

KN#4. Unpacking the empirics behind health tax revenue¹

The purpose of this note is to provide policy makers with an overview of the revenue potential for health taxes, including from increases in tax rates and reforms of tax structures. It is one in a series of knowledge notes responding to specific questions around health taxes and key issues raised during health tax reforms.

SUMMARY

Introducing, reforming and increasing health taxes on tobacco, alcohol, and sugar-sweetened beverages (SSBs) can generate meaningful increases in tax revenues while improving health outcomes over time. Using a novel health tax revenue database that draws on publicly available sources as well as country data, our analysis shows that tobacco and alcohol excise taxes generate an average of 0.6 and 0.3 percent of GDP in tax revenue, respectively. SSB taxes generate significantly less revenue than tobacco and alcohol.

Health tax revenues vary widely between countries, affected by tax design including tax structures and tax rates, tax administration and baseline levels of consumption. However, there is no significant variation between high-income and low- and middle-income countries, highlighting the usefulness and importance of health taxes to all countries.

Reforms of health taxes, including reforming tax structures and raising tax rates can contribute to significant increases in revenue very rapidly. Tax increases can be sustained over long periods, generating additional tax revenues over long periods of time. Even for countries with relatively high tax rates, tax increases still generate increases in tax revenues when these rates are increased regularly.

Health taxes are efficient since they are relatively easy to implement, can generate revenue quickly, and limited distortion to general economic activities. Health taxes are also fiscally progressive once the long-run behavioral effects of reduced consumption, reduced medical expenses, and increased labor productivity are accounted for. The expenditures that are funded by increases in general revenue because of health taxes can further increase the progressive distributional impact of health taxes.

WHY FOCUS ON HEALTH TAXES?

Health taxes are excise taxes applied to products that generate negative externalities and internalities, most commonly tobacco, alcohol, and SSBs.² Negative externalities are the costs that accrue to society at large, including non-users of these products. High taxes on tobacco and alcohol may be rationalized to reduce the costs that are externalized (e.g., healthcare costs, second-hand smoke, road traffic accidents, and domestic violence). Negative internalities are the uninternalized costs borne by the user resulting from time-inconsistent preferences due to imperfect information, present-bias, and/or addiction. Higher taxes on tobacco and alcohol are also justified by considering the internalities: they discourage people from initiating smoking and drinking, particularly at young ages, and they increase prices to

account for the underestimation of harm and difficulty of quitting in later life. In the case of SSB taxation, negative internalities help make a strong case. A growing literature supports the taxation of SSBs by showing the significant negative internalities their consumption generates (see Alcott et al., 2019a; Alcott et al., 2019b; Gertler et al., 2021).

Health taxes are an efficient revenue generating tool for governments due to their relative ease of introduction, ease of administration, and rapid revenue generation potential. Health taxes are also less distortionary to broader economic activity than other indirect taxes and, once reductions in healthcare costs and increased labor productivity are considered, increases in health taxes are found to be progressive.

¹ This note was prepared by Evan Blecher, Ceren Ozer and Danielle Bloom (World Bank). The authors wish to thank peer reviewers Mark Goodchild and Itziar Belausteguigoitia (WHO); Patrick Petit (IMF); Chris Lane and Hana Ross (World Bank), as well as Emilia Skrok, Tuan Minh Le, and Violeta Vulovic (World Bank) for comments and input, and Linde Kremer for support (also World Bank). This series is produced via the Global Tax Program Health Tax Project under Task Team Lead Ceren Ozer.

² Unless specifically indicated, references to tobacco, alcohol, and SSB taxes and revenues throughout the note refer to excise taxes and excise tax revenues on these products.

Nevertheless, as it is the case with any tax reform, policy makers who are considering health taxes are often presented with counterarguments to their effectiveness, including in terms of the magnitude, buoyancy and sustainability of their impact on revenue.

Health taxes are most effective when they are well designed and implemented; poorly designed and implemented health taxes may not result in the increases in revenues and improvements in health that policy makers expect. This note aims to review revenue related questions that may come up during the policy making process and provide evidence to support the development of well-designed and implement health taxes. In doing so, the note unpacks the factors behind the magnitude and buoyancy of health tax revenues and analyzes why these revenues are higher in some countries than in others. This is done by assessing the impact of tax structures and tax rates on revenue, in the context of a policy transmission mechanism.³ In this note we also touch on a broader range of key considerations including tax administration, the distributional impact, longer term sustainability of revenue, and excise tax revenues in the context of broader tax reforms. Country examples and empirical data are used to respond to the most frequently asked questions of policy makers and practitioners, particularly of ministries of finance and tax authorities. The purpose of this policy note is not to consider the best practices in health tax policy design. There is already a broad consensus on best practices published by international organizations including World Bank (2018; 2020), World Health Organization (2017; 2021a; 2023), and International Monetary Fund (Petit and Nagy, 2016; Petit et al., 2021).

A note on data and methods: As yet, there is no consistent resource for health tax revenue data with different sources covering narrow ranges of countries or products, or not including historical data.⁴ This Knowledge Note draws on a new resource that is under development. During the production of this note, the World Bank Global Tax Program (GTP) has started collecting and standardizing revenue data from secondary sources and supplementing them with data from national sources, including publicly available data from Ministries of

Finance as well as data shared with GTP during country engagements. The database includes all health tax revenues by product and country, as well as historical time series data. At present, the database includes data on 88 countries. The countries and data sources are listed in Appendix A, noting which products the data are available for in each country.⁵ Unless otherwise indicated, all references to tax revenues in this Knowledge Note are sourced from this database. See Box 1 for a discussion on the various metrics used to interpret revenue data.

WHAT DO WE KNOW ABOUT THE MAGNITUDE OF HEALTH TAX REVENUES?

While magnitudes vary significantly between products and countries, one thing is clear- health taxes generate meaningful revenues. In 2019, on average, tobacco and alcohol taxes generated revenues of 0.6 and 0.3 percent of GDP, respectively (see Figures 1 and 2, and Table A1 in Appendix A). 2019 is used as the most recent year for comparison since tax revenue data in 2020 and 2021 were subject to significant volatility due to the COVID-19 pandemic, while data for 2022 are not widely available yet (See Box 2 for an examination of the impact of the pandemic on revenues in several countries). In this sample there is no significant difference between revenues in high-income (HIC) and low- and middle-income countries (LMIC). Tobacco revenues averaged 0.6 and 0.5 percent of GDP in HICs and LMICs (40 and 41 countries), respectively, and alcohol revenues averaged 0.3 percent in both HICs and LMICs (40 and 38 countries). Revenues from tobacco exceeded alcohol in 48 of 76 countries (63 percent) for which tax revenue was available for both commodities in 2019.

In most cases, SSB taxes generate significantly less revenue than tobacco and alcohol taxes. Fewer countries implement SSB taxes,⁶ and as a result, revenue data is only available for 23 countries. Many of the countries for which data are available apply SSB taxes alongside broader non-alcoholic beverage taxes, averaging 0.07% of GDP, with a maximum of 0.19% of GDP. The lower magnitude of revenue is due to relatively lower tax rates, more elastic price elasticity of demand,

³ The tax structure refers to the type of tax (specific or ad valorem), the tax base, and other characteristics and attributes of the tax. Specific taxes are levied on the volume of the product (i.e., the number of cigarettes or litres of beer), with the tax base being the unit of volume (i.e., the litres of beverage or the volume of sugar or alcohol). Ad valorem taxes are levied on the value of the product with the tax base being the point in the supply chain where the value is established. This can be early in the supply chain (e.g., the CIF value or ex-factory price) or later in the supply chain (e.g., retail prices). Other characteristics and attributes include whether the tax is uniform (i.e., applied equally to all products) or tiered (when different rates are applied based on prices or other product characteristics (e.g., length, production volumes, or alcohol or sugar content), or whether a tax thresholds is applied (i.e., a tier below which no tax is paid). Finally, the scope of the tax is also part of this tax

structure. The scope refers to the specific products which are included or excluded from the tax.

⁴ These include OECD Global Revenue Statistics Database, European Commission Taxes in Europe Database, and the WHO Report on the Global Tobacco Epidemic.

⁵ The database is available to World Bank staff but is not published on a public forum due to the confidentiality of some national data. Furthermore, many of the data are easily accessed from sources listed in Appendix A.

⁶ WHO (2021a; 2018) report that 168 and 155 countries apply tobacco and beer excise taxes, respectively, compared to 94 national level SSB excise taxes, of which 20 apply only to SSBs, the remainder apply to non-alcoholic beverages that also apply to SSBs (World Bank, 2023b).

often a narrow scope of the tax,⁷ and tax structures that generate more supply side responses- although these will be considered in more detail later.

Health tax revenues are an unusually large contributor in several countries with distinct characteristics. Some small countries record relatively high tobacco and alcohol revenues, averaging 1.0 and 0.7 percent of GDP, respectively, well above global averages.⁸ This is not unexpected since small countries tend to generate relatively high indirect tax revenue.⁹ Health tax revenue shares are even higher in many small island states. For example, tobacco revenue accounts for 3.4 percent of GDP in Nauru¹⁰ and alcohol revenue accounts for 1.8 percent of GDP in the Seychelles. In Nauru, it likely stems from challenges in measuring GDP due to limited capacity and the narrow range of economic activity (see IMF, 2022). When combined with volatility in its primary industries, tracking changes in economic activity has become more difficult. In the Seychelles, it likely results from very high levels of domestic consumption (Perdix et al., 1999) supplemented with consumption from a very large tourism sector.¹¹ Countries with low overall tax revenues are also likely to have a relatively high share of total tax revenues from tobacco or alcohol excise taxes (see Box 1).

WHAT DETERMINES THE MAGNITUDE OF HEALTH TAX REVENUES?

Well-designed and administered tax policies contribute to higher tax revenues. The examples showed that higher tax rates and higher levels of use are a strong contributor to high revenues, yet this does not explicitly consider tax structures and tax administration. For example, Cambodia and the Philippines have starkly different tax structures, with Cambodia applying an ad valorem tax early in the supply chain (an identical tax structure to Vietnam), while the Philippines implements a best practice uniform specific tax. Furthermore, weak tax administration can lead to low or declining revenues. In South Africa, deterioration of tax administration resulted in relatively low tax revenues compared to the Philippines despite similar smoking prevalence, and similar tax rates and tax structures. These examples are discussed in detail in the subsequent section.

