain considered. The sample size was 8,064 households, with 5,504 being located in urban areas and 2,560 in rural areas, and the sample is clustered in 1,008 census tracts,[103]688 urban and 320 rural.

Nicaragua: The Living Standards Measurement Study 2001 (LSMS, 2001) was the third LSMS conducted by Nicaragua's National Institute of Statistics and Census (INEC), with the previous rounds being fielded in 1993 and 1998. The survey was conducted between February 1 and November 15, 2001, with the fieldwork taking place between April 30 and July 31.[104] Its aim was to collect information on and update socioeconomic indicators on living standards nationally and to monitor the level of poverty in the country. As a result, the information collected by the LSMS 2001 is broad and covers socio-demographic characteristics of households and their members, the household expenditure structure, and agricultural production among others. The survey's sampling design was based on the VII Population Census and III Housing Census of 1995, with a

[101] *Costa Rica – Encuesta Nacional de Ingresos y Gastos de los Hogares 2013, 2013*. Instituto Nacional de Estadísticas y Censos de Costa Rica.
[102] http://170.238.108.229/index.php/catalog/76/study-description
[103] In the databases, census tracts were coded under the PSU variable (Primary Sampling Units).
[104] In addition to a recall period between August 1st and 22nd.

stratified two-stage sampling by clusters (in both urban and rural areas). The primary sampling units (PSU) were the census tracts, where, in the first stage, 12 households per PSU were selected in urban areas and 10 households per tract in rural areas. A total of 4,676 households were selected for sampling (of which the data for 4,191 were eventually available in databases) divided among 228 PSUs.

Panama: The Living Standards Measurement Study 2008 (LSMS, 2008) was the third LSMS conducted for Panama by the World Bank, with the previous rounds being in 1997 and 2003. Fieldwork was carried out between May and August 2008. Its main objective was to collect information to assess the impact that certain public policies could have on households' living conditions, as well as to update poverty lines and related indicators. To meet this broad objective, the LSMS 2008 collected information on a wide range of subjects, including the socio-demographic characteristics of households and their members, the household expenditure structure, agricultural production, and others. The survey sampling was designed by the Directorate of Statistics and Census (DEC) of the National Institute of Statistics and Census (INEC) of Panama. It involved two-stage sampling, first selecting the primary sampling units (PSUs) and then selecting an average of 10 households within each PSU. In total, 8,000 households distributed among 800 PSUs were selected to participate in the survey.

The Dominican Republic: The National Survey of Household Income and Expenditure 2007 (ENIGH 2007) was a study conducted by the National Statistics Office of the Dominican Republic. It aimed to gather detailed information on the income and expenditures of the country's households, as well as to learn about the population's living conditions. The information gathered helped to update the CPI, estimate private consumption for the national accounts, and identify the structure of household income and expenditure by income level. The sample was selected using the process used for the VIII National Population and Housing Census of 2002. The 792 census supervision areas were selected as primary sampling units (PSUs). Specifically, a two-stage randomized sample of areas was designed, with a systematic selection of households proportional to the size of the PSUs in the first stage and systematic sampling with a single (random) starting point in the second stage.[105] In total, 9,600 dwellings were sampled, distributed among the 792 PSUs.

C. Statistical Treatment of Data

In order to estimate the demand for sugar-sweetened beverages, it was first necessary to identify and categorize the goods considered to be sugar-sweetened beverages, bottled water, coffee, tea, and cocoa, and milk. This was done by identifying the codes used for each item in each country. To standardize the units of measurement, for powdered drink mixes and powdered milk,

[105] National Statistics Office of the Dominican Republic (2007). *General Findings: National Survey of Household Income and Expenditure 2007*.

items that were measured in grams in some of the countries studied were expressed as the equivalent in milliliters, the unit of measurement used for other beverages.

At the same time, the sociodemographic and economic variables of interest were also identified, including the number of family members living in the household, the ratio of members over 8 years of age, the sex, marital status, and education of the head of household, total household expenditure, and the area (urban or rural) and place of residence.

The various available databases were merged into a household-based data set that contained data on total expenditure on the goods of interest in addition to the relevant socio-demographic and socioeconomic variables. Finally, in order to rule out atypical cases, the outliers were removed. For the percentage of expenditure on each beverage group, the quantity consumed, and unit value variables, all observations above or below three standard deviations from the mean were cut off.

D. Descriptive Statistics

In order to gain a more in-depth understanding of household beverage consumption, this section discusses the main available demographic and socioeconomic variables as well as the expenditure structure in the four groups identified for each country. First, the mean and standard deviations of demographic and socioeconomic variables were disaggregated by total expenditure quintile and by place of residence respectively. Then, the consumption and expenditure patterns under the four beverage groups were disaggregated by total expenditure quintile and place of residence respectively.

