

Chapter 3

Protecting and Promoting Health Through Taxation: Evidence and Gaps

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We provide evidence of the extent to which health taxes on tobacco, alcoholic beverages, sugar-sweetened beverages (SSBs) and other food and nutrients reduce demand for these products. We open with a conceptual framework that outlines the mechanisms through which health taxes impact consumption and health outcomes, and how substitution and tax avoidance behaviours may affect the net impact of the taxes. We then review empirical evidence on the tax responsiveness of demand based on estimates from both demand models and tax evaluations, showing that higher prices/taxes on products are associated with lower quantity demanded for taxed products. We also evaluate the differential impacts of the health taxes by demographic and socio-economic status (SES), finding that demand for tobacco and sugary beverages is more price sensitive among lower SES populations. Next, we examine the extent to which health taxes may induce substitution to other products and the extent that consumers may undertake explicit tax avoidance behaviours such as cross-border shopping, as these affect the net impact of a given tax. Finally, we review the evidence on the impact of health taxes on health outcomes – i.e., if the taxes translate into improvements in health and reductions in other

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consumption-related risks. We find that while higher tobacco and alcohol prices/taxes are associated with advantageously reduced health and social outcomes (i.e., lowered levels of tobacco-related cancer and respiratory disease and lowered levels of alcohol-related liver cirrhosis, accidents and violent acts), there is less evidence on the effectiveness of taxes on SSBs and other foods on health outcomes. Overall, the evidence shows that health taxes are effective fiscal measures for reducing the harmful consumption of products such as tobacco, alcohol and SSBs and are an important tool that policymakers can implement to achieve goals of reducing the burden of non-communicable diseases and other consumption-related adverse outcomes.

Health taxes are used to promote health and raise revenue. The focus of this chapter is on providing evidence on the goal of health promotion. In this regard, as part of a public health strategy to promote health, health taxes are used as a fiscal policy instrument aimed at reducing individuals' harmful consumption of products such as tobacco, alcohol and sugar-sweetened beverages (SSBs) with the ultimate goal of reducing adverse health and other outcomes linked to the consumption of such products.^{1,2} Figure 3.1 depicts the conceptual framework through which health taxes ultimately are expected to impact consumption and health. As discussed in the introduction of this book, the rationale for a health tax is to correct individuals' harmful levels of consumption of certain products, given that these products' prices do not account for their external costs.

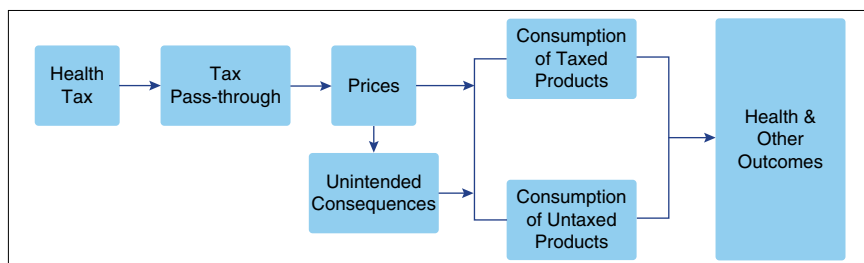
The idea is that the fiscal policy instrument of taxation changes relative prices of taxed versus untaxed products which, in turn, impacts behavior related to consumption. The key mechanism through which this occurs is that taxes generally result in higher prices for consumers, known as tax pass-through (see Chapter 4 of this book for a discussion related to factors affecting tax pass-through). According to the law of demand for normal goods, an increase in the price of a given product, all else constant, will reduce the quantity demanded of that product. How large or small the reduction depends on the price elasticity of demand (the percentage change in the quantity demanded resulting from a 1% increase in price). Price elasticity is a function of various factors, including consumer preferences and whether the good is a necessity or a luxury item, how much of a consumer's income

is spent on that good and the availability of substitutes. For example, if a consumer has a strong preference for a good or it is a necessity for them then they will tend to be relatively less price responsive; if they spend a large proportion to their income on the product then price matters more to them and they will tend to be more price responsive; and, if there are many non-taxed substitutes available then they will also be more price responsive as they can easily satisfy their demand by substituting to similar non-taxed products. For many years, conventional wisdom held that the demand for addictive products was unresponsive to changes in price. Advances in economic theory and empirical evidence show that this is not necessarily the case, with demand for addictive products somewhat responsive to price in the short run, and more responsive to price in the long run.³

Over the past few decades, extensive evidence has accumulated on the impact of prices and taxes on the demand for tobacco products and alcoholic beverages, and, in recent years, similar evidence has emerged on the demand for SSBs. Much of the early evidence on tobacco and alcohol demand came from high-income countries (HICs). Although there has been considerable research on the demand for tobacco products in low-to middle-income countries (LMICs) over the past 15–20 years, similar evidence on alcohol demand is limited. A number of demand models have been estimated for SSBs, mostly based on data from HICs. However, more recently, there is an emerging literature on the impact of SSB taxes on sales/purchases/consumption for both LMICs and HICs.