⁷ Of the 20 countries that have taxes on SSBs only, only 7 applied taxes to all six categories of SSBs that the World Bank (2023b) database covers. On the other end of the spectrum, 2 countries only applied to two categories, highlighting the wide variation in scope of tax.

⁸ We use the World Bank's definition of Small States, i.e., countries with populations less than 1.5 million (World Bank, 2023a).

⁹ Taxes on goods and services accounted for 9.3 percent of GDP in 24 small countries in 2019 compared to 8.6 percent in 104 other countries (World Bank, World Development Indicators). When considering only island small states, this rises to 10.2 percent (15 countries), compared to 8.5 percent in 112 other countries.

Box 1 // Measuring and interpreting tax revenue metrics

Measuring and interpreting health tax revenue data is challenging, and no single metric can tell the whole story. Excise tax revenues are often expressed as a percentage of GDP, however other denominators like share of tax revenue may be very useful when considering narrower aggregates like health taxes since it controls for the relative size of tax collections. Share of total revenue (including non-tax revenue) may also be useful in countries which have large non-tax revenues like resource royalties or social security contributions for similar reasons. Data from the World Bank's World Development Indicators is used as a standardized source of GDP, tax revenue and total revenue data.

Indonesia and Luxembourg highlight how these metrics can be used together to interpret the magnitude of health tax revenues (Table B1). Tobacco tax revenue as a percentage of GDP is the same in both countries, however tobacco tax revenue contributes a much larger share of total tax revenue and total revenue in Indonesia than Luxembourg (2.9 and 3.5 times, respectively). Tobacco tax revenue as a share of total revenue in Indonesia is amongst the highest in the world and principally due to the very low total tax and total revenue to GDP ratio. This highlights the need to consider multiple metrics when analyzing or comparing health tax revenues between countries, or even over time.

Table B1: Tobacco, total tax, and total revenues in Luxembourg and Indonesia, 2019

	Luxembourg	Indonesia
Tobacco tax revenue		
Percentage of GDP	1.0	1.0
Percentage of total tax revenue	3.8	10.9
Percentage of total revenue	2.4	8.5
Total tax revenue		
Percentage of GDP	26.4	9.8
Total revenue		
Percentage of GDP	42.0	12.3

¹⁰ Nauru also has a peculiarity in that the excise tax is legally an import duty. However, it is levied as a specific tax of \$A 380 per 1000 sticks (WHO, 2021a), a tax structure almost never observed for import duties, and almost always as an excise. Furthermore, the rate is substantially higher than almost all other import duties. Since cigarettes are not manufactured in Nauru and would not likely ever be, the excise tax is effectively implemented through the import duty system for simplicity. While it may legally be an import duty, it is, in every other respect an excise tax and we treat it as such.

¹¹ Annual tourist arrivals in 2019 were 428,000 compared to a population of 97,625 in the same year (World Bank, World Development Indicators).

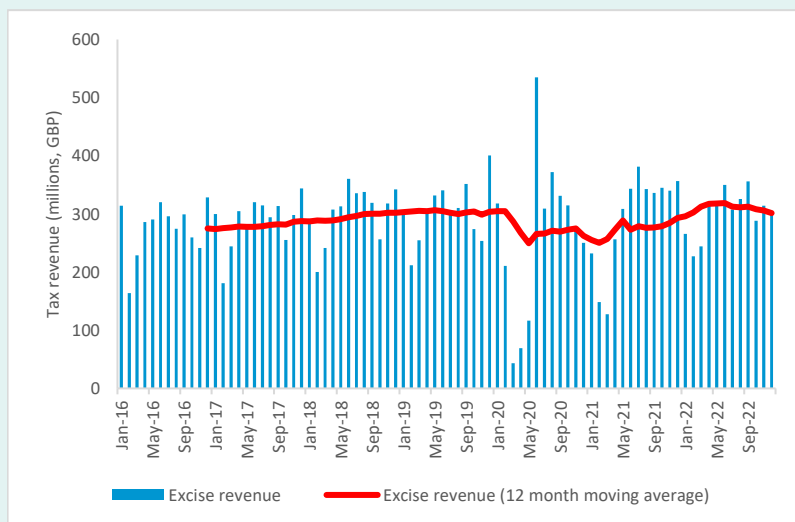
Box 2 // Health tax revenues during the COVID-19 pandemic

The COVID-19 pandemic generated one of the largest economic shocks since World War II and had a remarkable impact on tax revenues in many countries. For example, in 2020, total tax revenues declined in real terms in 97 of 105 countries for which data were available, averaging a decline of 10.1 percent. By comparison, in 2019 tax revenues declined in real terms in only 31 of the 105 countries, averaging a decrease of 3.5 percent. Furthermore, comparing tax revenues as a percentage of GDP in 2020 is also skewed due to large declines in GDP in many countries. Excise tax revenues were particularly affected, with declines in excise tax revenues resulting from supply chains disruptions, changes in consumption patterns, and even temporary sales bans in some places.

Declines in excise tax revenues were not heterogenous, with different countries and products experiencing varying trends. Several countries implemented temporary sales bans on tobacco and/or alcohol, which had large impact on tax revenues.¹ South Africa was one of the most prominent with the tobacco sales ban lasting approximately 5 months (Filby et al., 2022), and three separate alcohol sales bans lasting approximately 5 months in total (Barron et al., 2023). Tobacco and alcohol excise tax revenue declined 50.2 and 30.6 percent, respectively, in real terms in 2020/21 compared to 2019/20. By comparison, total tax revenue and VAT declined by 11.0 and 7.8 percent, respectively, highlighting the dramatic impact the sales bans had on tax revenues. Alcohol revenues recovered quickly, exceeding pre-pandemic levels, however tobacco revenues did not and are still significantly lower than pre-pandemic levels (see Box 3). The ban inadvertently benefited manufacturers who were disproportionately engaged in the illicit market prior to the ban and likely further entrenched the already large illicit cigarette market (Filby et al., 2022; van der Zee et al., 2023).

In the United Kingdom, beer sales and tax revenues fell sharply in early 2020, remaining at low levels through the first five months of the year but recovering somewhat before declining rather dramatically until early 2021 (HMRC, 2022c) (Figure B2).¹ Beer sales and tax revenue declined 13.2 and 13.6 percent, respectively, in 2020, and were still below the 2019 baseline in 2021. The variation in sales and excise tax revenues closely correlate with lockdown restrictions in the UK which limited the consumption of alcohol due to closures in restaurants, bars, and other establishments that sell beer for on-premises consumption.¹ On the other hand, cigarettes saw minimal disruption in clearances and tax revenues during the same period, with sales and tax revenue up by 0.1 and 7.3 percent, respectively, in 2020 (HMRC, 2022a).

Figure B2: Monthly excise tax revenue from beer in the United Kingdom, 2016-2022



Source: HMRC (2022c)

Specific taxes and mixed tax systems generally result in higher tax revenues than ad valorem taxes alone.

Data from the health tax revenue database shows that tobacco tax revenue averaged 0.6 and 0.7 percent of GDP in the 28 and 43 countries with specific and mixed systems, respectively, compared to an average of only 0.2% in the 10 countries with ad valorem taxes only.¹²

Other elements of the tax structure also affect tax revenue yield, including the tax base and tiers. There was insufficient variation of these factors within the tax types to generalize results, however they are considered in more detail through country examples later.

Specific taxes will result in more stable and predictable tax revenues than ad valorem taxes.

Under ad valorem taxes, the effective tax is the product of the tax rate and tax base. Firms can affect the tax base and thereby the effective tax even when tax rates remain unchanged. For example, firms can increase or decrease retail prices (when the tax base is located later in the supply chain) or affect their cost structure (when the tax base is located earlier in the supply chain). Furthermore, consumer behavior can also affect the effective tax, reducing it if they trade down to cheaper products, or increasing it when trading up to more expensive products. Specific taxes are applied to the volume of the product thereby negating the impact of firm and consumer behavior on the effective tax.

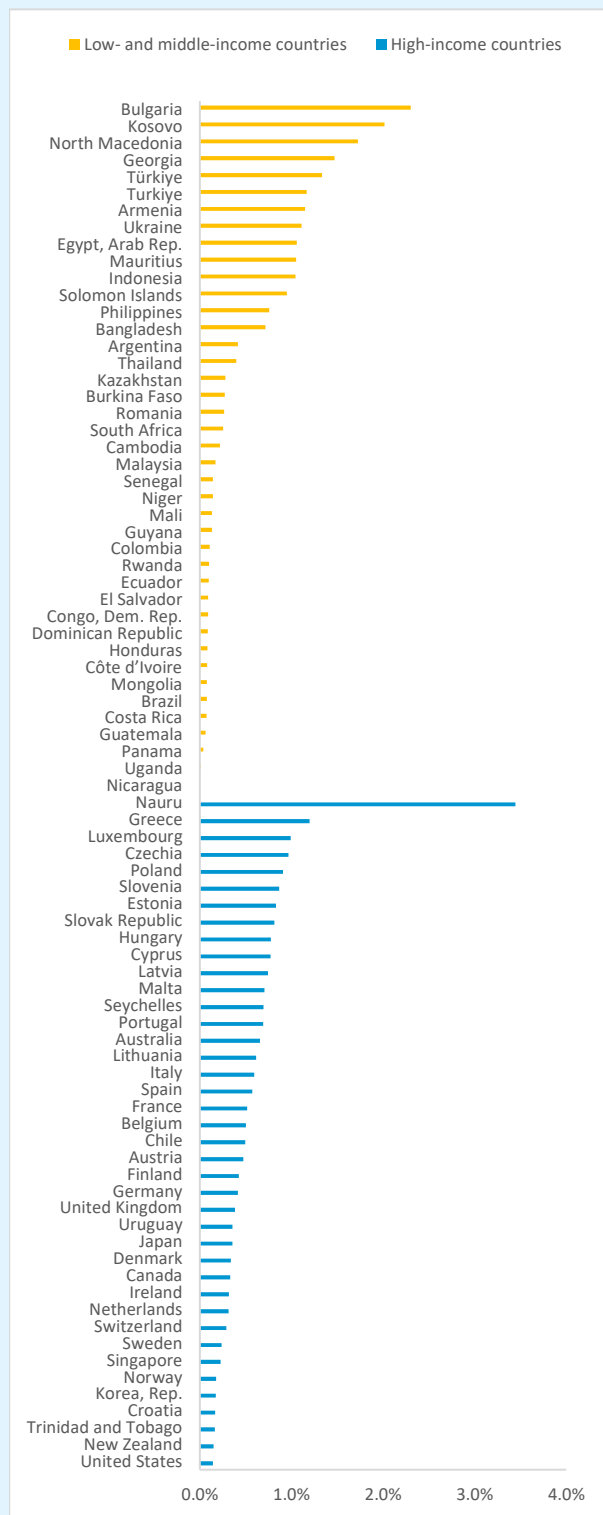
Specific taxes are also preferred to ad valorem taxes because they are more effective in targeting negative externalities and internalities and are more effective in improving health.

