Cejka, Tim; Piek, Marlies; Waseem, Mazhar

Working Paper

Shifting sweetness: Impacts of South Africa's Health Promotion Levy on sugar-sweetened beverages

WIDER Working Paper, No. 21/25

Provided in Cooperation with:
United Nations University (UNU), World Institute for Development Economics Research (WIDER)

Suggested Citation: Cejka, Tim; Piek, Marlies; Waseem, Mazhar (2025) : Shifting sweetness: Impacts of South Africa's Health Promotion Levy on sugar-sweetened beverages, WIDER Working Paper, No. 21/25, ISBN 978-92-9256-578-7, The United Nations University World Institute for Development Economics Research (UNU-WIDER), Helsinki, https://doi.org/10.35188/UNU-WIDER/2025/578-3

21
25

Shifting sweetness

Impacts of South Africa's Health Promotion Levy on sugar-sweetened beverages

Tim Cejka,[1] Marlies Piek,[2] and Mazhar Waseem[3]

April 2025

WIDER WORKING PAPER

wider.unu.edu

United Nations University
World Institute for Development Economics Research

Abstract: Sin taxes are increasingly being used to discourage the consumption of goods perceived to harm individuals and society. This paper examines the impact of South Africa's Health Promotion Levy (HPL)—the first sugar tax implemented in Africa—on the consumption of sugar-sweetened beverages (SSBs) in the country. Using comprehensive data from excise returns submitted by manufacturers and importers of SSBs, we find that the HPL was extremely effective in reducing the consumption of sugar through these beverages. Within two years of its introduction, the levy caused a substantial 33 per cent reduction in the consumption of sugar through taxable beverages. We also find that the consumption partially shifted to non-taxable beverages, resulting in an increase of 15 per cent in the consumption of non-taxable SSBs. These findings suggest that while the HPL is effective in reducing SSB consumption, policy adjustments, including broader product coverage and targeted use of tax revenues, could enhance its impact.

Key words: soda taxes, commodity taxation, pass-through

JEL classification: D61, D62, H21, H23

Acknowledgements: We thank UNU-WIDER, SA-TIED, National Treasury, and SARS for providing us access to the data. We gratefully acknowledge support from UNU-WIDER. We thank participants at the SA-TIED work-in-progress workshop for helpful suggestions and comments. We also thank Michelle Pleace for providing excellent research assistance. All errors are our own.

[1] University of California Berkeley, Berkeley, USA; [2] National Treasury of South Africa, Pretoria, South Africa; [3] University of Manchester, Manchester, UK; corresponding author: **mazhar.waseem@manchester.ac.uk**

This study has been prepared within the UNU-WIDER project **Southern Africa—Towards Inclusive Economic Development (SA-TIED)**.

Information and requests: publications@wider.unu.edu

ISSN 1798-7237 ISBN 978-92-9256-578-3

https://doi.org/10.35188/UNU-WIDER/2025/578-3

United Nations University World Institute for Development Economics Research provides economic analysis and policy advice with the aim of promoting sustainable and equitable development. The Institute began operations in 1985 in Helsinki, Finland, as the first research and training centre of the United Nations University. Today it is a unique blend of think tank, research institute, and UN agency—providing a range of services from policy advice to governments as well as freely available original research.

The Institute is funded through income from an endowment fund with additional contributions to its work programme from Finland and Sweden, as well as earmarked contributions for specific projects from a variety of donors.

Katajanokanlaituri 6 B, 00160 Helsinki, Finland

1 Introduction

Overweight and obesity are rapidly becoming one of the most pressing public health concerns in Africa. The latest analysis from the World Health Organization shows that the obesity rate among adults in the ten high-burden African countries ranges between 13.6 and 31 per cent. The continent is also home to 24 per cent of the world's overweight children aged under five (WHO 2020). Overweight and obesity are the key risk factors for many non-communicable diseases, including cardiovascular diseases, diabetes, and some cancers (Imamura et al. 2015; Xi et al. 2015). Due to less advanced medical care and other risk factors, such as smoking and air pollution, most African countries have higher death rates than high-income countries from obesity per capita. Rising prevalence of overweight and obesity is thus likely to be the next major public health challenge Africa faces in the coming years.

There is now abundant epidemiological and experimental evidence showing that excessive consumption of sugar-sweetened beverages (SSBs) is one of the strongest causes of overweight and obesity (Malik et al. 2013). The most cost-effective policy to counter the excessive consumption of SSBs and to reduce morbidities arising from it is price intervention in the form of taxes on sugar contained in SSBs. Analysis by the Department of Health of South Africa, for example, shows that sugar taxes have the lowest per capita cost (ZAR0.2 per head) among all the policy measures that are effective against obesity (DoH 2013).[1] So-called 'sugar taxes' have now become a popular instrument in the fight against overweight and obesity. They have been implemented in 44 countries, including four countries in Africa (Global Food Research Program 2020). While they have generally proven effective in reducing consumption, their impact varies by context, population, and tax structure (see Allcott et al. (2019b) and Griffith et al. (2019) for recent surveys of this literature).

Most of the existing research on sugar taxes has focused on high-income countries; in comparison, evidence from low- and middle-income countries (LMICs), especially those in Africa, is limited. It is not clear if sugar taxes in LMICs will produce the same types of responses as they do in high-income countries. In LMICs, the interplay between affordability, dietary alternatives, and cultural preferences might yield unique responses to such taxes. For instance, the elasticity of demand might be high in low-income populations and accordingly the impact on dietary habits and substitution to other caloric sources could vary more widely. We fill this gap in the literature, providing evidence on the effects of sugar taxes from South Africa. South Africa is not only a representative middle-income country, but is also the country most affected by

[1] Other policies include food advertising and labelling, worksite interventions, mass media campaigns, school-based interventions, and physician counselling. Their costs range between ZAR0.9 and ZAR11.8 per person (DoH 2013).

overweight and obesity in Africa.[2] South Africa is also one of the most unequal countries in the world (World Inequality Lab 2024), which makes the redistributive effects of the tax extremely relevant.

To estimate the causal effects of a sugar tax, we exploit the introduction of the Health Promotion Levy (HPL) in South Africa as a natural policy experiment. The levy was implemented on 1 April 2018, and it targets SSBs with sugar exceeding 4 grams per 100 millilitres of drink. The levy applies to a broad range of non-alcoholic beverages containing added sugar or other sweetening matter. This includes sodas, flavoured waters, energy drinks, and fruit juices with added sugar. Pure fruit juices without added sugars and milk products are exempt. The tax rate is set at 2.1 cents (ZAR) per 1 gram of sugar content exceeding 4 grams per 100 ml of the drink. The first 4 grams of sugar per 100 ml are exempt. The tax's design requires regular increases in its rate to keep up with inflation, otherwise it stops being effective. However, despite multiple planned increases of the tax, heavy lobbying from the industry and sugar producers' interest groups has led the government to halt any sugar tax increases until at least 2026.[3] While not legally earmarked, the HPL was introduced with the intention of using the revenue generated to support public health initiatives, such as combating non-communicable diseases (NCDs) and funding nutrition programmes. However, specifics on allocation vary, and transparency about revenue usage has been an ongoing public interest issue.

Through our partner organization UNU-WIDER, we have entered into a collaborative relationship with the National Treasury of South Africa. This collaboration allows us to access administrative data comprising the universe of excise declarations. Through the excise return, manufacturers and importers report the quantity of sugar in SSBs cleared by them. For at least two reasons, these data are the most appropriate data for estimating the causal effects of the sugar tax. First, being administrative data, they have little or no measurement error. We directly observe the filings of manufacturers through which they report the quantity of sugar cleared by them each month and the sugar tax paid by them on the quantity cleared. Second, we separately observe the quantity of sugar cleared in taxable and non-taxable drinks. Given that the sugar tax applies only to drinks containing more than 4 grams of sugar per 100 ml, it creates an incentive for manufacturers to reformulate their taxable products, reducing the sugar content below the threshold to make the product non-taxable. Because we observe the clearance of sugar in taxable and non-taxable products separately, we can estimate any shifting response through the reformulation channel.

---

[2] In South Africa, obesity has grown in the last 30 years and the country is now considered the most obese in Sub-Saharan Africa. Over half of the country's adults are now overweight and obese, with 42 per cent of women and 13 per cent of men being obese (National Treasury 2016).

[3] For example, a News24 (2016) article cites a leading executive from the beverage industry who argues that the sugar tax will cost South Africa 60,000 jobs. See also Madubela (2024) for the reasons behind postponing any increase in the tax to 2026.