To fully understand the underpinnings of the net impact on consumption and ultimately health outcomes, as depicted in Figure 3.1, it is also important to understand the extent to which taxes may induce substitution within types of the taxed products (e.g. to cheaper brands) or products taxed at relatively low rates and to non-taxed products (some of which may also be harmful to health) and the extent that consumers may undertake explicit tax avoidance behaviours such as cross-border shopping as these can change the net impact of a given tax. That is, substitution and tax avoidance behaviours influence consumption of taxed and untaxed products and may to some extent offset improvements in health and other outcomes.

Fig. 3.1. Impact of health taxes on consumption and health outcomes.



In this chapter, we review evidence on the price and tax responsiveness of the demand for tobacco, alcohol and SSB products and the extent to which such responsiveness varies by demographic and socio-economic characteristics. In terms of assessing health taxes on foods and beverages, we focus our review on SSBs but supplement it with some examples of taxes on other selected food products and nutrients. Next, we assess unintended consequences including the impact of changes in prices on substitution within taxed products and to non-taxed products and unintended tax avoidance behaviours such as cross-border shopping outside of the taxing jurisdiction. Finally, we review available evidence on the extent to which prices/taxes are associated with consumption-related health and other well-being outcomes.

It should be noted that this chapter itself is not a formal systematic review of the evidence; rather, we summarise the evidence based on existing reviews and meta-analyses and we draw on selected papers to provide country-specific examples. There are hundreds of studies on the impact of prices and taxes on demand for tobacco, alcohol and SSBs. These studies are based on a variety of data, including aggregate time-series data for a single jurisdiction, pooled cross-sectional time-series data from multiple jurisdictions (e.g. US states, countries in a given region or at the same income level) and individual-level survey data (including data from repeated cross-sectional surveys and from longitudinal surveys). Similarly, these studies apply a wide variety of econometric and other statistical methods, as well as alternative underlying theoretical and conceptual approaches. While all data, methods and approaches have limitations, the general consistency of the

findings from these studies – that higher taxes/prices will lead to reductions in demand for the products and the consequences of consumption – is striking.

3.1. Evidence of impact of prices and taxes on consumption/sales

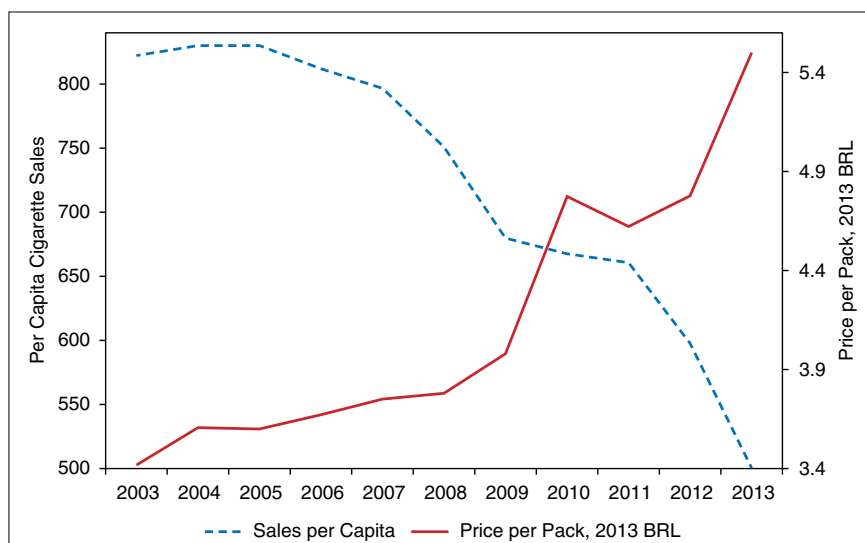
Numerous studies have estimated the impact of taxes and prices on the consumption or volume sold of various targeted products. Some studies use direct measures of consumption or various aspects of behaviour, including prevalence, frequency of use, intensity of use and cessation, using self-reported individual-level survey data. Other studies use direct measures of volume sold or purchases based on store-level scanner data or household scanner or expenditure survey data. Others use some proxy for consumption, such as tax-paid sales or total production plus imports less exports.

3.1.1. Evidence for tobacco products

An extensive body of research, including for countries at all income levels, has estimated the impact of prices and taxes on the demand for tobacco products.^{4,5} Most of this research focuses on the demand for manufactured cigarettes, given that these account for the vast majority of tobacco consumption, but similar evidence exists on the demand for other tobacco products, such as bidis, cigars, pipe tobacco, smokeless tobacco, and, more recently, electronic cigarettes.