The negative externalities and internalities of tobacco, alcohol, and SSBs do not coincide with the value of the product, but rather the volume of consumption. For example, a cheaper cigarette does not generate smaller externalities or internalities than a more expensive one, and thus a tax on volume is a better proxy of externalities and internalities than a tax on value. Specific taxes also increase prices of cheaper products more in relative terms, therefore reducing price variation in the market and reducing incentives to trade down to cheaper brands in response to a tax increase (WHO, 2021b). However, specific taxes need to be regularly adjusted to account for inflation to ensure that their value, and thus tax revenue is not eroded over time.¹³

Uniform taxes also result in higher, more stable, and predictable tax revenues than tiered tax systems.

Firms have similar a similar incentive to adjust the characteristics of products to shift them into lower tax tiers, reducing tax revenue, but also undermining the impact of the tax on increasing prices and reduction

Figure 1 // Tobacco excise taxes as a percentage of GDP by country, 2019



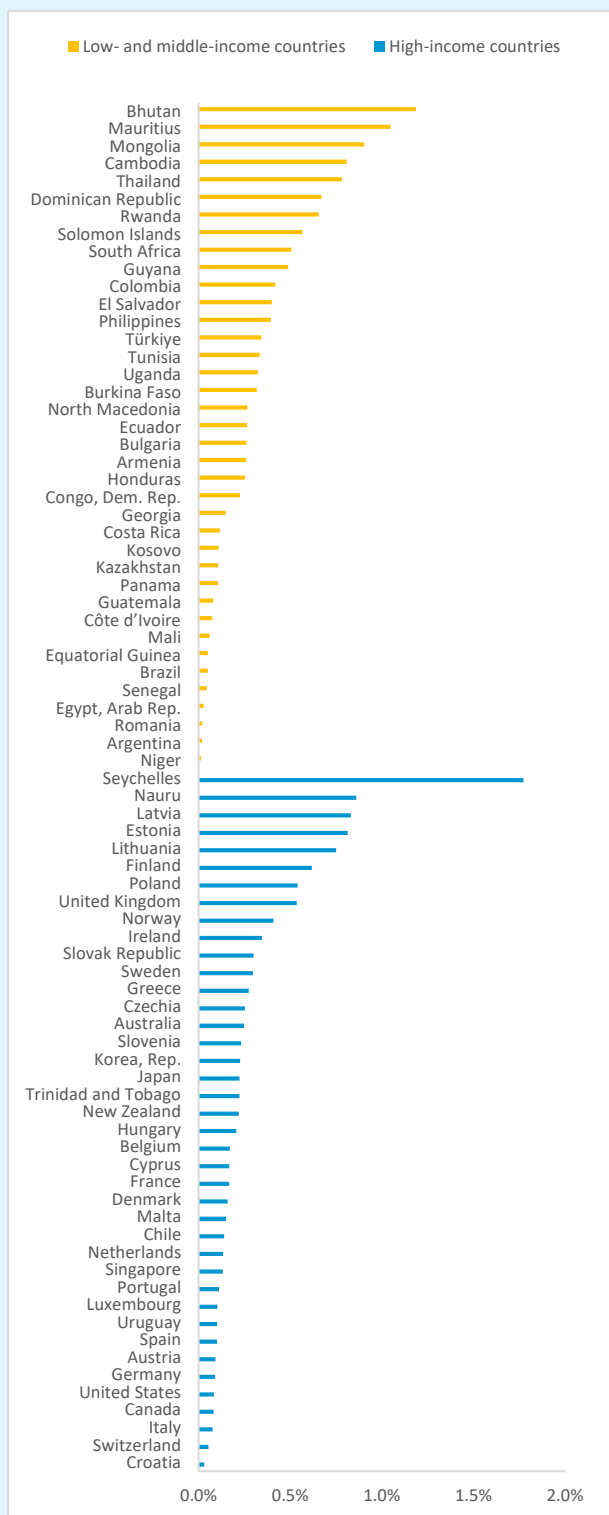
Source: World Bank GTP health tax revenue database

consumption. An exception is when the tiers are based on the alcohol or sugar content and generate intentional incentives for firms to adjust the characteristics of products to shift products into lower tax tiers. While this will still reduce revenue, it can be a trade-off for a larger

¹² Data on tax structures was sourced from WHO (2021a). No comparable tax structure data was located for alcohol and SSBs.

¹³ The GTP has recently published a [Knowledge Note](#) on the topic with a more detailed analysis of the effects of inflation on health taxes, including good practice policy solutions (Lane et al., 2023).

Figure 2 // Alcohol excise taxes as a percentage of GDP by country, 2019



Source: World Bank GTP health tax revenue database

health impact. Tax structures that generate these intentional trade-offs are discussed in more detail later.

THE IMPACT OF HEALTH TAX REFORMS ON INCREASING TAX REVENUE

Increases in taxes result in increases in prices that in turn reduce sales and consumption. The relationship between prices and consumption is defined by the price elasticity of demand.¹⁴ Since the price elasticity of demand for tobacco and alcohol is relatively inelastic and since taxes are only a share of the price, tax revenues increase despite declining consumption. This policy transmission mechanism – and thus the impact of tax increases on tax revenue – is influenced by a variety of factors, including tax policy and tax administration, as well as several parameters including tax pass-through rate.¹⁵

Health tax reforms including increasing tax rates and reforming tax structures can raise substantial tax revenue, quickly and efficiently. Beginning in 2012, the Philippines embarked on an ambitious series of alcohol and tobacco tax reforms (Kaiser *et al.*, 2016) that consolidated several price-based tiers on cigarettes and beer in an upward manner. The reforms culminated in a uniform specific tax being achieved in 2017 (Figure 3; the same figure for beer is shown in Figure A1 in Appendix A).¹⁶ Between 2012 and 2020, alcohol and tobacco excise revenues increased by 140 and 270 percent in real terms, respectively (Figure 4). Increases in tax revenue were very rapid, with tax revenues increasing by 24 and 112 percent on alcohol and tobacco, respectively, in the first year (2012 to 2013), amounting to 0.4 percent of GDP and accounting for the entire increase in total tax to GDP ratio in that year (15.1 to 15.5 percent). Between 2012 and 2020, total tax revenue to GDP increased from 15.1 to 17.8 percent with the incremental revenue from tobacco and alcohol taxes contributing approximately one third of the increase.

In addition to rapidly increasing tax revenues, sustained tax increases can generate additional tax revenues over long periods of time. Since the early 1990s, South Africa has experienced large increases in tobacco and alcohol tax revenues following consistent annual increases in tobacco and alcohol taxes. Notably, South Africa has a well-designed tax structure, employing specific taxes that are uniformly applied within each product category. Between 1990/91 and 2021/22, cigarettes taxes increased by 641 percent in real terms

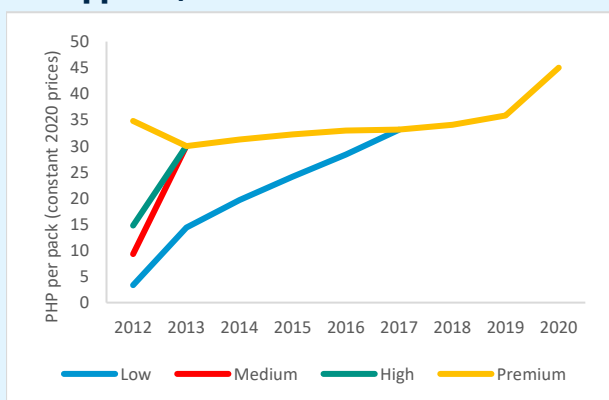
¹⁴ The impact of prices on consumption (defined by the price elasticity of demand) is a critical part of the policy transmission mechanism since this ultimately determines the impact on both health and revenue. The price elasticity of demand is the percentage change in consumption resulting from a percentage change in price. Inelastic demand means that the decline in consumption is less than proportional to the increase in price. This is discussed in more detail later in this section.

¹⁵ The tax pass-through rate is the magnitude by which a tax change influences prices. It measures the change in price in response to a change in the tax rate.

¹⁶ Between 2012 and 2020, cigarette taxes increased by 1,245 and 29 percent on the lowest and highest tiers, respectively. Beer taxes increased by 173 and 38 percent on the lowest and highest tiers, respectively.

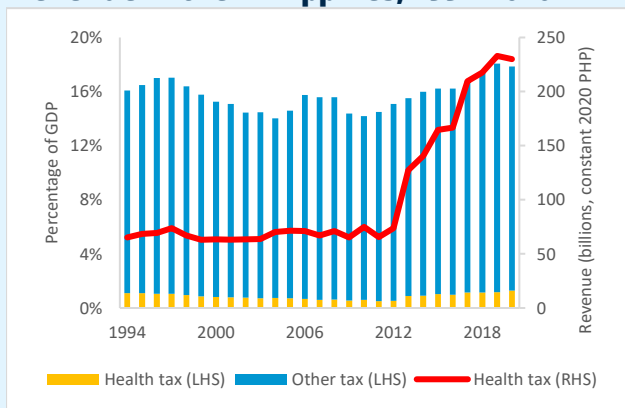
while tax-paid sales declined by 72 percent (Figure 5).¹⁷ Even though sales declined, tax revenues increased by 103 percent. Similar patterns are observed for alcohol taxes, although the magnitudes of tax and revenue increases varies between different products. Between 1990/91 and 2021/22, beer taxes increased by 95 percent in real terms coinciding with tax revenues increasing by 182 percent (Figure 6). Taxes on spirits increase by 146 percent in real terms, coinciding with tax revenue increasing 322 percent (Figure A2 in Appendix A).¹⁸ Despite challenges with tax administration and the over shifting of taxes (see Box 3 for a more detailed analysis of health taxes in South Africa), tobacco and alcohol tax increases in South Africa have resulted in substantial increases in revenues.