The excise data have some limitations as well. Importantly, a manufacturer is required to file an excise declaration only if it supplies any taxable product. Since SSBs were not taxable before the introduction of the levy, manufacturers were not required to file their excise declarations before April 2018. This means the excise data do not cover the baseline period and we do not observe any pre-existing trends in the consumption of sugar through SSBs. Our analysis, however, shows that this is not a major limitation of our empirical framework, as sugar consumption in South Africa through SSBs is essentially flat; once the effects of the sugar tax are completely realized, the sugar consumption in the country remains virtually constant over a long period of more than 36 months.

Using the excise data, we first document four broad trends on sugar consumption in South Africa and its response to the sugar tax. First, there is a strong seasonality in the consumption of SSBs in South Africa, with peaks typically observed in the warmer months (November to February). Second, if one controls for these seasonal fluctuations, the consumption of SSBs in the country is essentially flat, with no upward or downward trend seen over long periods. Third, the introduction of the sugar tax resulted in a large reduction in the consumption of taxable SSBs. The maximum sugar consumed per month through taxable drinks reduced by nearly 45 per cent from around 20,000 metric tons in 2018 to around 11,000 metric tons in 2022. Fourth, there was a strong shifting response, where the consumption shifted towards non-taxable drinks. This becomes evident when one compares the clearance of sugar in all SSBs with the clearance of sugar in taxable SSBs. During the same period (2018–22) that the sugar in taxable SSBs reduced by 45 per cent, it reduced by only 15 per cent in all, taxable and non-taxable, SSBs.

Motivated by the above four facts, our empirical framework uses a before–after estimator to estimate the causal effects of the sugar tax. To account for the seasonal variation in the consumption of SSBs, we use the fraction of sugar cleared in taxable SSBs as our outcome variable. Under the assumption that the seasonal variation in sugar consumption is the same across taxable and non-taxable SSBs, the consumption of taxable sugar as a fraction of total sugar will be independent of the seasonality. Indeed, we find evidence consistent with this assumption. In the last three years of our sample, when the reform's effects have been fully realized, the fraction of taxable sugar consumed through SSBs remained flat throughout the period, with no fluctuations within the year. Since the excise data are only available after the implementation of the sugar tax, we are constrained to comparing sugar consumption in the first few months after the introduction of the tax to sugar consumption in later months. To the extent that the supply and demand of SSBs are inelastic in the short term, our approach will deliver unbiased estimates of the response. Consistent with this assumption, we observe that the reduction in SSB consumption occurs gradually, with the full response materializing only two years after the reform. It is, however, important to emphasize that very inelastic demand and supply in the short run is a strong assumption. Forward-looking firms and consumers will op-

timize their production and consumption immediately after the change in incentives. While optimization frictions may slow down these adjustments, it is unrealistic to assume that the equilibrium quantity of SSBs consumed just a few months after the reform will remain completely unaffected. For this reason, our estimates have a lower bound interpretation, representing the minimum reduction in the consumption of taxable sugar arising from the tax.

Following the above empirical strategy, we find that the fraction of taxable sugar consumed in SSBs declined sharply after the introduction of the HPL. The fraction reduced by nearly 20 percentage points by the end of our sample period. Because the fraction of taxable sugar consumed in SSBs was around 51 per cent in the baseline period, the 20 percentage point reduction translates into a causal effect of nearly 40 per cent reduction in the fraction of taxable sugar consumed in SSBs. Assuming that the total quantity of sugar consumed in SSBs would have remained constant in the absence of the reform (a plausible assumption in our setup, as explained above), a 20 percentage point reduction in the fraction of taxable sugar means that the quantity of sugar consumed in taxable SSBs reduced by nearly 33 per cent. Our regression results also show that the total sugar consumed in SSBs decreased less than the taxable sugar. The difference between the two is the shifting responses, where either consumers shifted towards non-taxable drinks because they were cheaper, or producers shifted towards non-taxable products by reformulating their existing products. Our estimates show that these shifting responses mean that the consumption of non-taxable sugar in SSBs increased by 15 per cent as a result of the levy.

Our paper contributes to an emerging literature that studies the economic and health consequences of sugar taxes. Theoretically, sugar taxes are a class of corrective taxes imposed to discourage over-consumption of goods that are harmful to the individual and others in society. As we note above, sugar taxes have now been implemented in more than 44 countries by central or local governments. A strand of empirical literature evaluates some of these taxes, examining whether they cause a reduction in the consumption of sugar. In general, these taxes have been found to be effective, although outcomes vary based on tax design and demographic factors (see Allcott et al. (2019b) and Griffith et al. (2019) for recent surveys Sof this literature). Most of these studies are based in developed countries, where the environmental and economic factors, including the sensitivity of consumption to price, may be too different from those in developing countries. One notable exception in the literature is Colchero et al. (2017), who study the effects of a 1 peso per litre excise tax on SSBs implemented in Mexico from 2014. They find that following the tax the consumption of taxed beverages reduced on average by 7.6 per cent, whereas the consumption of untaxed beverages increased by 2.1 per cent during the same period. These estimates are in line with the emerging consensus in this literature that a 10 per cent tax is considered to reduce consumption by approximately 6–12 per cent, with lower-income groups showing higher sensitivity to price changes (Allcott et al. 2019a). Our estimates are almost an order of magnitude larger than these estimates and show that re-

sponses to the sugar taxes are highly context-specific and may vary based on, among other things, the distribution of tastes in the population.

We are not the first to study the effects of South Africa's HPL. Stacey et al. (2019, 2021) used data from Statistics South Africa's Consumer Price Index (CPI) and household scanner data from Kantar Worldpanel to document that the levy increased prices of taxed SSBs in the country while not affecting prices of untaxed products significantly. These studies further find that purchases of taxed SSBs fell by 30 per cent while sugar consumed from these SSBs fell by 50 per cent. These results are broadly in line with our results, although we rely on administrative supply-side data, whereas these studies rely on demand-side data from different sources. Relative to these studies, our paper examines responses over a longer time period and also studies shifting responses.

The rest of this paper is organized as follows. Section 2 describes environmental features of the South African context, focusing especially on the structure of the HPL. Section 3 describes the conceptual framework, explaining the forces that shape responses to a corrective tax such as the HPL. Section 4 describes our data and Section 5 our results. Section 6 concludes.

2 Context

South Africa's sugar tax, the HPL, was proposed in 2016 and implemented on 1 April 2018, becoming the first sugar tax in Africa. After discussions with lobbying groups, including beverage manufacturers and the sugar industry, the tax became around half as large as initially proposed, levied at the rate of 10 per cent rather than the initially proposed 20 per cent. The tax imposes a levy on SSBs at the rate of ZAR0.0221 per 1 gram of sugar exceeding 4 grams per 100 ml. The design of the tax, with a kink at 4 grams per 100 ml, creates an incentive for producers of products with sugar content just above this threshold to reduce the content to just below the threshold as this sugar is tax-free. Such shifting responses have been observed in other contexts. For example, the UK's Soft Drinks Industry Levy is a tiered tax based on sugar content. It levies the tax at the rate of GBP0.24 per litre for drinks with over 8 grams of sugar per 100 ml (high levy category), GBP0.18 per litre for drinks with 5–8 grams of sugar per 100 ml (low levy category), and no charge for drinks with less than 5 grams of sugar per 100 ml (no levy category). Scarborough et al. (2020) find that as a result of the levy, over 50 per cent of products reduced their sugar content to avoid higher tax rates.

An important feature of the HPL is that it is denominated in nominal terms, which means that the real value of the levy has decreased each year due to inflation as South Africa has not inflation-adjusted the HPL. Given that the annual inflation rate in South Africa averaged 5 per cent annually in the years 2019–23, the real value of the HPL has decreased by at least 22 per cent since its implementation. An increase of the HPL was scheduled for 1 April 2022, later

postponed until 1 April 2023, and eventually scrapped until at least 2026. If inflation in South Africa continues to average 5 per cent annually, the levy will lose more than 30 per cent of its real value by 2026.

In 2023, South Africa's government publicly acknowledged that 'limited published evidence [exists] about the effectiveness of [measures] to reduce obesity' (NDoH 2023). Our study aims to fill this evidence gap by investigating the effects of South Africa's sugar tax on important economic outcomes.

3 Methodology

Allcott et al. (2019a) develop a comprehensive optimal taxation framework for corrective taxes, which embodies both corrective and redistributive motives as well as revenue recycling. For the simple case with no market power (i.e. assuming perfect pass-through on consumers), they show that the optimal tax for a sin good commodity, such as SSBs, is given by:

$$t = \underbrace{\bar{\gamma}(1+\sigma)+e}_{\text{corrective motive}} + \frac{1}{\frac{d\bar{s}}{dt}} \underbrace{\text{Cov}\left[g(z), s_{\text{pref}}(z)\right]}_{\text{redistributive motive}} \tag{1}$$

where $\bar{\gamma}$ is the internality or average marginal consumer bias, σ is the progressivity of bias correction, e is the negative externality, $\frac{d\bar{s}}{dt}$ represents the responsiveness of average sin good consumption $\bar{s}$ to the tax t, $g(z)$ is the social marginal welfare weight on income z, and s_{pref} is a sufficient statistic for preference heterogeneity representing the amount of SSB consumption at income z relative to SSB consumption at the lowest income level. This intuitive representation makes clear that the optimal taxation depends on both the corrective and redistributive motives.