Estimates of the price elasticity of cigarette demand from numerous studies from HICs generally fall in the range from -0.25 to -0.5 , implying that a 10% increase in price will reduce overall cigarette consumption by between 2.5% and 5%.⁵ Estimates from LMICs are more variable, mostly falling in the range from -0.2 to -0.8 , indicating that a 10% increase in price will reduce consumption by 2–8%.^{4,5} Figure 3.2 illustrates this based on recent experiences in Brazil, where cigarette taxes and prices were increased significantly since 2000.

Fig. 3.2. Per capita cigarette sales and cigarette prices in Brazil, inflation adjusted, 2003–2013.



Source: Ministry of Health, Brazil; EIU; World Bank; and authors' calculations.

The wider range of elasticity of demand estimates in LMICs results from a variety of factors, including lower incomes, complex tobacco tax structures, trends in cigarette affordability, the availability of other tobacco products and the extent of illicit cigarette trade.⁴

More limited evidence for other tobacco products generally finds estimates of price elasticity greater than those for cigarette demand.⁶ One recent study from Bangladesh, for example, found that a 10% increase in prices would reduce bidi smoking by just over 10%, while reducing smokeless tobacco consumption by almost 4%.⁷ Emerging evidence for new nicotine products, such as e-cigarettes, suggests that the demand for these products is more responsive to price than demand for cigarettes.^{8,9}

In general, estimates indicate that price responsiveness of tobacco use is greater among youth and falls with age, with smoking initiation, particularly initiation of daily or regular smoking, highly responsive to price.^{4,5} With respect to cessation, it is estimated for the United States that a 10% price increase induces almost 2% of smokers to quit smoking.⁴

Estimates based on survey data indicate that roughly half of the impact of price on tobacco use comes through changes in prevalence, mostly the result of current users quitting, with the other half the result of continuing users reducing their consumption.^{4,5} Tobacco use is a highly addictive behaviour and economic models of addiction imply that the effects of price will grow over time. Estimates indicate that the long-run effect of price is about double the short-run impact.^{4,5}

Numerous studies have assessed the impact of tax and price changes on tobacco use. One study, for example, found that the largely tax-induced cigarette price increases in Brazil accounted for 46% of the decline in adult smoking prevalence, which was halved from 1989 to 2010.¹⁰ The 2018 World Bank report *Tobacco Tax Reform at the Crossroads of Health and Development* includes multiple case studies from a wide range of countries illustrating the success of significant tobacco tax increases in reducing tobacco use, including in the Philippines, Ukraine, Colombia, South Africa and France.¹¹

3.1.2. Evidence for alcoholic beverages

Similar evidence exists on the impact of taxes and prices on the demand for alcoholic beverages. Research from HICs has produced generally consistent findings about the impact of taxes and prices on overall demand for alcoholic beverages (beer, wine and spirits).^{12,13} Systematic reviews and/or meta-analyses find that estimates of the overall price elasticity for alcohol from HIC studies are in the range from -0.51 to -0.77 .^{14,15} In general, estimates show that the demand for spirits is most responsive to price, while demand for beer is least responsive.^{14–17} For example, one comprehensive review of estimates from HICs found that a 10% price increase would reduce beer consumption by between 1.7% and 4.6%, wine consumption by between 3.0% and 6.9% and spirits consumption by between 2.9% and 8.0%.¹⁴ One systematic review and meta-analysis of the limited research from LMICs concluded that the price elasticity of alcohol demand in LMICs is similar to that found in studies from HICs with the available estimates producing an average elasticity of -0.64 .¹⁶

Many studies from HICs use survey data to examine the impact of taxes and prices on different aspects of drinking behaviour, such as the frequency and intensity of drinking and drinking prevalence.^{14,15} In general, these studies find that all aspects of drinking are responsive to changes in the prices of alcoholic beverages, including various measures of excessive drinking, such as binge drinking.^{14,15} Some studies have also found that price responsiveness differs based on how much drinkers consume, with light and moderate drinkers more responsive to price than heavy drinkers.^{14,18}

A number of studies have assessed the impact of tax increases or decreases on alcohol use. For example, a recent evaluation of the increase in the sales tax on alcoholic beverages from 6% to 9% in the US state of Maryland found that overall alcohol sales were 3.8% lower than they would have been in the absence of the tax increase.¹⁹ Another study from Switzerland found that the significant reduction in import duties on distilled spirits, which led to a drop in imported spirits' prices of between 30% and 50%, led to a 30% increase in spirits consumption in the 3 months after the change.²⁰