Figure 3 // Cigarette excise taxes in the Philippines, 2012-2020



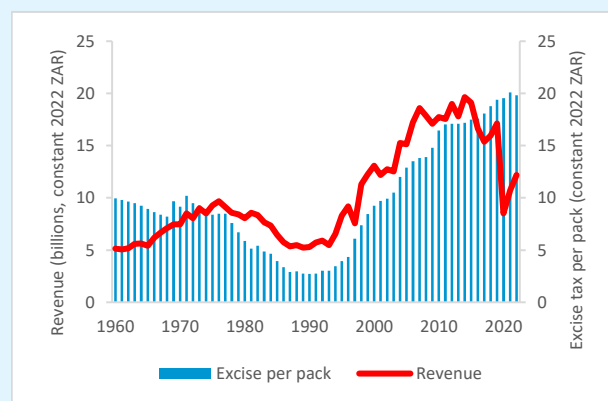
Note: Low (<₱5 per pack), Medium (₱5-6.5 per pack), High (₱6.5-10 per pack), and Premium (>₱10 per pack).
Source: Kaiser et al. (2016); Republic of the Philippines (2012; 2017); World Bank World Development Indicators (CPI)

Figure 4 // Alcohol and tobacco excise tax revenue in the Philippines, 1994-2020



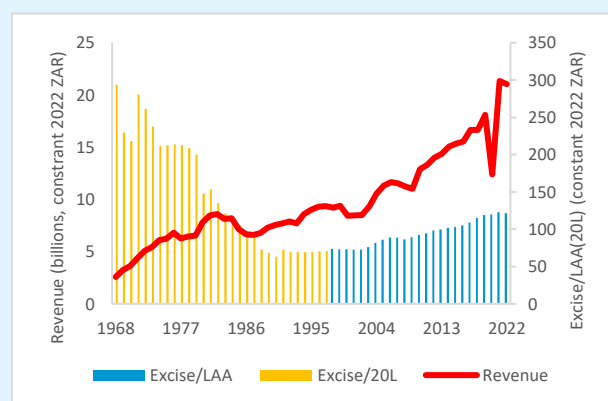
Source: OECD (2022); World Bank World Development Indicators (GDP; CPI)

Figure 5 // Tobacco excise taxes and tax revenue in South Africa, 1960-2022



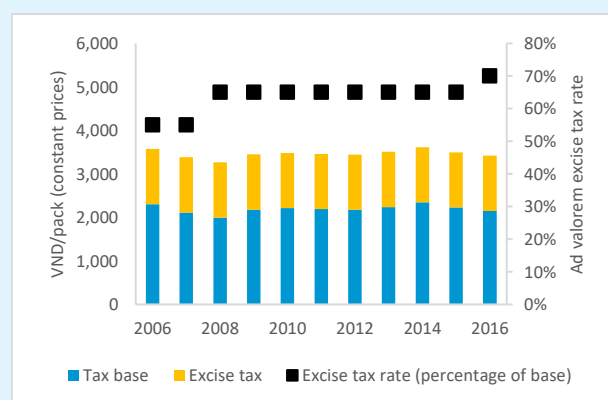
Note: Years represent fiscal years (e.g., 1968 is the 1968/69 fiscal years).
Source: National Treasury (2023); Statistics South Africa (CPI)

Figure 6 // Beer excise taxes and tax revenue in South Africa, 1968-2022



Note: Years represent fiscal years (e.g., 1968 is the 1968/69 fiscal years). The tax base was changed from a volumetric tax to a tax per litre of absolute alcohol in 1998/99; volumetric taxes have been scaled to 20 litres of beer approximating equivalence between 1997/98 and 1998/99.
Source: National Treasury (2023); Statistics South Africa (CPI)

Figure 7 // Tobacco excise tax base and effective tax in Vietnam, 2006-2016



Source: Blecher and Le (2018)

¹⁷ While not included in the figures, sales volumes are imputed from the tax revenue data by dividing tax revenue by the specific tax rate.

¹⁸ Similar increases in wine taxes and revenues have occurred, however still wine, the largest contributor to wine tax revenue, was not taxed in the 1980s, with tax being reintroduced only in 1991/92. Since wine had a

complicated tax history while being a relatively smaller contributor to alcohol tax revenue (ZAR 6.3 billion compared to ZAR 20.8 and 12.9 billion for beer and spirits, respectively), it is not included in the analysis.

Tax increases under an ad valorem tax may not generate the same degree of tax revenue, especially when applied early in the supply chain. Vietnam is a typical example, applying an ad valorem tax on cigarettes based on the ex-factory price. The tax rate increased from 55 to 65 percent in 2008, and 65 to 70 percent in 2016. Figure 7 shows the average tax base (i.e., average ex-factory price) and effective tax of cigarettes between 2006 and 2016 in real terms. The trend shows how the effective tax did not increase in response to the increase in the tax rate. Rather, the tax base decreased and the effective tax also decreased slightly. As a result, average prices fell in real terms (by 31 percent between 2007 and 2016) (Euromonitor, 2023). The reason for the decline in prices was the under shifting of tax increases,¹⁹ supported by the decline in the tax base and effective tax as well as the rest of the supply chain not increasing margins (these margins actually decreased).²⁰ Excise tax revenues increased from VND 13.5 to 13.8 billion between 2013 and 2019, however this amounted to a decline of 11 percent in real terms (Ross, 2021). The lack of increases in revenue was further compounded by cigarettes sales increasing by 2 percent between 2006 and 2016 (Euromonitor, 2021).

Ad valorem taxes can result in increasing tax revenues even when tax rates remain unchanged, although this is dependent on the tax base. This is called the “multiplier effect” and occurs when the tax base increases, resulting in an increase in the effective tax without an increase in the tax rate (Keen, 1998). The implications for tax policy are dependent on the location of the tax base. For example, when the tax base is located later in the supply chain, the multiplier effect can provide a hedge against inflation since increases in retail prices will increase the tax base and thus the effective tax. However, if the tax base is located early in the supply chain increases in retail prices may have limited impact on the tax base and effective tax. Tax revenues may benefit from industry led price increases although the multiplier effect itself may itself act as a disincentive for industry led price increases.

The degree to which taxes are passed through can also affect tax revenue, however the impact

depends on the tax structure, including the type of tax and the tax base. In addition to the tax structure, tax pass-through is also determined by the market structure and the price elasticity of demand (Keen, 1998). Under specific taxes, the greater the degree of over shifting, the smaller the increase in revenue. Conversely, the greater the degree of under shifting, the larger the increase in revenue. Under ad valorem taxes, the greater the degree of over shifting, the larger the increase in revenue, and the later in the supply chain the tax base is, the larger the increase in revenue because of the multiplier effect. Furthermore, specific taxes are more likely to be over shifted than ad valorem. See Appendix B for a more detailed discussion of tax pass-through.

Increases in tobacco and alcohol taxes result in relatively large increases in tax revenues because they are nearly always inelastic. The example of tobacco tax increases in South Africa highlighted this since the decline in consumption was less than proportional to the increase in prices and goes to show how tax revenue increases even when consumption declines. While the price elasticity varies between and even within products, between countries and over time, several systematic reviews have found that alcohol is inelastic (see Table 2 for selected estimates). Earlier systematic reviews showed that alcohol is more inelastic in HICs compared to LMICs (Sornpaisarn et al., 2013; Nelson, 2013) although a more recent study finds no significant difference between LMICs and HICs (Guindon et al., 2022). Beer is generally found to be more inelastic than other alcoholic beverages. Surprisingly, there are fewer systematic reviews of tobacco, however price

Table 2 // Price elasticity estimates from systematic reviews

Product	Category	Countries	Estimate	Reference
Tobacco	Cigarettes	HICs	-0.2 to -0.6, clustering around -0.4	NCI (2016)
		LMICs	-0.2 to -0.8, clustering around -0.5	
Alcohol	Beer	Global	-0.30	Guindon et al. (2022)
	Wine		-0.60	
	Spirits		-0.65	
	Beer	Mostly HICs	-0.30	
	Wine		-0.45	
	Spirits		-0.55	
	All alcohol	LMICs	-0.64	
	Beer		-0.50	
Other	-0.79			
SSBs	SSBs	Global	-1.59	Andreyeva et al. (2022)

¹⁹ Tax increases are said to be fully passed through when the change in price is the same as the change in the tax. Tax increases can also be over shifted when the price increases by more than the increase in tax (increasing margins). Tax increases are under shifted when the price increases by less than the increase in tax (decreasing margins as the supply chain absorbs some of the tax increase).

²⁰ These are several potential causes for this, including cost cutting, but it may also highlight the quality gradient. There is a widely held consensus for both tobacco (WHO, 2021b) and alcohol (WHO, 2017) that ad valorem taxes encourage a more diverse quality or perceived quality of product compared to specific taxes.

Box 3 // Health taxes in South Africa

South Africa implements specific taxes on tobacco and alcohol, with a uniform rate on cigarettes, and specific taxes based on alcohol content for beer and distilled spirits. Wine taxes are applied as volumetric rates across three separate categories (still, sparkling, and fortified wine). Since the early 1990s, tobacco and alcohol tax rates have been increased significantly and regularly. While tax increases have slowed in recent years, they have continued to increase in nominal terms to maintain their real value. Tax increases have led to large increases in prices, reductions in sales volumes, and increases in tax revenues on alcohol.