The corrective motive rises with the internality $\bar{\gamma}$ and externality e. The internality is scaled by the term $1+\sigma$ because the internality correction depends on (1) how large the bias is for the rich relative to the poor, and (2) the elasticity of demand of the rich relative to the poor.

The redistributive motive depends on the covariance of social marginal welfare weights and sin good consumption, which is the only consumption component determined by preference heterogeneity. This covariance term is thus determined by how sin good consumption tags ability; it rises if sin good taxation can redistribute over and above redistribution with just income taxation. The term is scaled by the responsiveness of average sin good consumption $\bar{s}$ to the tax t. If consumers are highly elastic, the redistributive motive loses importance relative to the corrective motive.

To illustrate this optimal sin tax formula further, notice that under no inequality aversion—if the planner has no redistributive motive and thus uses constant social marginal welfare weights—

the optimal sin tax is just equal to the internality plus the externality, $t = \bar{\gamma} + e$, corresponding to the standard Pigouvian tax. Now suppose that the planner has inequality aversion but that sin good preference heterogeneity is uncorrelated with ability (or income). In this case, sin good consumption is not a tag of ability, so any redistribution must be carried out by the income tax. Since in this case the covariance term is zero, the whole redistributive motive component is zero and the optimal sin tax will be $t = \bar{\gamma}(1+\sigma) + e$, where $(1+\sigma)$ scales the internality by the uncorrelated sin good preference heterogeneity. Finally, suppose that both the internality and externality are zero, so the corrective motive component is zero. Then only the distributional motive remains and $t = (1/\frac{d\bar{s}}{dt}) \cdot \mathrm{Cov}\left(g(z), s_{\text{pref}}(z)\right)$. It can be shown that $(t/(p+t)) = -\left(\mathrm{Cov}\left(g(z), s_{\text{pref}}(z)\right)\right)/(\bar{s}\bar{\zeta}^{c})$, which is a generalization of the Atkinson–Stiglitz theorem to deal with arbitrary preference heterogeneity (Allcott et al. 2019a). This shows that with a nonlinear income tax, the optimal sin good tax continues to resemble the familiar inverse elasticity rule for commodity taxes, but here the planner taxes the goods that high earners prefer rather than the goods they consume.

Imperfect competition changes the optimal sin tax formula in the following ways (O'Connell and Smith 2021). First, it adds a market correction motive with positive price-cost margins distorting resource allocations and, all else being equal, lowering the optimal tax rate. As in Buchanan (1969), the optimal tax on an externality produced by a monopolist is less than a Pigouvian tax. O'Connell and Smith (2021) show that the strength of this component is determined by the relative price-cost margins of the sin relative to the untaxed goods. Second, the redistributive motive interacts with market power because the distribution of positive profits in the population impacts the distributional effects of the sin tax. Finally, firms may re-optimize prices in response to a tax change, so the prices of untaxed goods may also change, leading to a potentially imperfect pass-through of the sin tax. If the tax reduces profits of rich individuals, then the tax is more progressive and, at optimum, higher. We can incorporate market power into our empirical analysis by directly estimating the pass-through on consumers by estimating the demand and supply elasticities and by analysing the distribution of net-of-tax profits before and after the tax change.

4 Data

Our collaboration with UNU-WIDER allows us to use administrative data from the National Treasury of South Africa. The data comprise the universe of the HPL excise form (DA 179) filed after the introduction of the levy in April 2018 (National Treasury and UNU-WIDER 2023). The excise form provides detailed information on the levied excise amounts collected from SSBs across the country. This form captures information on both the volume and sugar content of taxed and non-taxed beverages, as well as the specific excise amounts calculated based on the HPL rate. The DA 179 data, submitted by producers and importers, includes identifiers

for each registered business, allowing for analysis by company or brand within the SSB sector. These details allow for granular insights into the tax's direct impact on consumption and production adjustments, helping to identify trends such as product reformulation to reduce sugar content or volume-based shifts to non-taxed or lower-taxed beverages. Additionally, the DA 179 form enables tracking of seasonal patterns and demand fluctuations, given its regular submission schedule. Seasonal data points, in combination with excise amounts, can highlight consumption patterns related to weather, holidays, and other events that impact SSB purchases.

Using excise data for our empirical analysis offers us two comparative advantages. First, being administrative data they do not have the measurement error one usually encounters with survey data. We directly observe the filings of manufacturers and importers through which they report the quantity of sugar cleared by them each month and sugar tax paid by them on the quantity cleared. Second, we separately observe the quantity of sugar cleared in taxable and non-taxable drinks. Given that the sugar tax applies only to drinks containing more than 4 grams of sugar per 100 ml, it creates an incentive for manufacturers to reformulate their taxable products, reducing the sugar content below the threshold to make the product non-taxable. Because we observe the clearance of sugar in taxable and non-taxable products separately, we can estimate any shifting response through the reformulation channel.

Table 1 reports summary statistics of the data for the whole period 2018–23 and separately by fiscal year. We present the mean, standard deviation, and number of observations of the variables used in our empirical analysis. Our dataset comprises around 4,000 observations. The table shows taxable and total sugar in thousands of metric tons as well as the fraction of taxable sugar cleared in each fiscal year. We also show the categorization of products observed based on the tariff subheadings from the South Africa Tariff Book's Schedule No. 1 Part 2A, which indicates excise duties. The most important categories are syrups (24 per cent), fruit-juice-based syrups (29 per cent), and flavoured drinks in bottles not exceeding 2.5 litres (28 per cent).

Table 1: Summary statistics

	Total			2018			2019			2020			2021			2022			2023		
	Mean	Std dev.	*N*	Mean	Std dev.	*N*	Mean	Std dev.	*N*	Mean	Std dev.	*N*	Mean	Std dev.	*N*	Mean	Std dev.	*N*	Mean	Std dev.	*N*
Taxable sugar	153	957	4006	250	1270	522	176	1090	738	125	804	761	133	863	782	127	851	805	126	844	398
Total sugar	432	2110	4006	542	2360	522	462	2330	738	391	1930	761	417	2050	782	400	2030	805	406	2000	398
Fraction taxable sugar	0.299	0.234	3324	0.379	0.228	476	0.328	0.229	621	0.294	0.227	632	0.272	0.231	649	0.260	0.234	640	0.265	0.241	306
Client type WH	0.955	0.208	4006	0.933	0.250	522	0.950	0.218	738	0.951	0.215	761	0.953	0.212	782	0.966	0.180	805	0.977	0.149	398
Tariff subheading																					
Cocoa powder	0.082	0.274	4006	0.079	0.269	522	0.079	0.269	738	0.079	0.270	761	0.083	0.276	782	0.083	0.276	805	0.093	0.291	398
Malt-based food preparations	0.082	0.275	4006	0.082	0.275	522	0.066	0.249	738	0.075	0.263	761	0.100	0.300	782	0.087	0.282	805	0.080	0.272	398
Other food preparations	0.000	0.016	4006	0.000	0.000	522	0.001	0.037	738	0.000	0.000	761	0.000	0.000	782	0.000	0.000	805	0.000	0.000	398
Syrups	0.240	0.427	4006	0.274	0.446	522	0.240	0.427	738	0.240	0.428	761	0.230	0.421	782	0.235	0.424	805	0.226	0.419	398
Fruit-juice-based syrups	0.294	0.456	4006	0.310	0.463	522	0.337	0.473	738	0.306	0.461	761	0.290	0.454	782	0.252	0.435	805	0.264	0.441	398
Flavoured drinks (at most 2.5 L)	0.276	0.447	4006	0.310	0.463	522	0.289	0.453	738	0.281	0.450	761	0.258	0.438	782	0.260	0.439	805	0.261	0.440	398
Flavoured drinks (over 2.5 L)	0.084	0.277	4006	0.073	0.260	522	0.085	0.280	738	0.095	0.293	761	0.078	0.268	782	0.086	0.280	805	0.080	0.272	398
Non-alcoholic beer (at most 2.5 L)	0.005	0.074	4006	0.000	0.000	522	0.000	0.000	738	0.000	0.000	761	0.005	0.071	782	0.015	0.121	805	0.015	0.122	398
Non-alcoholic beer (over 2.5 L)	0.020	0.139	4006	0.004	0.062	522	0.000	0.000	738	0.025	0.156	761	0.027	0.162	782	0.030	0.170	805	0.033	0.178	398
Other drinks (at most 2.5 L)	0.135	0.341	4006	0.165	0.371	522	0.150	0.358	738	0.134	0.341	761	0.132	0.338	782	0.117	0.321	805	0.108	0.311	398
Other drinks (over 2.5 L)	0.108	0.310	4006	0.151	0.359	522	0.108	0.311	738	0.109	0.312	761	0.102	0.303	782	0.089	0.286	805	0.093	0.291	398

Note: this table shows summary statistics for key variables used in our regressions, for different fiscal years. Taxable sugar and total sugar are in thousands of metric tons. Flavoured drinks include waters, mineral waters, and aerated waters that contain added sugar.