3.1.3. Evidence for SSBs and selected other foods and nutrients

Studies on the impact of prices on the demand for sweetened beverages (e.g. carbonated beverages, fruit drinks, sports drinks, ready-to-drink teas and coffees, energy drinks and flavored waters including both SSBs and non-sugar sweetened beverages [NSSBs]) find that the elasticity is around -0.8 , based largely on evidence from HICs.²¹ Studies that focus on SSB demand only find that demand is more responsive to price, with the elasticity around -1.2 , with the greater elasticity reflecting the opportunity to substitute from SSBs to other NSSBs in response to an increase in sugary drink prices.^{22,23} Recent studies of SSB demand from LMICs produce similar or greater elasticity estimates. For example, recent studies from LMICs in the region of the Americas for Brazil, Mexico, Ecuador, Chile and Guatemala estimated price elasticities of SSB demand of -0.85 , -1.06 , -1.20 , -1.37

and -1.39 , respectively.^{24–28} Similarly, a recent study from South Africa estimated elasticities of -1.18 and -1.17 for carbonated soft drinks and fruit juice concentrates, respectively.²⁹ A study from India estimated a price elasticity of SSB consumption of -0.94 which is slightly lower than the -1.2 SSB estimate.³⁰ Evidence from demand models for other selected foods that are considered high in nutrients recommended to limit (i.e. high in sugars, saturated fats and sodium) have generally been found to be price inelastic (i.e. price elasticity in absolute value < 1). For example, a comprehensive review provides the following mean price elasticities: sweets/sugars (-0.34); fats/oils (-0.48); and, food away from home (-0.81).²¹

Based on a recent systematic review, a meta-analysis found that a 10% increase in an SSB tax is associated with a 10% decline in SSB purchases and dietary intake, corresponding to a tax elasticity of demand of -1.0 .³¹ Indeed, as SSB taxes have increasingly been implemented worldwide over the last decade, a number of evaluations have been undertaken to assess the impact of these taxes on sales, purchases and consumption of taxed beverages. A substantial body of evidence has been produced assessing the impact of Mexico's 1 peso per litre SSB tax, the first of the recent SSB taxes to be implemented based on a public health rationale. Evaluations of this tax found declines of approximately 6–8% in sales and purchases of the taxed beverages and the evidence shows that this impact was sustained two years post-tax implementation.^{32–34} A recent evaluation of the 10% ad valorem SSB excise tax in Barbados found a 4.3% reduction in SSB sales volume.³⁵ Evaluations of Chile's 2014 tiered beverage tax structure that increased the tax rate from 13% to 18% on high-SSBs and lowered it 13% to 10% on low-sugar sweetened beverages (including NSSBs), found reductions in purchases of high-sugar sweetened beverages with either no change or an increase in purchases for low-sugar sweetened beverages.^{36,37} Both the Barbados and Chile taxes are ad valorem (based on a percentage of price) rather than specific (based on the unit of the product) excise taxes, and as noted in Chapter 8, when comparing the impact of statutory rates for ad valorem excise taxes, one must consider where they are applied in the value chain. For example, in Barbados, the ad

valorem excise tax is applied to the producer price, which is a lower base value, whereas in Chile, the ad valorem excise taxes are applied to the retail price excluding VAT. Therefore, even in cases where statutory ad valorem excise tax rates may be the same across countries, if they are applied at different points in the value distribution chain, their effective impact on prices (and, hence demand) may be different.

The 2012 increase in the Danish SSB tax and the subsequent 2014 repeal of the tax were associated, respectively, with significant decreases and then increases in household purchases of taxed beverages with similar levels of response estimated for the tax increase and decrease equivalent to a price elasticity of -1.3 .³⁸ Evidence from an evaluation of the 2012 French sweetened beverage tax on purchases finds that the tax was associated with a reduction in soft drink purchases for heavy consumers but not for consumers generally; however, this is not surprising given the low tax rate which only raised prices by about 5%.³⁹ Following public health calls for industry to reduce sugar content in food and beverages along with the 2016 announcement of the introduction of the 2018 UK tiered soft drink industry levy (SDIL) tax (24 pence/L for beverages with >8 g sugars per 100 mL and 18 pence/L for beverages with 5–8 g/L), a recent study found that between 2015 and 2018, sales of soft drinks in the top sugars tier (>8 g/L) fell by 41%, sales in the mid-sugars tier (5–8 g/L) fell by 73% and sales in the low-sugars tier (0.1–4.9 g/L) increased by 41%; and, the net reduction in the volume sold of sugars per day from soft drinks was 4.6 g per capita per day (equivalent to a 30% reduction).⁴⁰