Since the mid-2010s, tax revenues from tobacco taxes have declined because of weak tax administration, not weak tax policy. Tax revenue in 2021/22 was 45 percent lower than its peak in 2014/15. Independent estimates show that illicit cigarettes increased from less than 10 percent of the market in 2009 to nearly one third by 2017 (Vellios *et al.*, 2020). A targeted intervention against illicit cigarettes that began in 2013 was subsequently shut down alongside other deliberate attempts to undermine the governance of tax administration (Van Walbeek, 2020). As was highlighted in Box 2, tobacco tax administration was vulnerable and the temporary sales bans fed an already large illicit market, with the lack of any security features on packs increasing the vulnerability to tax evasion (Vellios *et al.*, 2022). Tobacco tax administration in South Africa suffers from many challenges that continue to undermine tax revenue collection.

Tobacco tax increases have also resulted in dramatic declines in tobacco use, with adult smoking prevalence declining from 32 percent in the early 1990s (Van Walbeek, 2002) to 18 percent in 2012 (Reddy *et al.*, 2015), leading to significant declines in mortality and morbidity. Tobacco's contribution to all-cause mortality declined from 13 to 8 percent of all deaths, and 8 to 5 percent of all disability adjusted life years lost (DALYs) between 1990 and 2019 (GBD, 2019). Using a synthetic control analysis Chelwa *et al.* (2016) show that 78 percent of the decline in per capita cigarette sales between 1990 and 2004 was attributable to tax increases.

During much of the 1990s and early 2000s, tax increases were over shifted to retail prices (Linegar and van Walbeek, 2018) leading to faster consumption decline and lower than expected tax revenue increases. Alcohol tax increases were also over shifted, making the increases in tax revenues even more impressive (Russel and van Walbeek, 2016).

elasticity estimates vary between LMICs and HICs, with most estimates in HICs between -0.2 and -0.6, clustering around -0.4, and between from -0.2 to -0.8, clustering around -0.5 in LMICs (NCI, 2016). Price elasticity is explained in more detail in Appendix B.

The demand for SSBs is more elastic than tobacco and alcohol meaning that SSB taxes have a relatively smaller tax revenue potential.

A systematic review across a range of countries finds SSBs to be elastic, with an elasticity estimate of -1.59 (Andreyeva *et al.*, 2022). Systematic reviews have not yet identified differences between HICs and LMICs, however a cross-sectional study found that SSBs were less elastic in the lowest-income countries (Muhammad *et al.*, 2019). The most significant reason that SSBs are found to be elastic, or more elastic than tobacco and alcohol, is the greater availability of substitutes, including water. While there are significant challenges in access to safe and affordable drinking water in many countries, leading to the inclusion of access to safe and affordable water in the Sustainable Development Goals (United Nations, 2018), potable water provides a readily available substitute when consumers are faced with higher prices.²¹

MOVING FROM THE SHORT- TO LONG-RUN

In the long run, successful health tax policy will lower consumption, raising the question of whether tax revenues may begin to decline at some point in the future.

This is supported by economic theory that teaches us that as time goes by the price elasticity is going to become less inelastic as consumers can find more or better alternatives, or as firms respond. This is confirmed by a meta-analysis of long-run price elasticities for tobacco (Gallet and List, 2003).²² The implications is that the demand response to price increases with time, which lowers the tax revenue, but also increases the impact on health. From a practical perspective, this raises several questions. First, how elastic (or inelastic) is demand for tobacco, alcohol, and SSBs in the long-run. Second, how might authorities mitigate the risk of declining revenue (keeping in mind that the lower consumption of products with externalities and internalities will bring economic benefits in terms of lower health care costs and higher labor productivity). And third, what is the time horizon that we need to consider. These questions are best answered by considering trends in good practice countries who have well-designed tax structures and high tax rates resulting from a long history of raising taxes.

²¹ The price elasticity is only one reason that SSBs have a smaller revenue potential than tobacco and alcohol. Other reasons include lower tax rates and tax structures.

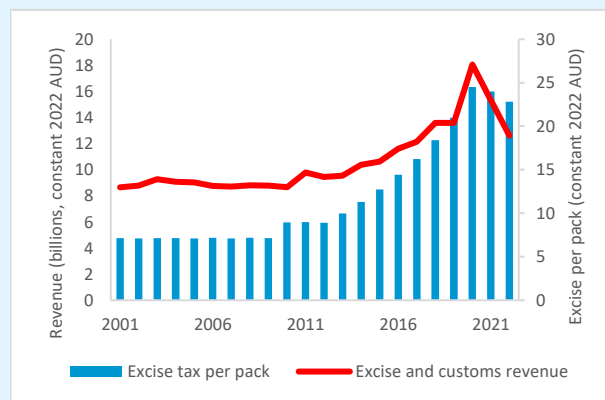
²² The price elasticities analyzed in the previous section are short-run elasticities.

Even countries with relatively high taxes can continue to experience increases in revenues from raising taxes.

Australia has some of the highest cigarette taxes and prices in the world and has continued to raise taxes in recent years.²³ Figure 8 shows tobacco tax revenues in real terms since 2001 and how increases in tax rates have resulted in increased tax revenues. Deliberate increases occurred in 2010, and annually from 2013 to 2020, in addition to twice-annual automatic adjustments to account for inflation and income growth.²⁴ This tax policy coincided with large declines in tobacco use. Daily adult smoking prevalence declined from 22.3 to 10.7 percent between 2001 and 2021, respectively (Greenhalgh *et al.*, 2021). Ignoring the disruptions in tax revenues in 2021 and 2022 due to the COVID-19 pandemic (see Box 2), Australia shows that even the highest taxed countries can still generate substantial increases in tax revenues when tax rates are increased.

In contrast, countries with relatively high taxes that do not increase taxes are at risk of experiencing declines in tax revenues in the long-run. This is because countries are likely to experience long term trends in declining consumption precisely because of prior tax increases. An example of this situation is the United Kingdom (UK) where both cigarette taxes and prices are relatively high.²⁵ While the UK has also continued to raise taxes, it has not done so as aggressively as Australia. Between 2000 and 2022, tax per pack increased by a total of 59 percent (in real terms), coinciding with a decline in tax revenue from cigarettes of 38 percent as cigarettes sales volumes declined by 61 percent (Figure 9). However, only part of the decline in revenue was due to the secular decline in cigarette consumption, with substitution to other tobacco products playing a significant role, notably a significant increase in sales of hand-rolled tobacco (HRT) used to make “roll-your-own” cigarettes (RYO). HRT sales increased by 246 percent between 2000 and 2022, however off a significantly smaller base. A large portion of this substitution was likely due to the relatively higher taxes on cigarettes compared to HRT (average excise per pack of cigarettes was GBP 6.95 compared to an average of GBP 4.57 on RYO in 2022).²⁶ The significant difference in taxes is despite taxes on HRT having increased more rapidly than cigarettes (95 percent in real terms since 2000). Once revenue from HRT is included, the decline was only 21 percent indicating that a portion of the

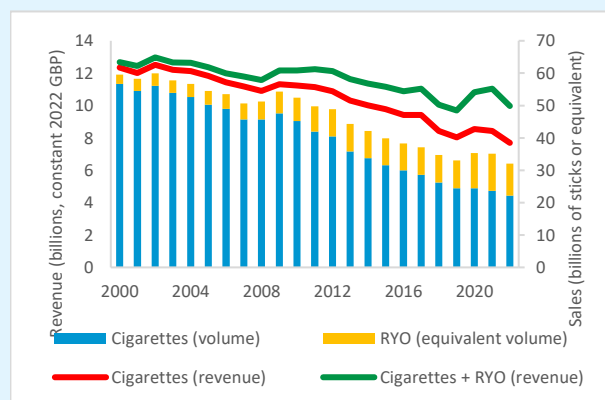
Figure 8 // Tobacco excise taxes and excise tax revenues in Australia, 2001-2022



Notes: Excise tax per pack is measured at year end, 20 cigarettes per pack

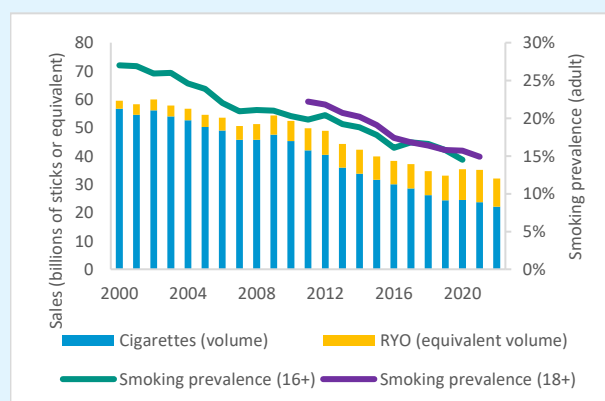
Source: Scollo and Bayley (2022); ABS (2022)

Figure 9 // Cigarette and hand-rolled tobacco excise tax revenue and volumes in the UK, 2000-2022



Source: HMRC (2022a); ONS (2022a)

Figure 10 // Cigarette sales and smoking prevalence in the UK, 2000-2022



Note: The definition of age in smoking prevalence data was changed from 16 years and older to 18 years and older from 2021. ONS (2022b) only backdated changed to the historic time series to 2011. Both series are shown for the overlapping years.

Source: HMRC (2022a); ONS (2021; 2022b)

²³ In 2020, using the WHO benchmark of the most sold brand of cigarette, Australia had the highest price and second highest excise tax in the world (WHO, 2021a). This example is somewhat different to the earlier example of South Africa which showed the buoyancy of revenue over long periods, however tax rates in South Africa are still substantially lower than Australia. The example of Australia is to highlight a country with very high tax rates in the long-run.

²⁴ Automatic adjustment for inflation until 2014, and for nominal wages thereafter.

²⁵ In 2020, using the WHO benchmark of the most sold brand of cigarette, the UK had the 6th highest price and 4th highest excise tax in the world (WHO, 2021a).

²⁶ A RYO cigarette tends to use approximately 0.75g of fine-cut tobacco (Gallus *et al.*, 2015).

decline in cigarette revenue was due to a substitution to HRT.²⁷

Over the long run, declines in tax revenue may be less than expected or only occur when accompanied by dramatic declines in consumption.