Source: authors' compilation.

5 Results

South Africa introduced the HPL (hereinafter called the reform) on 1 April 2018. Using the excise data described in Section 4, we estimate the effects of the reform on the consumption of SSBs in the country. The excise data, as we note above, are available only for the post-reform months because firms supplying SSBs became liable to file excise returns only once the HPL became applicable to them. Before we describe our empirical strategy to estimate the causal effects of the levy, we first present graphical evidence on how firms producing SSBs reacted to the levy. Our empirical strategy is inspired by these high-level responses observed in the raw data.

5.1 Graphic evidence

Figure 1 plots the quantity of sugar removed from SSBs by firms. Panel A shows the total sugar removed by these firms, and Panel B restricts attention to taxable sugar only. Taxable sugar, as we describe in Section 2, is the sugar in SSBs containing more than 4 grams of sugar per 100 ml of the beverage. Note that our data show the clearance and not production of SSBs. The quantities shown in both plots thus represent the equilibrium quantity of goods traded in the market. We therefore refer to these quantities as the consumption of SSBs in the country.

The analysis in Figure 1 produces five key insights. First, unsurprisingly, there is strong seasonality in the consumption of SSBs, with greater quantity consumed during summer than winter. To account for this seasonality, we aggregate our data to the yearly level for our main estimates. Second, the quantity of sugar consumed in SSBs drops substantially in the post-reform months. Total sugar consumed per month, for example, reached a peak of 42,000 metric tons in the first year after the reform. This peak dropped by more than 15 per cent to a level of around 35,000 metric tons in later years. Third, the drop in the consumption of sugar was observed in the first two years only, stabilizing from 2020 onward. This stable trend in the consumption of sugar is important for our empirical strategy, and we come back to this point when we discuss our year-level results. Fourth, the drop in the consumption of taxable sugar is far more pronounced than the drop in the consumption of total sugar. For example, the maximum taxable sugar consumed per month reduced by nearly 45 per cent from a peak of around 20,000 metric tons in 2018 to a peak of around 11,000 metric tons in 2022, whereas during the same period the peak of total sugar consumption reduced only by around 15 per cent. The fact that the reduction in taxable sugar is three times the reduction in total sugar suggests that the response we document is driven by the HPL rather than by other factors such as a change in consumer preferences away from consuming SSBs. Fifth, the reduction in the consumption of taxable sugar is more than the reduction in total sugar. Again, comparing the maximum sugar consumption in a year, the consumption of total sugar decreases by around 7,000 metric

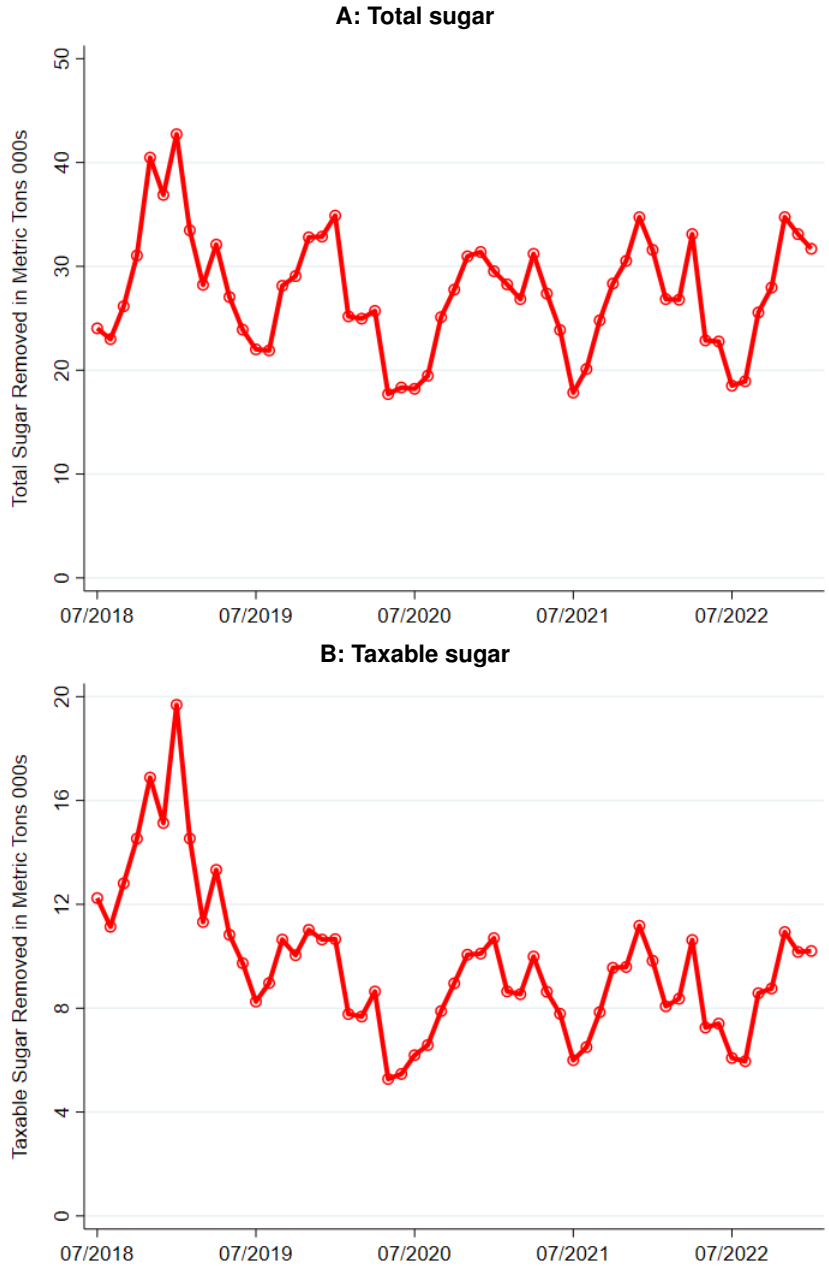
tons, whereas the consumption of taxable sugar reduces by around 11,000 metric tons. This suggests a strong *shifting* response to the reform. The shifting response could be a supply-side response, where firms shift away from taxable to non-taxable SSBs by either reducing the sugar content in their SSBs below the taxable threshold or by aggressively marketing their non-taxable SSBs. Alternatively, it could be a demand-side response, where consumers substituted strongly towards non-taxable SSBs once the levy came into operation. Such shifting responses have also been observed in other contexts, such as the Philadelphia soft drink tax, which increased purchases of untaxed natural juices by 9 per cent and had no effect on purchases of bottled water (Seiler et al. 2021).

Figure 2 probes this last point even further. Panel A decomposes total sugar consumed in SSBs into taxable and non-taxable sugar, while Panel B plots the fraction of taxable sugar removed from SSBs. Strikingly, the fraction of taxable sugar removed from SSBs falls by nearly 40 per cent from a peak of 50 per cent just after the reform to around 30 per cent in the next two years. Another striking feature of this plot is that the fraction of taxable sugar stabilizes at 30 per cent from the middle of the tax year 2019–20 and remains flat throughout our sample period after that. This is a feature of all our time series plots and is even more pronounced in our next set of plots, which are at the year rather than month level.

Figure 3 replicates the analysis in Figure 1, aggregating sugar consumption at the tax year level to get rid of the seasonality. Two features of these plots are important for our empirical estimates. First, there is no long-run trend in the consumption of sugar through SSBs. Once the effects of the reform subside, the trend becomes remarkably flat, with sugar consumption—-both taxable and total—remaining virtually constant over the last three years of our sample. Second, because of the stable trend, we can clearly see that the reduction in taxable sugar exceeds the drop in total sugar by a ratio of 3:1 in terms of percentage change. The larger drop in taxable sugar, as we note above, suggests that the reduction in SSB consumption is driven by the HPL and not by other factors such as macroeconomic growth or a shift in preferences.