In the United States, evidence from the 1-cent per ounce tax in Berkeley, CA, the first of the recent local jurisdictions to impose SSB excise taxes, found that SSB consumption fell 21% compared to a 4% increase in comparison cities, while relative water consumption increased 63% compared to 19% in the same comparison cities.⁴¹ Another study found that Berkeley supermarket volume sold of taxed beverages fell 9.6% compared to an increase of 6.9% in non-Berkeley stores and that sales of untaxed beverages rose 3.5% in Berkeley versus 0.5% in non-Berkeley stores; but found no significant changes in SSB

intake when using individual-level data.⁴² Yet another Berkeley study, based on individual-level data three years post-tax, found that SSB consumption fell by 0.55 times per day while water consumption increased by 0.85 times per day – both relative to changes in comparison cities.⁴³ A study for Oakland's penny per ounce SSB tax found no statistically significant effects for either purchases (except for soda) or consumption of taxed SSBs.⁴⁴ A study of the Seattle, Washington, 1.75-cent per ounce SSB tax found that in the first year post-tax implementation volume sold of taxed SSBs fell by 22% and there was no evidence of this impact being offset by cross-border shopping.⁴⁵ Two US local jurisdictions imposed excise taxes that applied to both SSB and NSSBs. Regarding the 1.5-cent per ounce tax on SSBs and NSSBs implemented in Philadelphia, Pennsylvania, a study based on repeated cross-sectional random-digit-dial phone surveys found a reduction in the odds of daily regular soda (–40%) and energy drink (–64%) consumption as well as an increase in daily bottled water consumption (+58%).⁴⁶ Using store scanner data, a recent Philadelphia study found a 51% reduction in volume of taxed beverages in the taxed jurisdiction with a net decrease of 38% when accounting for cross-border shopping.⁴⁷ A study of the Cook County, Illinois, 1-cent per ounce tax on SSBs and NSSBs (repealed after 4 months) found a 27% reduction in sales volume of taxed beverages with a net reduction of 21% after accounting for increased sales volume in Cook County's 2-mile border area.⁴⁸

There is also some limited evidence available from evaluations of taxes that have focused on other food categories or nutrients. For example, an evaluation of the impact of the 2011 Danish tax on saturated fat on the purchases of food product categories such as butter, butter blends, margarine and oils found that the tax was associated with a decrease in purchases in the range of 10–15%.⁴⁹ Several studies have evaluated the impact of Mexico's 8% tax on non-essential energy-dense foods and have found that household purchases of taxed foods were 4.8–5.1% lower 1-year following the implementation of the tax and that this impact was slightly larger 2 years post-tax (–7.4% at 2 years' post-tax).^{50,51}

3.2. Evidence of differential impacts on demand

Many studies of tobacco use based on survey data have assessed the differential effects of taxes and prices on different population subgroups, including those defined by age, gender and socio-economic status (SES). In contrast, relatively fewer studies have done this for alcohol and SSB demand.

3.2.1. Differential impacts for tobacco products

Studies generally find that younger and/or lower SES groups are relatively more responsive to price.^{4,5} Estimates of price elasticity for youth smoking prevalence from LMICs and HICs, for example, tend to be two to three times greater than those for adults, while a few studies from HICs estimate that a 10% price increase would reduce youth smoking initiation by 4% or more (the average impact across ages), with larger reductions in the transition from experimental smoking to regular smoking.^{4,5} One recent study from Chile similarly found that a 10% increase in price reduced the likelihood of smoking initiation by 4%.⁵² Also, studies find greater price effects on cessation among young smokers. Most studies assessing differences by SES find that high-SES populations are largely unresponsive to cigarette prices, while low-SES population are highly responsive.^{4,5} Consistent with this, studies that have assessed differences by educational attainment generally find that more educated populations are less sensitive to price than less-educated populations.⁵ In contrast, no consistent patterns are seen in the relatively few studies that have assessed gender differences in price responsiveness of tobacco use.⁵³ Finally, little evidence exists about differences in price responsiveness by smoking intensity; one study from the United States found that heavier smokers reduced consumption by more than lighter smokers when cigarette prices increased.⁵⁴

3.2.2. Differential impacts for alcoholic beverages

Several studies have explored differences in elasticities by age and gender, producing some evidence that drinking and excessive drinking among young

men are more responsive to price than drinking among older men and among women.¹⁵ However, there does not appear to be a consistent pattern on the extent of price responsiveness among young consumers, particularly across drinking intensity levels.² In contrast to the evidence for tobacco, estimates of price elasticities for alcoholic beverages appear similar across countries of different income levels, while there is some limited evidence that within a given country, drinking in lower SES populations is more responsive to price than drinking in higher income populations.⁵⁵