For example, the decline in tax revenue in the UK coincided with large declines in cigarette sales and smoking prevalence (Figure 10).²⁸ The decline in tax revenue is less consequential when considering the impact on health resulting from declining tobacco use since reducing the negative externalities and internalities generates a net benefit for society. Declining revenue should also be netted against the savings to the budget from a reduction in expenditure on direct medical costs (and potentially elsewhere, for example, in the judicial system). For example, in South Africa, estimates were that alcohol costs the national and provincial governments ZAR 17.2 billion in 2009/10, which was more than the total tax collections from alcohol in that year (National Treasury, 2014). While, in the United States, Lightwood and Glantz (2016) found that a 10 percent relative decline in smoking was followed by an expected decline in healthcare expenditure of US\$ 80 billion in the following year.²⁹ Thus, even if tax revenues were to decline in the long run, they cannot be considered in isolation of the dramatic impact that health taxes can have on the expenditure side of the budget.

Long-run declines in tax revenue are only likely to occur in the distant future. As the examples of South Africa and Australia showed declines in excise tax revenues are unlikely to occur for the foreseeable future. However, if countries are concerned about the long run sustainability of revenue there is ample opportunity to seek alternative revenue sources, even from other health taxes. In the case of the UK, declining tobacco tax revenue has been partially offset by the implementation of an SSB excise that generated GBP 334 million in the 2021/22 fiscal year (HMRC, 2022b), and by large increases in alcohol excise taxes, that increased revenue by 28% (in

real terms) between 2000 and 2021 (HMRC, 2022c). Some countries are less concerned about long-run revenue losses. New Zealand will phase out cigarette sales, banning the sale of cigarettes to anyone born after 2008, aiming to eliminate smoking.³⁰ There is concern that as countries achieve success with health tax policies and set tax rates at high levels, that the remaining smokers or drinkers will become a vulnerable group in society, whether that may be persons with lower incomes³¹ or mental health or substance abuse issues³², or those without adequate support to successfully change behaviors. Countries should pay attention to vulnerable populations when considering health tax reforms and consider appropriate complementary non-tax policy interventions to support their cessation and behavior change.

WHAT ARE KEY CONDITIONS FOR INCREASED TAX REVENUES?

Policy makers and practitioners are faced with many challenges when considering health tax reforms.

While they will likely face opposition, particularly from the manufacturing industries, there are other substantive challenges that are important to reflect on. These include the impact of tax administration on revenues, particularly how poor or weak tax administration can undermine revenue generation. Arguments are often made that health taxes are regressive, yet studies show that tax increases are progressive once the long-run impact of reduced consumption are accounted for. In addition, revenue generated by health taxes can be directed to ensure even more progressive distributional outcomes. And finally, while increasing taxes is argued to increase revenue, this is not always the case. As has already been alluded to, health taxes are sometimes not designed with revenue generation in mind, but rather to affect incentives for producers or consumers to avoid the tax.

²⁷ The rise in popularity of electronic nicotine delivery systems (ENDS) presents a similar challenge, however the impact on revenue is yet to be determined. Heated tobacco products (HTP) are taxed in the UK, although tax paid sales and revenue data do not show a significant impact yet. Electronic cigarettes are not taxed and while prevalence is significant (7.7 percent of adults) a quarter of cigarette smokers also use electronic cigarettes (ONS, 2022b), potentially limiting the revenue impact.

²⁸ Importantly, smoking prevalence estimates include illicit tobacco, and the decline in smoking prevalence highlights how declines in cigarette sales were not a result of smokers substituting to illicit cigarettes in response to higher taxes. Blecher (2019) highlights how official data on illicit tobacco in the UK shows declining illicit cigarette sales declined sharply since the early 2000s as taxes increased.

²⁹ The study estimated the value to be US\$ 63 billion in 2012 prices. Converted to 2022 prices using CPI-U from the Bureau of Labor Statistics.

³⁰ <https://www.bbc.com/news/world-asia-63954862>

³¹ Lower income populations are relatively more price sensitive than higher income populations and thus the relative impact of tax increases should favor greater behavior change among them compared to higher-

income populations. Van Walbeek (2002) shows that the decline in smoking prevalence in South Africa was significantly steeper among poorer compared to richer groups between 1993 and 2002. However, he notes that evidence from the UK shows that smoking prevalence declined more rapidly in higher- rather than lower socio-economic groups since the 1960s. While it may be argued that the South African case has a greater attribution to tax increases, it nevertheless highlights the need to focus attention lower-income or socio-economic groups when considering health taxes. See also the discussion on progressivity in the next section.

³² Unhealthy alcohol use is often found to coincide with mental health disorders (see Palzes et al. (2020) for a typical example), however causality can run in either direction or be bidirectional. While little is known about price elasticities of these groups, systematic reviews show that price sensitivity declines as volume or concentration of drinking increases (see Guindon et al., 2022). However, evidence also shows that tax/price increases reduce initiation (for example, see Sormpaisarn et al., 2015) and thus would reduce the potential for future unhealthy alcohol use. Nonetheless, the higher prevalence of unhealthy alcohol use among vulnerable populations highlights the need for focussed attention when considering health tax policy.

These challenges are considered in more detail in this section.

Tax administration

Health taxes are relatively easier to administer than many other taxes. Excise taxes are usually collected from a small number of taxpayers early in the supply chain, in most cases at the point of importation or the factory gate, making tax administration relatively simple and cost effective. Application of technological solutions like track-and-trace systems are increasing the efficiency and reducing costs of tax administration, increasing tax compliance, while simultaneously increasing revenue collection.

Tax evasion can undermine health tax revenues; countries with weak tax administration are particularly vulnerable to tax avoidance and evasion on high-risk products and tax increases may not increase revenue as much as expected. There are many forms of tax evasion, varying by product. Tobacco is at relatively higher risk of tax evasion due to its relatively higher value to volume and weight ratio, and (often) has higher taxes (see WCO, 2021).³³ While it is argued that tax increases may increase the incentives for tax evasion it is notable that countries with higher tax rates often tend to have lower rates of tax evasion. While this may not seem intuitive, countries with more significant governance and corruption challenges tend to have lower tax rates, and countries with higher rates of tax have a greater incentive to invest in improving tax administration and compliance (Joossens et al., 2010).

Specific taxes and uniform taxes are easier to collect, particularly in low resource tax administration settings, resulting in higher and more stable revenues. Ad valorem taxes generate increased opportunities for tax evasion through undervaluation and under invoicing (WHO, 2021b; Petit *et al.*, 2021). Conceptually, it is easier for authorities to estimate a volume of product than ascertain a value, especially when levied early in the supply chain. Weak or under resourced authorities may be more vulnerable, lacking the resources to effectively administer ad valorem systems. Additionally, tax administrations in both HICs and LMICs can employ modern technological tools like track-and-trace systems that can track volumes accurately and effectively.

Challenges in tax administration and reforms to improve tax administration are not unique to health taxes. Health tax administration will suffer if general tax administration is weak since they share and rely on many

of the same systems and methods, particularly those in other areas of indirect tax like customs and VAT. Furthermore, improvements and reforms in one area of tax administration likely affects others. While health taxes may receive particular attention, concerns about tax compliance should not be seen in isolation or as a barrier to health tax policy reforms and should be coordinated with broader efforts to improve the effectiveness of tax administration.

Health taxes have unique tax administration challenges and barriers that should be recognized including a unique and unusual incentive for firms to exploit illicit trade and weak tax structures to avoid tax increases. There is a long history of firms overstating the levels and scale of illicit trade in tobacco to generate a causal link between tax increases and tax compliance, while also actively engaging in illicit trade to undermine tax policy or for other strategic purposes like market entry (WHO 2021b). Independent research points to no or limited impact of tax increases on illicit cigarette trade (Ross and Blecher, 2019). Authorities should take an independent view, ensuring that independent estimates of tax compliance inform policy and evaluation while recognizing a conflict of interest between firms and tax policy.

Health taxes are progressive when the long-run impact of behavior changes are accounted for

World Bank research shows that health taxes can be fiscally progressive in the long-run when the behavioral effects of reduced consumption are accounted for. A common argument against health taxes is that they are regressive since the burden of the tax increase falls disproportionately on the poor. This is a narrow argument that relies on the average rather than marginal tax incidence. Since poorer income groups are relatively more price sensitive (i.e., more price elastic) than richer income groups the anticipated change behavior (i.e., increased cessation or reduced intensity) is larger in poorer than richer income groups. Furthermore, savings in avoided health costs and increases in labor productivity and extended working life disproportionately favor the poor thereby making health taxes progressive in the long run. This has been demonstrated for tobacco, alcohol, and SSB taxes in 14 countries using the World Bank's Extended Cost Benefit Analysis (ECBA) (see Fuchs and Pierola (2022) for a summary of these results). It should be noted that almost all these studies were conducted in LMICs, many of which have very low tax rates. As previously discussed, there are concerns that

³³ Tobacco tax evasion is often referred to as illicit trade, which can involve the smuggling, counterfeit, illicit/cheap white cigarettes, unbranded tobacco, bootlegging, and under declaration (Ross and Blecher, 2019).

countries with very high tax rates and declining use may encounter different equity challenges among vulnerable populations in the long-run.

Tax revenues generated by health taxes contribute to the progressive impact of government expenditures in most countries.

The analysis of health tax incidence ignores the overwhelmingly progressive impact of expenditures supported by higher health tax revenue. While tax revenue is largely fungible, World Bank research in South Africa has shown that government expenditure was overwhelmingly progressive, with just over half of government expenditure devoted to social spending. Furthermore, it shows that the tax system is progressive although excise taxes on alcohol and tobacco were found – on average – to be regressive (Inchauste et al., 2015). This study however, did not consider the impact of reduced externalities and internalities. Once reductions in medical costs and increases in working years were accounted for in an ECBA study on tobacco taxes in South Africa, the distributional impact of tobacco tax increases over time was progressive (Fuchs et al., 2018). When the impact of the progressivity of the increased fiscal expenditure was accounted for (as shown by Inchauste et al., 2015), the net impact of tobacco tax increases is even more progressive.

When revenue isn't the goal: reformulation and other health objectives

Some health tax reforms may be designed in a revenue neutral manner. For example, a non-alcoholic beverage tax that includes taxes on both SSBs and non-SSBs might be reformed to reduce or eliminate the tax on non-SSBs while increasing the tax on SSBs. This reform would have significant health benefits and have little or no impact on revenue if tax structures are well designed and tax rates smartly set. In 2014, Finland reformed their non-alcoholic beverage tax, increasing the tax on SSBs relative to sugar-free beverages (Thow et al., 2022).