Figure 4 compares the consumption of taxable and non-taxable sugar at a yearly level. These plots illustrate more clearly the patterns we document above with reference to Figure 2. After the implementation of the HPL, the consumption of taxable sugar reduces sharply and the consumption of non-taxable sugar increases. But the increase in non-taxable sugar was less than the decrease in taxable sugar, so overall sugar consumption through SSBs reduces, though the reduction was modest. These plots also generate a key insight for our empirical analysis. Note that the reduction in the fraction of taxable sugar consumption is smaller when analysed on a yearly basis compared to a monthly basis (40 per cent vs. 30 per cent). This occurs because taxable sugar consumption falls sharply in the first year after the reform. The month-level analysis shows this sharp decrease within the year, whereas the year-level anal-

Figure 1: Sugar removed in SSBs by month

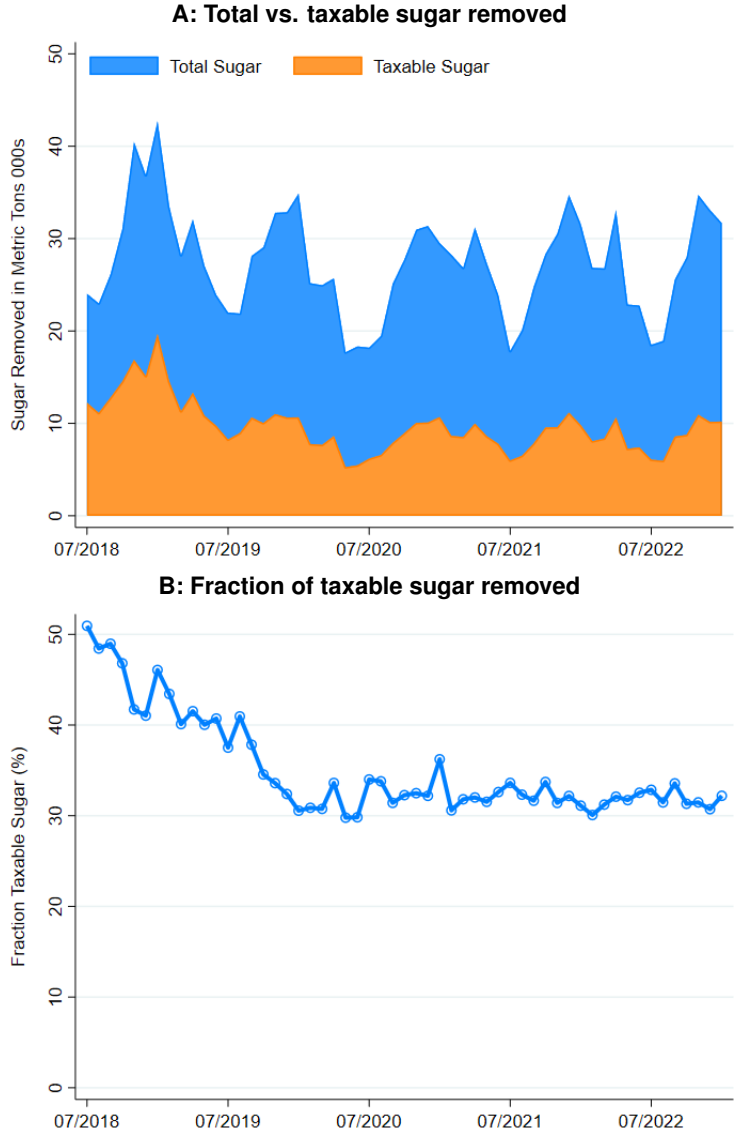


Note: the figure illustrates the evolution of sugar consumption through SSBs in South Africa. Each marker in the figure denotes the sugar cleared by manufacturers and importers of SSBs from warehouses in the calendar month indicated on the horizontal axis. Panel A examines total sugar cleared, while Panel B examines only the taxable sugar. Taxable sugar is the sugar cleared in beverages containing more than 4 grams per 100 ml of the beverage.

Source: authors' compilation.

ysis smooths it out, resulting in an underestimation of the response. Primarily for this reason, we run our estimations at the month level.

Figure 2: Total vs. taxable sugar removed by month



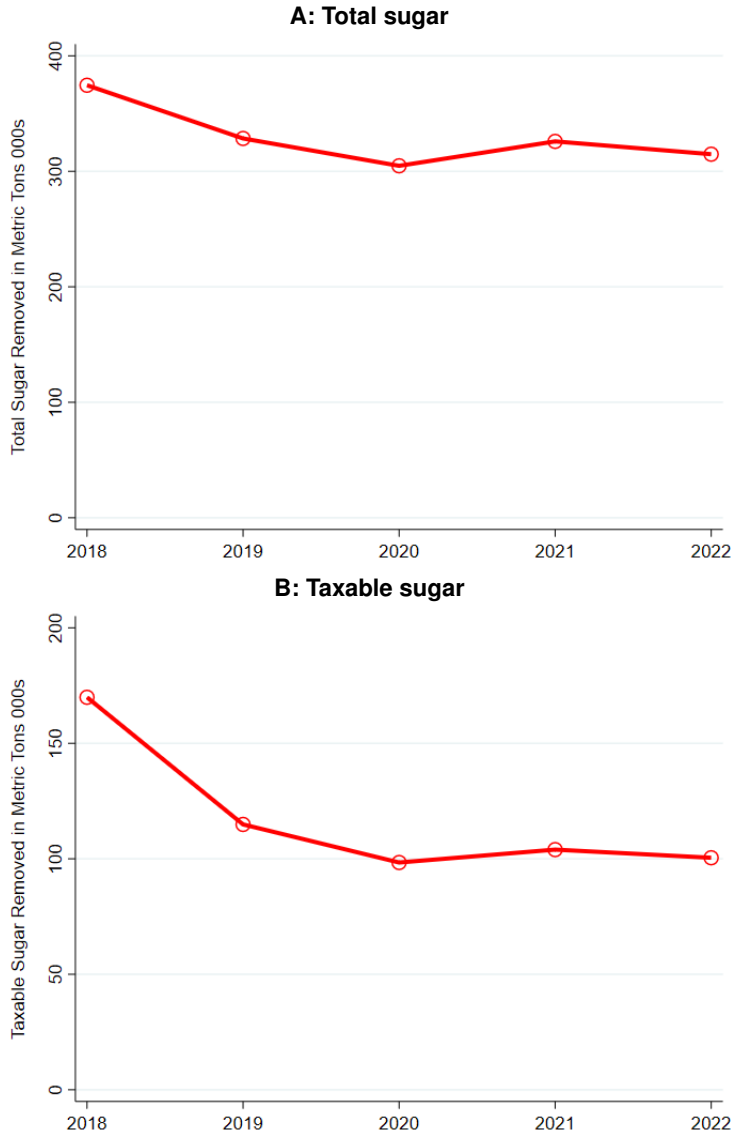
Note: the figure examines the composition of total sugar cleared by the suppliers of SSBs. Panel A decomposes total sugar consumed in SSBs into taxable and non-taxable sugar, while Panel B plots the fraction of taxable sugar removed in SSBs. Taxable sugar is the sugar cleared in beverages containing more than 4 grams per 100 ml of the beverage.

Source: authors' compilation.

5.2 Empirical strategy

The above analysis shows that in our setting there are two key challenges to estimate the causal impacts of the HPL. There is a strong seasonality in the consumption of SSBs in South Africa, where intake is much greater during the summer than the winter. To account for this seasonality, we use the fraction of taxable sugar consumed as our outcome variable instead of the quantity of taxable sugar consumed, making the following assumption.

Figure 3: Sugar removed in SSBs by year



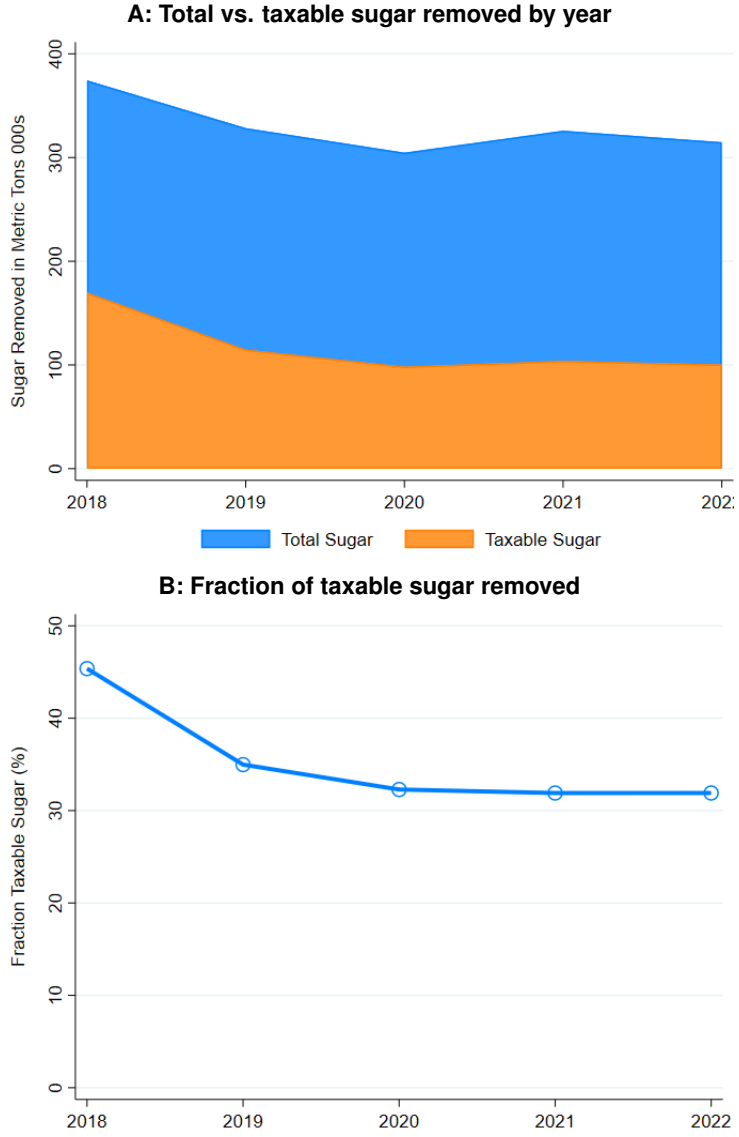
Note: the figure illustrates the evolution of sugar consumption through SSBs in South Africa. Each marker in the figure denotes the sugar cleared by manufacturers and importers of SSBs from warehouses in the financial year indicated on the horizontal axis. Panel A examines total sugar cleared, while Panel B examines the taxable sugar. Taxable sugar is the sugar cleared in beverages containing more than 4 grams per 100 ml of the beverage.
Source: authors' compilation.