3.2.3. Differential impacts for SSBs and selected other foods and nutrients

Findings from several studies indicate that SSB demand among lower income populations responds more to price than demand among higher income populations.^{56–58} A tax evaluation from Mexico found that lower SES households responded more to the SSB tax than higher SES households.^{32,59} In terms of differences by consumption level, another evaluation of the Mexico SSB tax found differences based on household purchase levels, with larger reductions (16.1–20.0%) among households that initially had higher purchases of taxed beverages compared to slight increases (0.6–1.9%) among households who initially had lower purchases of taxed beverages.⁶⁰ Additionally, this same study found that the reduction in purchases among the high purchasers of taxed beverages was greater for those who were low SES.⁶⁰

An evaluation of Mexico's tax on non-essential energy-dense foods found that the decline in purchases of taxed foods was greater for low-SES (–10.2%) and middle-SES (–5.8%) households, whereas purchases were unchanged among high-SES households.⁵⁰

A meta-analysis of food price elasticities globally found that changes in prices have the greatest impact on demand in low-income countries: for example, the estimated elasticity of demand for low-income country, middle-income country and HIC, respectively, was –0.74, –0.68 and –0.56 for sweets and –0.60, –0.54 and –0.42 for fats and oils.⁶¹

3.3. Evidence on substitution and tax avoidance

It is important to understand the extent to which taxes may induce substitution and toward which types of products and the extent that consumers may undertake explicit tax avoidance behaviours as these can change the net impact of a given tax. That is, substitution and tax avoidance behaviours will to some extent offset the purpose of the tax.

Consumers will substitute away from taxed products towards untaxed products as a result of the change in relative prices introduced by the tax. If the tax base of the product category being taxed captures the full range of targeted products then substitution from say taxed SSBs to untaxed water or milk would not be an unintended consequence and, hence, would not offset the health aim of the tax. But if a tax was placed, for example, on beer and not wine and as a result some substitution occurred to wine then this would offset the intended outcome of reducing alcohol intake. Similar unintended consequences can exist if, for example, only cigarettes, but not other forms of tobacco products are taxed. Additionally, there may be cross-price/tax substitution to products outside of the taxed product category that may be an unintended consequence. For example, a tax on SSBs may induce substitution to more sweets if the consumer is looking to obtain sugar in another form. Tax avoidance may also take the form of substitution within taxed product categories. For example, in the presence of an ad valorem excise tax, to minimise the impact of a tax, consumers may substitute down to cheaper brands or cheaper (per volume) package sizes of taxed products.

Additionally, in the cases of local-level taxes, or national taxes in places without hard borders, consumer proximity to the border of an untaxed jurisdiction will allow for relatively easy tax avoidance in the form of cross-border shopping, which may dampen the net impact on consumption of a given tax. Additionally, although not discussed below as part of cross-border shopping, it should be noted that tax pass-through (the extent to which taxes raise consumer prices) within local tax jurisdictions may be lower in retail outlets located closer to an untaxed border area which, for example, has recently been found in a study for SSB tax pass-through.⁶²

Finally, firms in the taxed industry and their allies often argue that new or higher taxes will result in extensive tax evasion, including unrecorded manufacturing, large-scale smuggling of untaxed products, purchases from low-tax jurisdictions for resale in higher tax jurisdictions, sale of counterfeit products and other activities. Evidence for cigarettes shows that other factors, such as high levels of corruption, ineffective customs and tax administration and weak governance are as or more important than tax and price differentials in explaining tax evasion.⁵ Issues related to illicit trade and enforcement mechanisms are addressed comprehensively in Chapter 9 of this book.

3.3.1. Evidence for tobacco products

Most studies of demand for multiple tobacco products find evidence of substitution among products in response to changes in relative prices, particularly among more 'like' products (e.g. roll-your-own tobacco, little cigars and cigarettes), while increases in income lead users to 'trade up' to products they perceive as higher quality (e.g. switching from local cigarette brands to international brands or switching from bidis to manufactured cigarettes).⁶ In Lebanon, for example, increases in cigarette prices relative to water pipe tobacco prices led some cigarette smokers to switch to water pipe.⁶³ One recent study based on US sales data found that cigarettes were substitutes for a variety of other combustible tobacco products, including roll-your-own tobacco, little cigars and cigarillos, as well as for e-cigarettes.⁶⁴

Several cigarette demand studies based on tax-paid sales data from US states have included measures of the incentives for cross-border activity, reflecting a mix of both individual smokers crossing state lines to purchase cigarettes in nearby lower tax states, as well as more organised larger scale purchases of cigarettes in lower tax states for resale in higher tax states.^{65,66} Others have used a similar approach to capture cross-border activity in the European Union.⁶⁷ These studies generally find that the greater the difference in prices across borders, the larger the extent of cross-border activity. Additionally, some tobacco use surveys that include questions about

purchase behaviours report that the likelihood of cross-border purchases rises as respondents are nearer borders with lower prices and as the price differences across borders are larger.^{68,69}