More sophisticated tax designs may generate incentives for consumers to substitute towards lower alcohol or sugar beverages. For example, specific taxes on alcohol and SSBs may be based on the alcohol or sugar content rather than the volume of the beverage. This would result in lower effective taxes on lower alcohol or sugar content products. Firms may respond by passing through tax differentials to consumers which will increase

the sales of lower alcohol or sugar beverages and decrease sales of higher alcohol or sugar beverages.³⁴ Since the lower alcohol or sugar content products will attract a lower effective tax than products with higher alcohol or sugar content, revenue will be expected to decline over time as this shift occurs.

Alternatively, firms may respond by reformulating products to reduce the alcohol or sugar or shifting advertising from higher to lower alcohol or sugar products. Evidence from South Africa suggests that a reform of the tax base on beer from the volume to alcohol content, combined with increases in the tax rate, resulted in dramatic shifts in advertising from higher to lower alcohol beers that coincided with a significant decline in the average strength of beer consumed and total alcohol consumption from beer (Blecher, 2015).³⁵ More recently, South Africa implemented an SSB tax with similar incentives in the tax structure. The excise tax is based on the grams of sugar per 100ml that exceed a threshold of 4g/100ml. This generates an incentive for firms to lower sugar content to reduce their tax liability. Since implementation, revenue from the SSB tax declined from ZAR 3.3 to 2.3 billion (2018/19 and 2021/22 fiscal years) even though the tax rate has remained unchanged (National Treasury, 2022). Furthermore, this also indicates a significant decline in the volume of sugar consumed from SSBs, thus achieving the policy goal. Similar evidence on reformulation has been observed in the UK where a tiered system exists with a threshold below which no tax is paid (5g/100ml), and a tier above which a higher tax is paid (8g/100ml). Initial estimates were that the tax would raise GBP 520 million, with revenues declining over time as both producers and consumers were expected to shift behavior (HMRC, 2016). The tax was announced nearly two years in advance of implementation to provide producers with sufficient time to reformulate products to reduce sugar content to reduce or eliminate their tax liability. The market response was significantly greater than initially anticipated, with dramatic reformulation occurring even before the tax was implemented, resulting in a reduction in the official revenue estimate to GBP 240 million (HM Treasury, 2018). Fifty days prior to implementation, the proportion of beverages with sugar content above the threshold had declined by 42 percent, whereas 50 days after implementation the proportion of beverages with sugar content above the threshold had declined by 67 percent (Scarborough et al., 2020). The tax

³⁴ Lower alcohol or sugar beverages will become relatively cheaper than products with higher alcohol or sugar content.

³⁵ Even though this system has coincided with a reduction in the average alcohol strength of beer and a reduction in alcohol consumption (Blecher, 2015), the tax rate has increased by 67 percent in real terms between 1998/99 and 2021/22, while tax revenues have increased by 113 percent during the same time (National Treasury, 2022).

raised GBP 318 million in the first year (HMRC, 2023), highlighting the significant impact that tax structures with strong incentives for firms to reformulate products to reduce sugar content can have on revenue, with a clear tradeoff between revenue and health impact.

POLICY CONSIDERATIONS

Several policy relevant lessons can be drawn from the cross-country evidence and experience with respect to tax revenues when implementing health taxes:

- Health tax revenues are supported by well-designed policy. Specific taxes and uniform systems are more likely to generate larger and more stable tax revenues, while the use of ad valorem taxes and tiers are likely to result in smaller revenue generation or even a lack of meaningful revenue increase resulting from a tax increase.
- The short-run impact on revenue of well-designed health tax reforms will be overwhelmingly positive in most, if not all countries. The impact of tax increases on revenue is very rapid, and increases can be sustained over long periods of time.
- Questions regarding the sustainability of revenues should be acknowledged although it should not be considered a barrier to raising health taxes. In the long-run, the impact on revenue may weaken or decline. However, even countries with relatively high excise taxes continue to experience increases in tax revenues when increasing taxes.
- Long-run declines in tax revenues should not be viewed as a policy failure but rather as a policy success, resulting in lower mortality, morbidity, and ultimately economic costs.
- Health taxes generate unique tax administration challenges and revenue may be undermined by tax evasion. Improvements in tax administration may be required to support health tax reforms to ensure an optimal revenue impact. Concerns regarding tax compliance should not be a barrier to excise tax reforms.
- Revenue generation is not the only goal of health taxes, and consideration should also be given to their impact on health. Furthermore, some health taxes or health tax reforms may be designed in a revenue neutral manner or to generate incentives for consumers or firms to reduce their tax liability and thus with revenue expectations declining over time.
- While health taxes are an important source of revenue, it is important to be reminded that the revenues they generate should not be considered in isolation from the large economic savings and reductions in mortality and morbidity due to reduction in consumption of tobacco, alcohol, and SSBs.

APPENDIX A: ADDITIONAL DATA

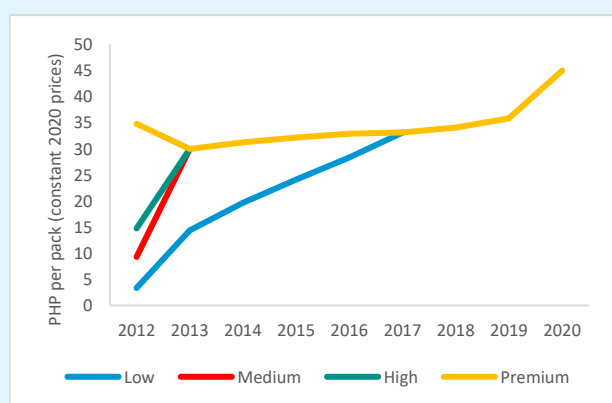
Table A1 // Tobacco and alcohol tax revenues

	Tobacco tax revenue (percentage of)								
	GDP			Tax revenue			Total revenue		
	All	HICs	LMICs	All	HICs	LMICs	All	HICs	LMICs
Count	81	40	41	69	37	32	69	36	33
Mean	0.6	0.6	0.5	3.0	2.8	3.2	1.9	1.6	2.3
Median	0.4	0.5	0.2	2.4	2.8	1.6	1.4	1.6	1.0
Minimum	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Maximum	3.4	3.4	2.3	11.2	9.6	11.2	8.5	3.3	8.5
CV	1.04	0.94	1.15	0.88	0.64	1.05	0.94	0.48	1.07
	Alcohol tax revenue (percentage of)								
	GDP			Tax revenue			Total revenue		
	All	HICs	LMICs	All	HICs	LMICs	All	HICs	LMICs
Count	78	40	38	66	37	29	66	36	30
Mean	0.3	0.3	0.3	1.8	1.3	2.3	1.2	0.8	1.7
Median	0.2	0.2	0.3	1.1	0.8	2.0	0.7	0.6	1.1
Minimum	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1
Maximum	1.8	1.8	1.2	7.6	3.9	7.6	5.8	2.6	5.8
CV	0.98	1.07	0.91	0.90	0.80	0.84	1.00	0.81	0.87

Note: The CV (coefficient of variation) is ratio of the standard deviation to the mean and is a standardized measure of dispersion that shows the extent of variability in relation to the mean of the population.

Source: World Bank GTP health tax revenue database

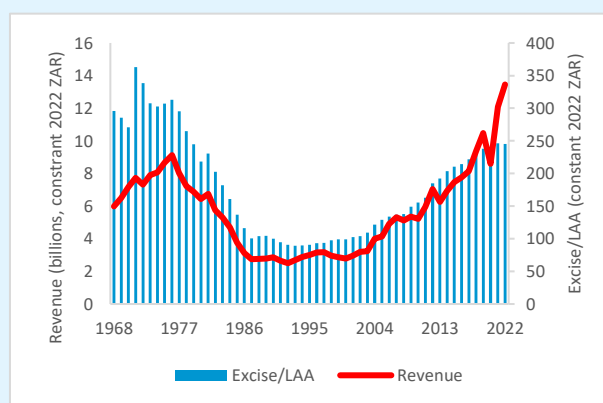
Figure A1 // Beer excise taxes in the Philippines, 2012-2020



Note: Low (<P14.5 per liter), Medium (P14.5-22 per liter), and High (>P22 per liter).

Source: Kaiser et al. (2016); Republic of the Philippines (2012; 2017); World Bank World Development Indicators (CPI)

Figure A2 // Spirits excise tax and excise tax revenue in South Africa 1968-2023



Note: Years represent fiscal years (e.g., 1968 is the 1968/69 fiscal years). A uniform rate has been applied since 1998/99. Prior to that, multiple categories with different, albeit similar tax rates, were applied. For simplicity, only one category from each period is shown. Whiskey is used from 1968/69 to 1973/74 (other categories were wine brandy, grape brandy, and dop brandy), and "other spirits" from 1974/75 to 1997/98 (other categories were wine, sugarcane, and grain spirits).

Source: National Treasury (2023); Statistics South Africa (CPI)

APPENDIX B: TECHNICAL ANNEX

Tax pass-through explained

As previously indicated, when specific taxes are employed over shifting results in a smaller increase in tax revenue than a fully passed through tax increase. This is because over shifting will increase retail prices by more and result in sales decreasing by more than if the same tax increase was fully passed through. Since the effective tax is not affected by the over shifting, the relatively lower sales volumes will result in relatively lower revenue. The opposite is also true and under shifting results in a larger increase in revenue since the increase in retail prices will be smaller, resulting in a larger decrease in sales compared to when taxes were fully passed through. Furthermore, the degree of over and under shifting will affect the magnitude of the relatively lower and higher revenue.

The opposite occurs when ad valorem taxes are employed, with over shifting resulting in a larger increase in tax revenue than a fully pass through tax increase. This is because the over shifting results in a larger increase in the effective tax rate for the same tax increase. Even though retail prices will increase by more when tax increases are over shifted compared to tax increases being fully passed through, the relatively higher effective tax will result in higher tax revenue. The opposite is also true for under shifting of tax increases under ad valorem taxes, with smaller revenue increases compared to a fully passed through tax increase. Once again, the degree of over and under shifting will affect the magnitude of the relatively higher and lower revenue.