When the entire sample was disaggregated by the percentage of the population living in rural areas, it was found that, on average, more households in the poorest quintile live in rural areas than those in the richest quintile. The percentages of female-headed households, the average age of the head of household, and the quintile with the oldest average age of the head of household were also identified.

In terms of education, the sample was broken down between those who have no formal education or who have not completed primary education, those who have not completed secondary education, those who have completed secondary education, and those who have completed some university education. By disaggregating this statistic by level of total expenditure, in the majority of the countries studied, the first (lowest income) quintiles tend to have a lower level of educational attainment. A disaggregation by place of residence also revealed a large difference between the educational levels of heads of household. A representative proportion of rural heads of household had no formal education or had not completed primary school, and only a small percentage had completed some university studies.

Household consumption patterns were analyzed both across the total sample and by quintiles. For the entire sample, we broke down by quintile how much they spent on average in local currency and the number of liters of SSB that they consumed as a percentage of their total expenditure (among those households who reported consuming sugar-sweetened beverages).

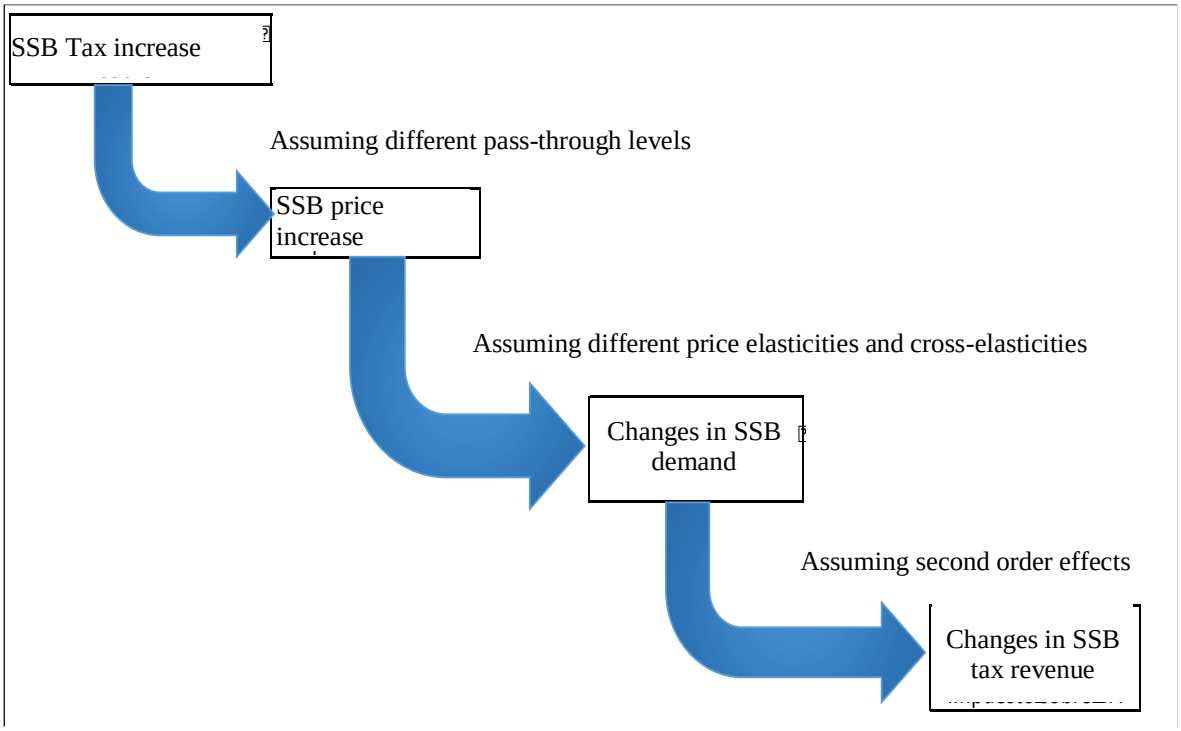
We also analyzed the amount of sugary drinks consumed as well as the amount of money allocated for their consumption in local currency in both urban and rural households (as a percentage of total expenditure). We also compared the consumption of non-sugared beverages such as bottled water, coffee, tea, cocoa, milk (average liters consumed and expenditure allocated as a percentage of total expenditure) between urban and rural areas**.** Standard deviations were also calculated for the quantities consumed.

E. Simulations of Tax Changes

Due to the fact that estimates of elasticities were available to us, our tax change simulation exercises contain less uncertainty than those previously run by other authors who lacked these estimates.[106/107] However, our simulation exercise was otherwise similar to those run in these studies and is summarized in Annex Figure 2.1.