3.3.2. Evidence for alcoholic beverages

A limited literature from HICs has assessed the substitutability of alcoholic beverages, generally finding consistent evidence of substitution between alcoholic beverages in the same category, but more mixed evidence of substitution across categories. One comprehensive study from Australia, for example, found relatively consistent evidence of substitution among different varieties of beer (premium, full strength, mid strength and low alcohol), as well as between red and white wines and light and dark spirits, but found less consistent evidence of substitution across beverage categories.⁷⁰ Similarly, one US study produced inconsistent and mostly statistically insignificant estimates for the effects of wine and spirits prices on beer consumption, suggesting little cross-category substitution.⁷¹

Similarly, albeit fewer, studies have assessed cross-border shopping for alcohol beverages. One study based on US state-level tax-paid alcoholic beverage sales, for example, concluded that cross-border shopping accounted for between 20% and 40% of the price elasticity of distilled spirits sales.⁷² Another study based on sales data from Swedish municipalities concluded that there was considerable cross-border price elasticity and that this elasticity increased as municipalities were closer to the border.⁷³ Concerns about cross-border shopping led Denmark, Finland and Sweden to lower alcoholic beverage taxes when they joined the European Union.⁷⁴

3.3.3. Evidence for SSBs and selected other foods and nutrients

There is generally consistent evidence of substitution among different types of non-alcoholic beverages in response to changes in relative prices, such

as substituting to bottled water and milk in response to higher SSB prices.⁷⁵ Indeed, several tax evaluations have found increases in sales/purchases/consumption of untaxed beverages, particularly bottled water, following the introduction of SSB taxes.^{32,35,41,45} For example, a recent evaluation of the 10% ad valorem SSB excise tax in Barbados found a 5.2% increase in sales volume for untaxed beverages.³⁵ However, recent evaluations of the Cook County, IL, and Philadelphia, PA, sweetened beverage taxes found no significant increases in volume sold of untaxed beverages.^{47,48} A recent meta-analysis of SSB taxes found mixed results on substitution with significant increases in untaxed beverage consumption in three of four jurisdictions assessed but no significant change in one of the jurisdictions (Chile).³¹ It should be noted that most of the recently implemented SSB taxes even with health goals provide exemptions to 100% fruit juice which contain free sugars and to milk products including those with added sugars such as flavoured milk and thereby can lead to substitution to untaxed products containing sugars, which may offset the intended health benefits of the tax.

A few modelling studies have estimated substitution between beverages and other sources of calories, concluding that increases in beverage prices can lead to some substitution to various foods, partially offsetting the reductions in added sugar and/or caloric intake from reduced consumption of the higher priced beverages.^{76,77}

Tax evaluations to date have generally used data that are aggregated by beverage category and while scanner data have distinguished formats, individual-level consumption data have not, and hence we do not have a clear understanding on the extent to which consumers may be brand switching to lower cost brands or switching to different formats. Further, tax evaluations on the extent to which consumers may be substituting to other forms of 'sugars' such as purchasing more sweets or other vices such as salty snacks or alcohol are lacking. Substitution to other forms of discretionary (foods and beverages not necessary for the provision of nutrients) calories may offset the intended health benefits of SSB taxes and evaluations are needed

to understand these tax avoidance behaviors and potential unintended consequences.

Several evaluations of the local-level sweetened beverage taxes in the United States have examined the extent of cross-border shopping associated with those taxes. A study of the Philadelphia, PA, tax found that cross-border shopping in the neighbouring zip codes offset the decrease in volume sold of taxed beverages in Philadelphia by 24%.⁴⁷ Similarly, a study of the Cook County, IL, sweetened beverage tax found significant cross-border shopping in the 2-mile border area of Cook County which offset the reduction in volume sold of taxed beverages by 22%.⁴⁸ However, unlike the local taxes in Philadelphia and Cook County, a recent study of the local SSB tax in Seattle found no significant change in volume sold of taxed beverages in the 2-mile border area.⁴⁵ These mixed results suggest when cross-border shopping does occur it somewhat offsets the tax impact but does not fully wipe it out and that geographic context and the proximity with which the population lives to the borders are important considerations for whether in fact it will occur and by how much.

At the national level, it has been reported that the Danish SSB tax was associated with Danish-German cross-border shopping (with a reported estimate of 23% of soft Danish drink purchases) and, in turn, was a significant concern related to the repeal of that tax.⁷⁸

3.4. Evidence on health and other consumption-related outcomes

It is important to understand the extent to which taxes that are intended to change health behaviors actually translate into improvements in health and reductions in other consumption-related risks. For example, do tobacco taxes reduce lung cancer? Do taxes on alcohol reduce cirrhosis of the liver, drinking and driving, alcohol-related violence incidents? Do SSB taxes reduce the prevalence of type 2 diabetes and obesity?