The location of the tax base in the supply chain has a significant impact in an ad valorem system. The later in the supply chain the tax base, the larger the effect on the effective tax rate. If the tax base is later in the supply chain, then the relationship between the tax base and tax pass through is much closer. For example, if the tax is based on the retail price and the tax rate increase, a decline in the net-of tax price would imply an under shift, an increase in the net-of-tax price would imply an over shift. If the tax base is located early in the supply chain, a shrinkage of the tax base to maintain the effective tax would only result in an under shift if various margins later in the supply chain (e.g., at the wholesale or retail level) remain unchanged. In general, ad valorem taxes generate weaker incentives for the suppliers to over shift the tax increase since doing so will increase the effective tax.

The more inelastic the product, the more likely taxes are to be over shifted since there is a stronger incentive for the tax to be over shifted to compensate for declining volumes by increasing profit margins. Since tobacco and

alcohol tend to be more inelastic, they are more likely to be over shifted, particularly when specific taxes are applied since over shifting does not affect the effective tax. This is supported by empirical evidence, alcohol tends to be fully passed-through or over shifted (Shang et al., 2020; Nelson and Moran, 2020) whereas SSBs which are generally elastic or more elastic are more likely to be under shifted (Andreyeva et al., 2022). However, since over shifting of ad valorem taxes results in a larger effective tax, the incentive for firms to over shift tax increases is smaller, making ad valorem taxes less likely to be over shifting, and more so when applied later in the supply chain.

The example of ad valorem cigarette taxes in Vietnam showed how tax increases were not over shifted under an ad valorem tax. As tax rates increased, the tax base declined resulting in the effective tax declining slightly, coinciding with declining prices. The increase in tax rate had a negligible impact on tax revenues. Contrast this to South Africa where specific tax increases on cigarettes and beer were over shifted, resulting in larger price increases and sales declines than if tax increases were fully pass through. While revenue was lower than if the tax increases were fully passed through, revenue still increased significantly since the over shifting had no impact on the effective tax and the marginal impact of the over shifting on prices (and consequently sales) was small compared to the impact of the tax increase on prices (and consequently sales).

The less competitive or more concentrated a market the higher the expected tax pass-through since firms have greater pricing power. Conversely, over shifting is less likely (or under shifting is more likely) in more competitive or less concentrated markets where firms are more likely to compete on price. Products that are more inelastic are more likely to see higher degree of tax pass-through (over shifting) because the suppliers can compensate for falling quantity demanded with higher margins, whereas products that are more elastic are more likely to witness lower degree of passed-through (under shifting).

Price elasticity of demand

Policy makers and practitioners are concerned that reductions in consumption will reduce tax revenue. The empirical evidence shows that tax revenues will increase when tax increases drive down consumption due to the inelastic nature of demand. Demand is said to be inelastic when the reduction in consumption is less than proportional to the increase in price. For example, if consumption declines by 6 percent in response to a 10 percent increase in price, the price elasticity of demand is

-0.6 and the demand is inelastic.³⁶ If consumption were to decline by 12 percent after a 10 percent increase in price, then demand is elastic since the decline in consumption is more than proportional to the increase in price.

The less elastic the demand for a product, the larger the increase in excise tax revenue for a tax increase, all else being held constant. Price elasticity will influence the tax revenue after a tax increase through its impact on sales volumes after a price change. Ultimately, the magnitude of revenue increase is primarily determined by the magnitude of the tax increase. Table A2 shows a conceptual example of this in practice. The less elastic the product, the less responsive the quantity demanded to higher tax (and price), and the higher the revenue. The example also highlights that increases in taxes generate positive incremental tax revenue even when a product has a unitary elasticity or is elastic since the tax is just a share in the price, and a relatively small share.

Table A2 // Conceptual example of the impact of price elasticity of tax revenue

	Very inelastic	Somewhat inelastic	Unitary	Elastic
Price elasticity of demand	-0.4	-0.6	-1.0	-1.2
Quantity	1,000	1,000	1,000	1,000
Excise tax (per unit)	0.20	0.20	0.20	0.20
Price (per unit)	1.00	1.00	1.00	1.00
Excise tax revenue	200	200	200	200
Excise tax increase (per unit)	0.10	0.10	0.10	0.10
New excise tax (per unit)	0.30	0.30	0.30	0.30
New price (per unit)	1.10	1.10	1.10	1.10
Percentage change in price	10%	10%	10%	10%
Percentage change in quantity	-4%	-6%	-10%	-12%
New quantity	960	940	900	880
New tax revenue	288	282	270	264
Increase in tax revenue	88	82	70	64

Note: Tax increase are assumed to be fully passed through to prices. The point elasticity formula is used in the example.

³⁶ If the price elasticity is -0.8, then the 10 percent increase in price results in an 8 percent decline in consumption. This is still inelastic since the decline in consumption is still less than proportional to the increase in

price, however it is said to be less inelastic since the same price increases results in a larger decline in consumption.

APPENDIX C: DATA SOURCES

Country	Product			Source
	Alcohol	Tobacco	SSB	
Argentina	✓	✓	✓	OECD
Armenia	✓	✓		National data
Australia	✓	✓		*Australian Tax Office ³⁷
Austria	✓	✓		EC
Bangladesh		✓		National data
Belgium	✓	✓	✓	EC; OECD
Bhutan	✓		✓	OECD
Brazil	✓	✓		OECD
Bulgaria	✓	✓		EC
Burkina Faso	✓	✓		OECD
Cambodia	✓	✓		National data
Canada	✓	✓		OECD
Chile	✓	✓	✓	*Servicio de Impuestos Internos ³⁸ ; OECD
Colombia	✓	✓		OECD
Congo, Dem. Rep.	✓	✓	✓	OECD
Costa Rica	✓	✓	✓	OECD
Cote d'Ivoire	✓	✓		OECD
Croatia	✓	✓		EC
Cyprus	✓	✓		EC
Czech Republic	✓	✓		EC
Denmark	✓	✓	✓	EC; OECD
Dominican Republic	✓	✓		OECD
Ecuador	✓	✓	✓	OECD
Egypt, Arab Rep.	✓	✓		OECD
El Salvador	✓	✓	✓	OECD
Equatorial Guinea	✓			OECD
Estonia	✓	✓		EC
Finland	✓	✓		EC
France	✓	✓		EC
Georgia	✓	✓		OECD
Germany	✓	✓		EC
Greece	✓	✓		EC
Guatemala	✓	✓	✓	OECD
Guyana	✓	✓		OECD
Honduras	✓	✓	✓	OECD
Hungary	✓	✓		EU
Indonesia		✓		National data
Ireland	✓	✓		EU
Italy	✓	✓		EU
Japan	✓	✓		OECD
Kazakhstan	✓	✓		OECD
Korea, Rep.	✓	✓		OECD
Kosovo	✓	✓		National data
Latvia	✓	✓		EC
Lithuania	✓	✓		EC
Luxembourg	✓	✓		EC
Malaysia	✓	✓		OECD

³⁷ <https://www.ato.gov.au/About-ATO/Research-and-statistics/In-detail/Taxation-statistics/>

³⁸ https://www.sii.cl/sobre_el_sii/serie_de_ingresos_tributarios.html

Mali	✓	✓	✓	OECD
Malta	✓	✓		EU
Mauritius	✓	✓	✓	OECD
Mongolia	✓	✓		OECD
Morocco			✓	OECD
Nauru	✓	✓		OECD
Netherlands	✓	✓		EC
New Zealand	✓	✓		OECD
Nicaragua	✓		✓	OECD
Niger	✓	✓		OECD
North Macedonia	✓	✓		National data
Norway	✓	✓	✓	OECD
Panama	✓	✓	✓	OECD
Philippines		✓		OECD
Poland	✓	✓		EC
Portugal	✓	✓		EC
Romania	✓	✓		EC
Rwanda	✓	✓		*Rwanda Revenue Authority Annual Reports ³⁹ ; OECD
Senegal	✓	✓	✓	OECD
Seychelles	✓	✓	✓	OECD
Singapore	✓	✓		OECD
Slovak Republic	✓	✓		EC
Slovenia	✓	✓		EC
Solomon Islands	✓	✓		OECD
South Africa	✓	✓	✓	*National Treasury Budget Review ⁴⁰
Spain	✓	✓		EC
Sweden	✓	✓		EC
Switzerland	✓	✓		OECD
Thailand	✓	✓		*Thai Revenue Department Annual Report ⁴¹
Tokelau	✓	✓		OECD
Trinidad and Tobago	✓	✓	✓	OECD
Tunisia		✓		OECD
Turkiye	✓	✓		National data*
Uganda	✓	✓	✓	OECD
Ukraine		✓		National data
United Kingdom	✓	✓	✓	*HMRC Tobacco Bulletin ⁴² , Alcohol Bulletin ⁴³ , and Soft Drinks Industry Levy Bulletin ⁴⁴
United States	✓	✓		Office of Management and Budget (federal) ⁴⁵ ; US Census Bureau (state and local) ⁴⁶ ;
Uruguay	✓	✓	✓	OECD
Venezuela, RB	✓	✓		OECD

³⁹ <https://www.rra.gov.rw/en/public-information/annual-reports>

⁴⁰ <https://www.treasury.gov.za/documents/national%20budget/2023/review/FullBR.pdf>

⁴¹ <http://webinter.rd.go.th/publish/24602.0.html>

⁴² <https://www.gov.uk/government/statistics/tobacco-bulletin>

⁴³ <https://www.gov.uk/government/statistics/alcohol-bulletin>

⁴⁴ <https://www.gov.uk/government/statistics/soft-drinks-industry-levy-statistics>

⁴⁵ <https://www.whitehouse.gov/omb/historical-tables/>

⁴⁶ US Census Bureau (2000), updated annually. Annual Survey of State and Local Government Finances, 1977-2020. Compiled by the Urban-Brookings Tax Policy Center. Washington, DC: Urban-Brookings Tax Policy Center. Tobacco available at: <https://www.taxpolicycenter.org/statistics/state-and-local-tobacco-tax-revenue> Alcohol available at: <https://www.taxpolicycenter.org/statistics/state-and-local-alcohol-tax-revenue>

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This Knowledge Note Series is funded by the World Bank's [Global Tax Program \(GTP\)](#).

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