> **Assumption A1:** *Seasonal variation in sugar consumption through SSBs is the same across taxable and non-taxable consumption so that the fraction of taxable sugar consumed through SSBs remains independent of the seasonality.*

The evidence presented in Figure 2 strongly supports this assumption. In the last three years of our sample, when the reform's effects have been fully realized, the fraction of taxable sugar consumed through SSBs remains flat throughout the year.

The second challenge we face is that the excise data we use begins only after the introduction of the HPL. This means that we do not have a baseline period against which we can compare any reduction in the consumption of sugar resulting from the implementation of the HPL.

Figure 4: Total vs. taxable sugar removed



Note: the figure examines the composition of total sugar cleared by the suppliers of SSBs. Panel A decomposes total sugar consumed in SSBs into taxable and non-taxable sugar, while Panel B plots the fraction of taxable sugar removed in SSBs. Taxable sugar is the sugar cleared in beverages containing more than 4 grams per 100 ml of the beverage.

Source: authors' compilation.

We are accordingly constrained to use the first month in our data (July 2018) as the baseline period. Under the following assumption, comparing the consumption of sugar in later periods relative to July 2018 isolates the causal impacts of the HPL.

> **Assumption A2:** *Both supply and demand responses to the imposition of the HPL are slow and do not materialize immediately after the reform.*

This assumption can be justified if both the supply and demand for taxable SSBs are inelastic in the short term. On the supply side, this may occur because firms need time to design and market new products, delaying the reallocation of factors at their disposal to alternative uses. On the demand side, it may happen if the tax is not salient in the short term because

it is applicable to a narrow group of goods only (Chetty et al. 2009). Indeed, consistent with this assumption, we observe that the reduction in taxable sugar occurs gradually, with the full response to the tax only materializing two years after the reform (see the second panel of Figures 2 and 4).

It is important to emphasize, however, that Assumption A2 is a strong assumption. Forward-looking firms and consumers will optimize their production and consumption decisions immediately following the tax announcement. While optimization frictions may slow down these adjustments, it is unrealistic to assume that the equilibrium quantity of SSBs consumed just a few months after the reform remains unaffected. For this reason, our estimates of the causal impacts of the HPL have a lower bound interpretation, representing the minimum reduction in consumption of taxable sugar arising from the tax.

To the extent that the above two assumptions are satisfied, we can use the following model to estimate the effects of the HPL

$$y_{it} = \alpha_i + \beta D_t + X'\Theta + \varepsilon_{it} \tag{2}$$

Here, y_{it} is the fraction of taxable sugar cleared by firm i in month t; α_i is the firm fixed effect; D_t is a dummy variable indicating a month other than our baseline period (July 2018); and X is a vector of controls. Our coefficient of interest is β. It is essentially a before–after estimator, measuring the average within-firm change in the fraction of taxable sugar cleared by it in SSBs relative to the baseline period.

Identification in this setup rests on the following assumption.

> **Assumption B1:** *There is no upward or downward trend in the fraction of taxable sugar cleared by firms so that the fraction would have remained the same in the absence of the HPL.*

Lack of secular trends is usually a strong assumption but is highly plausible in our setup. In general, all our outcomes remain completely flat in the 36-month period beginning from July 2020. This suggests that there is no long-standing trend in the consumption of sugar via SSBs. Nor is this consumption subject to abrupt technology or preference shocks. In this environment, the before–after estimator we employ is unlikely to be biased by these factors.

Ideally, we would have liked to use the difference-in-differences estimator to estimate the causal impacts of the HPL. In this framework, we would have used the consumption of goods similar to SSBs but not affected by the HPL (e.g. fruit juices, tea, or coffee) as the control group to account for any demand and supply shocks confounding the impacts of interest. We cannot, however, employ the difference-in-differences estimator because the excise data contains only the treated firms—that is, firms that supply SSBs. It is, however, important to emphasize

that the difference-in-differences estimator will have its own concerns. Importantly, given the shifting response, the estimator is subject to concerns from the violation of SUTVA (the stable unit treatment value assumption). After the implementation of the HPL, consumers are likely to substitute towards non-taxable drinks, some of which could be in the control group. Indeed, the closer a product is to the SSBs and hence a better candidate for the control group, the more likely it is to be affected by the substitution response. In contrast, the before–after estimator is not subject to these concerns and, given stable trends, is a more suitable estimator for our setup.

5.3 Regression estimates

We now present our results following the empirical strategy described above. Figure 5 displays coefficients from estimating a version of Equation (2). In this version, instead of having a dummy for each post month, we include a dummy for each post year, excluding the first month in our dataset—the baseline month (July 2018). Our outcome variable is the fraction of taxable sugar. The coefficient thus reflects the reduction in the fraction of taxable sugar in post-reform years relative to the baseline month of July 2018. Table 2 reports the corresponding regression estimates. The first column combines all post-reform months into a $post$ dummy and hence reports the average decline in the fraction of taxable sugar in all post-reform months relative to the baseline month. The second column breaks down this average response by each post-reform year.

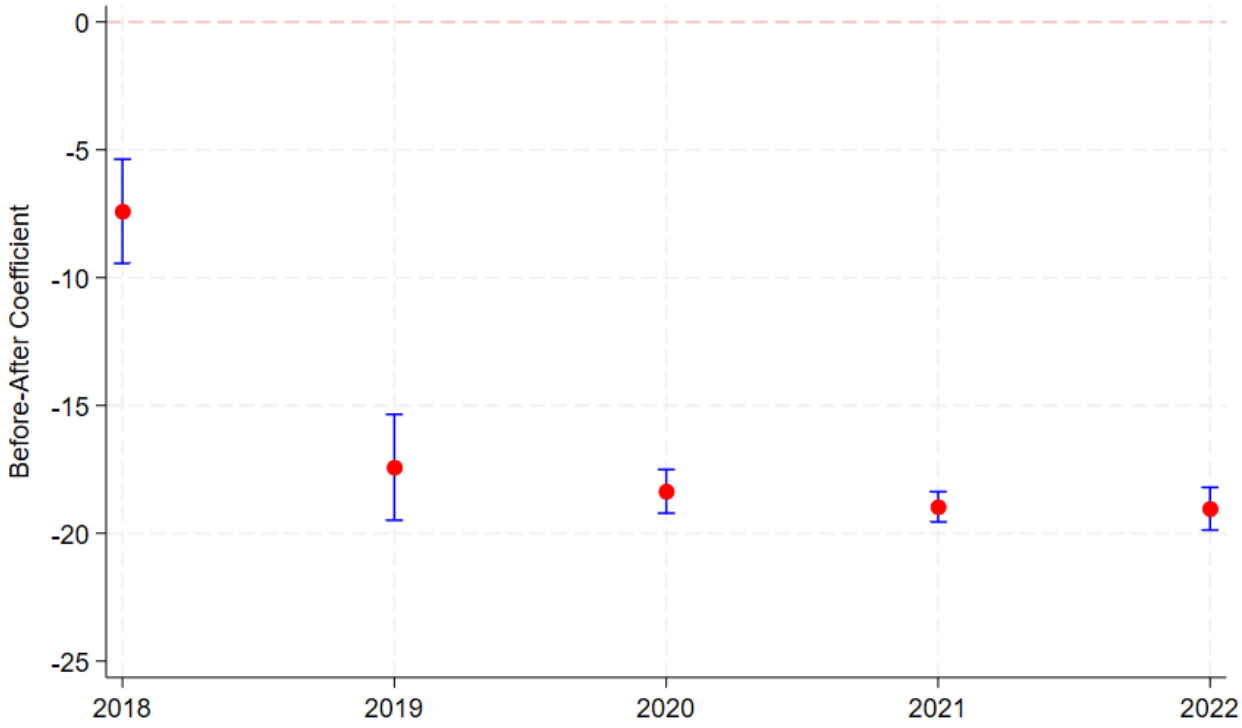
Table 2: Fraction of taxable sugar

	Outcome: fraction of taxable sugar (%)	
	(1)	(2)
Post	–16.088***	
	(0.710)	
2018		–7.407***
		(1.040)
2019		–17.419***
		(1.057)
2020		–18.361***
		(0.436)
2021		–18.966***
		(0.302)
2022		–19.039***
		(0.426)
Constant	50.939	50.939
Observations	54	54