[106] Manyema, M., L.J. Veerman, L. Chola, A. Tugendhaft, B. Sartorius, D. Labadarios et al. (2014) The potential impact of a 20 percent tax on sugar-sweetened beverages on obesity in South African adults: a mathematical model. *PloS one*, 9(8): e105287.
[107] Briggs, A., O. Mytton, P. Scarborough, and M. Rayner (2012). "Modelling the effects of a 10 percent sugar-sweetened drinks tax on obesity and overweight in Ireland: a report to inform the Health Impact Assessment." Dublin: The Institute of Public Health in Ireland.

Annex Figure 2.1: Sequences in Tax Change Simulation



Our simulation of the effects of an SSB tax increase showed that this translates into changes in the price of SSB. When SBB tax increases, the supply declines, the price goes up, and the quantities traded go down. The higher the price elasticity of demand, the greater the decrease in these quantities due to the percentage increase in price. However, it is crucial to know what impact the tax increase will have on prices. That parameter, known in economics as the pass-through, was unknown for the countries in this study. What is usually done is to assume a value for this parameter based on some explicit or implicit criteria. Some authors assume point values for this pass-through; for example, Briggs et al (2012) [108] assumed it was equal to 0.9, while Manyema et al (2014)[109] assumed it was equal to 1.

[108] Briggs, A., O. Mytton, P. Scarborough et al
[109] Manyema, M., L.J. Veerman, L. Chola et al

In the absence of specific data, analysts need to consider different pass-through values when conducting sensitivity analyses on this parameter. In this paper, we used three different pass-through values—0.9, 1, and 1.1. There is evidence, at least for the United States[110] and Mexico,[111] that the pass-through of taxes to prices is higher than the tax increase. Some studies have reported results where such pass-through was as high as 1.3.[112] In France, the tax was completely transferred (a pass-through of 1), although it was only partially transferred to artificial juices (0.6 pass-through) and sugary drinks (0.8 pass-through).[113] In light of this evidence, it would be reasonable to establish a range around 0.9-1.1. (See our simulations for Costa Rica in Table 2, Guatemala in Table 3, and the Dominican Republic in Table 4.)

To estimate the effect that a tax would have on the quantities of SSB consumed with a given pass-through, we had to estimate price elasticities. It is possible, as is done here, to estimate not only point values for the required elasticities but also their confidence intervals and to use the elasticities corresponding to the lower and upper bounds of the intervals.

When determining the potential effect of a tax rise, it is necessary to determine not only the pass-through rate (which depends, *inter alia*, on the market structure) but also the price elasticity of supply, which is unknown. The pass-through is key to determining the impact of such tax, in other words, how much of this tax rise will be passed on to the buyer through a price increase. and how much will fall on the supplier (how much less than the initial price the supplier will receive.[114]

[110] Besley, T. and H. Rosen (1999). "Sales Taxes and Prices: An Empirical Analysis." *National Tax Journal*, 52.
[111] Grogger J. (2015). "Soda Taxes and the Prices of Sodas and Other Drinks: Evidence from Mexico." National Bureau of Economic Research Working Paper Series. Nº 21197.
[112] Besley, T. and H. Rosen (1999) Sales Taxes and Prices: An Empirical Analysis." *National Tax Journal*, 52.
[113] Berardi, N., P. Sevestere, M. Tepaut, and A. Vigneron (2012). "The Impact of a 'Soda Tax' on Prices: Evidence from French Micro Data." Banque de France Working Paper No 415. Paris: Banque de France.
[114] For further information, see pages 132-133 of Guillermo Paraje (2018). *El impacto del precio en el consumo de bebidas azucaradas en seis países de América Central y el Caribe*.