Note: the table reports the results from our before–after model corresponding to specification (2). The outcome variable is the fraction of taxable sugar consumed in SSBs, defined as the total quantity of sugar cleared in taxable SSBs divided by the total quantity of sugar cleared in all SSBs, expressed as a percentage. We drop the dummy for the month of July 2018 and consequently the reported coefficients measure the reduction in the fraction in percentage points relative to this month. The first column combines all post-reform months into a *post* dummy and hence reports the average decline in the fraction of taxable sugar in all post-reform months relative to the baseline month. The second column breaks down this average response by each post-reform year. ***, **, and * denote significance at the 1, 5, and 10 per cent levels.

Source: authors' calculations.

Figure 5: Dynamic event study coefficients



Note: the figure plots the results from our event study specification (2). The outcome variable is the fraction of taxable sugar consumed in SSBs, defined as the total quantity of sugar cleared in taxable SSBs divided by the total quantity of sugar cleared in all SSBs, expressed as a percentage. We drop the dummy for the month of July 2018 and consequently the displayed coefficients measure the reduction in the fraction in percentage points relative to this month. The red markers represent the coefficient and the whiskers the 95 per cent confidence interval around them.

Source: authors' compilation.

Consistent with the graphic evidence presented above, the fraction of taxable sugar consumed in SSBs declines sharply after the introduction of the HPL. The fraction reduced by more than 7 percentage points in the first year after the reform. In the following years, it reduced even further, settling at nearly 20 percentage points lower than the baseline period. Since the fraction of taxable sugar consumed in SSBs was around 51 per cent in the baseline period, the 20 percentage point reduction translates into a causal effect of a nearly 40 per cent reduction in the fraction of taxable sugar consumed in SSBs.

The summary statistics in Table 1 show that a total of 542,000 metric tons of sugar was consumed in SSBs in South Africa in 2018, the first year after the introduction of the levy. Assuming that the total quantity of sugar consumed in SSBs would have remained constant in the absence of the reform (an assumption borne out by data; see the discussion in the previous section), a 20 percentage point reduction in the fraction of taxable sugar means that the quantity of sugar consumed in taxable SSBs reduced by 178,155 metric tons—a nearly 33 per cent reduction in the quantity of sugar consumed in taxable SSBs. Table 1 also shows that the total sugar consumed in SSBs decreased from 542,000 metric tons in 2018 to 406,000 metric tons in 2022, a 136,000-ton reduction. The difference between the reduction in taxable sugar

and the reduction in total sugar is the increase in non-taxable sugar. This captures the shifting responses, where either consumers shifted towards non-taxable drinks because they were cheaper or producers shifted towards non-taxable products by reformulating the existing products. The above numbers show that around 42,000 metric tons of sugar was shifted from taxable to non-taxable products, which constitutes around a 15 per cent increase in the consumption of sugar in non-taxable SSBs.

Tables 3 and 4 showcase the robustness of our results. We use micro-data that allow us to include firm, beverage type, and client type fixed effects. Our estimates are insensitive to the inclusion of these additional controls (see the second row in Table 3 and rows 4–12 in Table 4). The size of the treatment effect is also similar to what we get from our aggregate-level regressions. Our estimate size is also very similar to those reported in the earlier literature (see Stacey et al. 2019, 2021). These earlier studies used either aggregate macro-level data or household-level scanner data. In comparison, we use administrative supply-side data from excise records. Yet our results are very similar to the earlier studies. This further reinforces the robustness of our results.

Table 3: Event study results

	Outcome: fraction of taxable sugar (%)			
	(1)	(2)	(3)	(4)
Constant	0.406***	0.401***	0.343***	0.444***
	(0.032)	(0.021)	(0.035)	(0.052)
Post	–0.109***	–0.103***	–0.106***	–0.104***
	(0.026)	(0.021)	(0.021)	(0.021)
Firm fixed effects	-	✓	✓	✓
Tariff subheading control	-	-	✓	✓
Client type control	-	-	-	✓
N	3,324	3,324	3,324	3,324
R^2	0.00	0.83	0.84	0.84

Note: the table reports the results from our before–after model corresponding to specification (2). The outcome variable is the fraction of taxable sugar consumed in SSBs, defined as the total quantity of sugar cleared in taxable SSBs divided by the total quantity of sugar cleared in all SSBs, expressed as a percentage. We drop the dummy for the month of July 2018 and consequently the reported coefficients measure the reduction in the fraction in percentage points relative to this month. We combine all post-reform months into a $post$ dummy and hence report the average decline in the fraction of taxable sugar in all post-reform months relative to the baseline month. The first column does not add any fixed effects. The later columns successively introduce the firm, beverage type, and client type fixed effects. ***, **, and * denote significance at the 1, 5, and 10 per cent levels.
Source: authors' calculations.

Table 4: Dynamic event study results

	Outcome: fraction of taxable sugar (%)			
	(1)	(2)	(3)	(4)
Constant	0.406	0.373	0.333	0.389
	(0.032)	(0.014)	(0.032)	(0.033)
Post	–0.109			
	(0.026)			
Post × 2019		–0.060	–0.060	–0.059
		(0.015)	(0.015)	(0.015)
Post × 2020		–0.080	–0.078	–0.076
		(0.017)	(0.017)	(0.017)
Post × 2021		–0.095	–0.094	–0.093
		(0.020)	(0.020)	(0.021)
Post × 2022		–0.099	–0.098	–0.096
		(0.021)	(0.021)	(0.022)
Post × 2023		–0.104	–0.104	–0.102
		(0.021)	(0.022)	(0.022)
Firm fixed effects	-	✓	✓	✓
Tariff subheading control	-	-	✓	✓
Client type control	-	-	-	✓
N	3,324	3,324	3,324	3,324
R^2	0.00	0.83	0.84	0.84

Note: the table reports the results from our before–after model corresponding to specification (2). The outcome variable is the fraction of taxable sugar consumed in SSBs, defined as the total quantity of sugar cleared in taxable SSBs divided by the total quantity of sugar cleared in all SSBs, expressed as a percentage. We drop the dummy for the month of July 2018 and consequently the reported coefficients measure the reduction in the fraction in percentage points relative to this month. In the first column, we combine all post-reform months into a $post$ dummy and hence report the average decline in the fraction of taxable sugar in all post-reform months relative to the baseline month. In the next columns, we break down this average response by each post-reform year. These columns also successively introduce the firm, beverage type, and client type fixed effects. ***, **, and * denote significance at the 1, 5, and 10 per cent levels.

Source: authors' calculations.

It is important to emphasize that our estimates represent a conservative lower bound on the real average treatment effect. This is because we are treating July 2018 as the baseline period. The HPL took effect from April 2018. As such, our estimates do not take into account the reduction in sugar consumed through taxable SSBs from the announcement of the reform to July 2018. Despite having a lower bound interpretation, our estimate size is really large. This shows that the South African HPL was extremely effective in reducing the consumption of taxable sugar in SSBs. Considering that the South African tax rate was quite low and the reduction in taxable sugar caused by it is an order of magnitude larger than the one observed in other contexts (e.g. for Mexico, see Colchero et al. 2017), it is clear that the consumption of sugar in SSBs is extremely elastic in South Africa, which makes price interventions such as the HPL an effective policy to reduce consumption.

6 Conclusion

The rapid spread of obesity and overweight is emerging as the next major public health challenge in developing countries, particularly in Sub-Saharan Africa, where rising urbanization and dietary shifts towards high-calorie, processed foods are accelerating weight-related health issues. With limited healthcare resources, these countries face an increasing burden of NCDs such as diabetes and cardiovascular conditions, further exacerbating socio-economic inequalities and straining public health systems. Price interventions such as sugar taxes are among the most cost-effective strategies to address public health issues stemming from the excessive consumption of SSBs, as they directly reduce demand through price sensitivity while generating government revenue that can be reinvested in health initiatives. By encouraging consumers to reduce intake and producers to reformulate products, these taxes efficiently target the root causes of diet-related diseases without requiring costly, large-scale healthcare interventions.