Annex 3: Macroeconomic Indicator Assumptions by Country

COUNTRY	2015	2016	2017	2018 projections	2019 projections	2020 projections
Costa Rica						
Local average exchange rate / US$1 (estimated) [1]	534.6	544.7	567.5	575.0	585.0	604.0
Macroeconomic indicators						
GDP at current prices (US$ billion) [2]	55.38	57.81	58.06	61.29	64.85	68.50
GDP growth rate (%) [2]	3.6	4.50	3.2	3.6	3.6	3.5
GDP per capita (US$) [2]	11,415.78	11,775.71	11,685.16	12,188.71	12,744.07	13,300.31
Increase in per capita GDP (%) [3]	2.55	3.10	2.17	2.37	2.37	2.27
Average annual inflation rate (%)	0.80	-0.02	1.63	2.82	3.00	3.00
Population (million) (updated June 30 this year)	4.85	4.91	4.97	5.03	5.09	5.15
Guatemala						
Local average exchange rate/ US$1 (estimated) [1]	7.63	7.52	7.34	7.57	7.65	7.81
Macroeconomic indicators						
GDP at current prices (US$ billion)) [2]	63.77	68.76	75.66	82.36	87.82	93.46
GDP growth rate (%) [2]	4.1	3.1	2.8	3.2	3.6	3.8
GDP per capita (US$) [2]	3,923.56	4,146.72	4,471.87	4,770.74	4,985.93	5,200.57
GDP growth per capita (%) [3]	2.03	1.04	0.75	1.19	1.57	1.69
Average annual inflation rate (%)	2.39	4.45	4.43	4.20	3.66	3.45
Population (million) (updated June 30 this year)	16.25	16.58	16.92	17.26	17.61	17.97
Honduras						
Local average exchange rate/ US$1 (estimated) [1]	22.09	22.99	23.65	23.91	24.23	24.9
Macroeconomic indicators						
GDP at current prices (US$ billion)) [2]	20.98	21.64	23.0	24.021	24.823	25.67
GDP growth rate (%) [2]	3.8	3.80	4.8	3.5	3.7	3.7
GDP per capita (US$) [2]	2,598.10	2,642.71	2,765.88	2,851.21	2,904.98	2,961.99
GDP growth per capita (%) [3]	2.08	2.02	3.06	2.01	2.19	2.28
Average annual inflation rate (%)	3.16	2.73	3.93	4.67	4.50	4.50
Population (million) (updated June 30 this year)	8.08	8.19	8.31	8.43	8.55	8.67
El Salvador						
Local average exchange rate/ US$1 (estimated) [1]	8.75	8.75	8.75	8.75	8.75	8.75
Macroeconomic indicators						
GDP at current prices (US$ billion)) [2]	26.05	26.80	28.02	29.41	30.71	32.07

COUNTRY	2015	2016	2017	2018 projections	2019 projections	2020 projections
GDP growth rate (%) [2]	2.3	2.4	2.4	2.3	2.3	2.2
GDP per capita (US$) [2]	4,128.73	4,226.74	4,399.87	4,596.23	4,777.93	4,966.36
GDP growth per capita (%) [3]	1.87	2.06	1.79	1.84	1.83	1.73
Average annual inflation rate (%)	-0.73	0.60	1.01	1.73	1.93	2.00
Population (million) (updated June 30 this year)	6.31	6.34	6.369	6.398	6.427	6.457
Nicaragua						
Local average exchange rate/ US$1 (estimated) [1]	27.25	28.62	30.05	33.64	35.71	40.24
Macroeconomic indicators						
GDP at current prices (US$ billion)) [2]	12.75	13.23	13.73	14.53	15.50	16.52
GDP growth rate (%) [2]	4.90	4.70	4.90	4.70	4.50	4.50
GDP per capita (US$) [2]	2,095.96	2,151.27	2,206.64	2,309.74	2,435.60	2,566.68
GDP growth per capita (%) [3]	3.60	3.50	3.72	3.52	3.32	3.33
Average annual inflation rate (%)	4.00	3.52	3.85	6.18	7.16	7.09
Population (million) (updated June 30 this year)	6.08	6.15	6.22	6.29	6.36	6.44
Panama						
Local average exchange rate/ US$1 (estimated) [1]	1	1	1	1	1	1
Macroeconomic indicators						
GDP at current prices (US$ billion)) [2]	54.32	57.82	61.84	66.71	72.37	78.15
GDP growth rate (%) [2]	5.80	5.00	5.40	5.60	5.80	5.60
GDP per capita (US$) [2]	13,662.94	14,322.58	15,089.35	16,040.89	17,154.47	18,265.44
GDP growth per capita (%) [3]	3.84	3.30	3.70	4.06	4.29	4.13
Average annual inflation rate (%)	0.13	0.74	0.87	2.16	2.54	2.26
Population (million) (updated June 30 this year)	3.98	4.04	4.10	4.16	4.22	4.28
Dominican Republic						
Local average exchange rate/ US$1 (estimated) [1]	45.05	46.07	47.58	52.26	55.02	61
Macroeconomic indicators						
GDP at current prices (US$ billion)) [2]	68.20	71.67	75.02	80.41	84.59	89.37
GDP growth rate (%) [2]	7.00	6.60	4.60	5.50	5.00	5.00
GDP per capita (US$) [2]	6,833.24	7,113.93	7,374.81	7,830.20	8,158.09	8,537.49
GDP growth per capita (%) [3]	5.79	5.44	3.57	4.54	3.97	3.97
Average annual inflation rate (%)	0.84	1.61	3.28	4.43	3.52	4.04
Population (million) (updated June 30 this year)	9.98	10.08	10.17	10.27	10.37	10.47

Sources: [1] World Bankl/ Country Central Bank until 2017. Projections 2018-2020 are made by *Trading Economics*

[2] IMF World Economic Outlook Database (April 2018).

[3] World Bank Database 2015-2016 (https://data.worldbank.org/indicator/); 2017-2020 Projections based on International Monetary Fund data (http://www.imf.org/external/pubs/ft/weo/2018/01/weodata/)

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