Our regression results show that the fraction of taxable sugar consumed in SSBs declined sharply after the introduction of the HPL. The fraction reduced by nearly 20 percentage points by the end of our sample period. The reduction translates into a causal effect of nearly 40 per cent reduction in the fraction of taxable sugar consumed in SSBs and 33 per cent reduction in the quantity of sugar consumed in taxable SSBs. Our results also show that the sugar consumption shifted from taxable to non-taxable beverages. These shifting responses mean that the consumption of non-taxable sugar in SSBs increased by 15 per cent as a result of the levy.

In this paper, we study the effects of the first sugar tax implemented in Africa. The sugar tax, known as the HPL, is an excise tax applied specifically to SSBs containing more than 4 grams of sugar per 100 ml, with each gram above this threshold taxed at 2.1 cents (ZAR). Using administrative data comprising the universe of excise returns filed by the importers and manufacturers of SSBs, we first document four broad trends on sugar consumption in South Africa and its response to the sugar tax. First, there is a strong seasonality in the consumption of SSBs in South Africa, with peaks typically observed in warmer months. Second, there is no long-term trend in the consumption of SSBs as the consumption essentially stays flat for long periods during which other environmental features affecting demand and supply remain fixed. Third, the introduction of the sugar tax resulted in a large reduction in the consumption of taxable SSBs. The maximum sugar consumed per month through taxable drinks reduced by nearly 45 per cent from around 20,000 metric tons in 2018 to around 11,000 metric tons in 2022. Fourth, there is a strong shifting response, where the consumption shifted towards non-taxable drinks. During the period 2018–22, when the taxable sugars reduced by 45 per cent, total sugars reduced by only 15 per cent.

Our findings have important policy implications for addressing sugar consumption and associated public health challenges through targeted fiscal measures such as sugar taxes. The ob-

served reduction in taxable sugar consumption underscores the effectiveness of South Africa's HPL in curbing sugar intake from SSBs. However, the partial shift to non-taxable drinks highlights the importance of a more comprehensive tax design that could encompass a broader range of sugary products to reduce the overall sugar consumption more effectively. Policymakers might also consider adjusting tax rates to account for inflation and revisiting the tax structure periodically to enhance long-term efficacy. Furthermore, revenue generated from the levy could be strategically allocated to health and education initiatives, amplifying the public health benefits. Future research could explore the health outcomes linked to reduced sugar consumption post-HPL, examine the economic effects on both producers and low-income consumers, and analyse the effects of alternative policy designs, such as tiered sugar content taxes or incentives for product reformulation, to create a more holistic approach in tackling the health and economic burden of excessive sugar consumption.

References

Allcott, H., B.B. Lockwood, and D. Taubinsky (2019a). 'Regressive Sin Taxes, with an Application to the Optimal Soda Tax'. *Quarterly Journal of Economics*, 134(3): 1557–626. **https://doi.org/10.1093/qje/qjz017**

Allcott, H., B.B. Lockwood, and D. Taubinsky (2019b). 'Should We Tax Sugar-Sweetened Beverages? An Overview of Theory and Evidence'. *Journal of Economic Perspectives*, 33(3): 202–27. **https://doi.org/10.1257/jep.33.3.202**

Buchanan, J.M. (1969). 'External Diseconomies, Corrective Taxes, and Market Structure'. *American Economic Review*, 59(1): 174–77.

Chetty, R., A. Looney, and K. Kroft (2009). 'Salience and Taxation: Theory and Evidence'. *American Economic Review*, 99(4): 1145–77. **https://doi.org/10.1257/aer.99.4.1145**

Colchero, M.A., J. Rivera-Dommarco, B.M. Popkin, and S.W. Ng (2017). 'In Mexico, Evidence of Sustained Consumer Response Two Years after Implementing a Sugar-Sweetened Beverage Tax'. *Health Affairs*, 36(3): 564–71. **https://doi.org/10.1377/hlthaff.2016.1231**

DoH (2013). 'Strategic Plan for the Prevention and Control of Non-communicable Diseases 2013–17'. Pretoria: Department of Health, Republic of South Africa.

Global Food Research Program (2020). *Sugary Drink Taxes Around the World*. Chapel Hill, NC: Global Food Research Program.

Griffith, R., M. O'Connell, K. Smith, and R. Stroud (2019). *The Evidence on the Effects of Soft Drink Taxes*. Report. London: IFS.

Imamura, F., L. O'Connor, Z. Ye, J. Mursu, Y. Hayashino, S.N. Bhupathiraju, and N.G. Forouhi (2015). 'Consumption of Sugar Sweetened Beverages, Artificially Sweetened Beverages, and Fruit Juice

and Incidence of Type 2 Diabetes: Systematic Review, Meta-Analysis, and Estimation of Population Attributable Fraction'. *BMJ*, 351. **https://doi.org/10.1136/bmj.h3576**

Madubela, A. (2024). 'Sugar Industry Wants Delay on Increasing Tax Crippling the Sector'. *Mail & Guardian*. Available at: **https://mg.co.za/business/2024-09-30-sugar-industry-wants-delay-on-increasing-tax-crippling-the-sector/** (accessed 22 February 2025).

Malik, V.S., A. Pan, W.C. Willett, and F.B. Hu (2013). 'Sugar-Sweetened Beverages and Weight Gain in Children and Adults: A Systematic Review and Meta-Analysis'. *American Journal of Clinical Nutrition*, 98(4): 1084–102. **https://doi.org/10.3945/ajcn.113.058362**

National Treasury and UNU-WIDER (2023). 'Excise Sugar Data 2018–2023 [dataset]. Version 5.0'. Pretoria: South African Revenue Service (producer of the original data), 2023. Pretoria: National Treasury and UNU-WIDER (producer and distributor of the harmonized dataset), 2023.

National Treasury (2016). 'Taxation of Sugar Sweetened Beverages'. Policy Paper. Pretoria: Economics Analysis Chief Directorate, National Treasury.

NDoH (2023). 'Strategy for the Prevention and Management of Obesity in South Africa, 2023–2028'. Pretoria: National Department of Health.

News 24 (2016). 'Sugar Tax to Cost SA 60 000 Jobs, Warns Coca-Cola'. Available at: **https://www.news24.com/fin24/sugar-tax-to-cost-sa-60-000-jobs-warns-coca-cola-20160816** (accessed 22 February 2025).

O'Connell, M., and K. Smith (2021). 'Optimal Sin Taxation and Market Power'. Working Paper W21/30. London: IFS.

Scarborough, P., V. Adhikari, R.A. Harrington, A. Elhussein, A. Briggs, M. Rayner, J. Adams, S. Cummins, T. Penney, and M. White (2020). 'Impact of the Announcement and Implementation of the UK Soft Drinks Industry Levy on Sugar Content, Price, Product Size and Number of Available Soft Drinks in the UK, 2015–19: A Controlled Interrupted Time Series Analysis'. *PLoS Medicine*, 17(2): e1003025. **https://doi.org/10.1371/journal.pmed.1003025**

Seiler, S., A. Tuchman, and S. Yao (2021). 'The Impact of Soda Taxes: Pass-Through, Tax Avoidance, and Nutritional Effects'. *Journal of Marketing Research*, 58(1): 22–49. **https://doi.org/10.1177/0022243720969401**

Stacey, N., C. Mudara, S.W. Ng, C. van Walbeek, K. Hofman, and I. Edoka (2019). 'Sugar-Based Beverage Taxes and Beverage Prices: Evidence from South Africa's Health Promotion Levy'. *Social Science & Medicine*, 238: 1–8. **https://doi.org/10.1016/j.socscimed.2019.112465**

Stacey, N., I. Edoka, K. Hofman, B.M. Popkin, and S.W. Ng (2021). 'Changes in Beverage Purchases Following the Announcement and Implementation of South Africa's Health Promotion Levy: An Observational Study'. *Lancet Planetary Health*, 5(4): e200–08. **https://doi.org/10.1016/S2542-5196(20)30304-1**

WHO (2020). 'Obesity and Overweight'. Factsheet. Available at: **https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight** (accessed 28 October 2024).

World Inequality Lab (2024). *World Inequality Report*. Berkeley, CA: University of California.

Xi, B., Y. Huang, K. Reilly, S. Li, R. Zheng, M. Barrio-Lopez, M. Martinez-Gonzalez, and D. Zhou (2015). 'Sugar-Sweetened Beverages and Risk of Hypertension and CVD: A Dose–Response Meta-Analysis'. *British Journal of Nutrition*, 113: 1–9. **https://doi.org/10.1017/S0007114514004383**