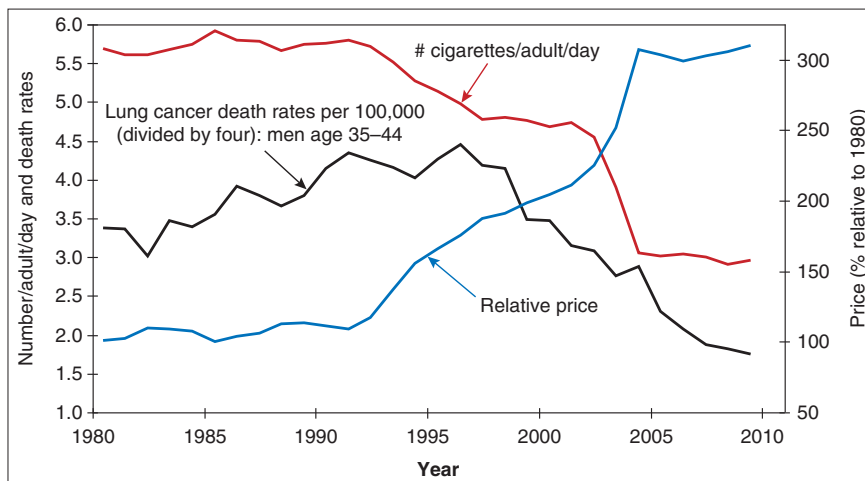
3.4.1. Evidence for tobacco products

Evidence shows increases in cigarette taxes and prices are associated with reductions in the diseases and premature deaths caused by smoking. One US study, for example, found that higher state cigarette taxes reduced overall mortality at the state level, as well as deaths from throat, lung and other cancers and respiratory diseases.⁷⁹ Another recent US study using county-level data concluded that higher cigarette taxes would increase life expectancy, with a one-dollar tax increase raising life expectancy by one year.⁸⁰ Other studies find that higher cigarette taxes lower hospitalisations for heart failure and reduce the severity of childhood asthma.^{81,82} Estimates show that smoking among pregnant women is particularly responsive to price, with prevalence elasticities two to three times greater than for adults.⁸³ As a result, higher taxes and prices reduce low-birthweight births, sudden infant death syndrome and overall infant mortality.^{84,85} One recent study using country-level data from the EU estimated that a one euro increase in the price of a pack of cigarettes was associated with a drop of 0.23 deaths per 1,000 live births in the same year, and an additional drop of 0.16 deaths per 1,000 live births in the following year.⁸⁶ The positive impact of cigarette taxes and price on health is illustrated in Figure 3.3, showing that the increases in the French cigarette tax in the 1990s and early 2000s were associated with immediate reductions in cigarette consumption, followed soon after by reductions in lung cancer deaths among young men.⁸⁷

3.4.2. Evidence for alcoholic beverages

More consistent evidence for the impact of taxes and prices on excessive drinking comes from the relatively large evidence base, again limited almost entirely to studies from HICs, on various harms from excessive drinking. Researchers have studied a variety of outcomes, including motor vehicle crashes and fatalities; deaths from liver cirrhosis, alcohol dependence and various other diseases caused by excessive drinking; incidence of sexually

Fig. 3.3. Smoking, tax and male lung cancer, France, 1980–2010.



Source: Jha P. Death and taxes: Epidemiological and economic evidence on smoking. *Global Heart*. 2012; 7(2): 139–142.

transmitted diseases; crime and violence, including homicides, rape, robbery, child abuse and spousal abuse; and, workplace accidents. A number of comprehensive reviews of the evidence on the impact of alcohol consumption on these adverse outcomes demonstrate generally consistent evidence that higher taxes and prices lead to reductions in the consequences of excessive drinking.^{14–16} Another review of 50 studies examining the impact of taxes and prices on various harms caused by alcohol, concluded that the tax elasticity for all alcohol-related disease and injury outcomes was -0.35 .⁸⁸ The authors further estimated that a doubling of alcohol taxes would reduce fatalities from traffic crashes by 11%, sexually transmitted diseases by 6% and violence by 2%.

3.4.3. Evidence for SSBs and selected other foods and nutrients

Evidence has yet to emerge based on evaluations that directly assess the impact of recent SSB taxes on health outcomes. Limited evidence exists on the impact of prices or sales taxes of carbonated beverages (i.e. soda). For example, a longitudinal study that examined carbonated beverage prices found that higher prices were related to lower body mass index (BMI) among

US children in kindergarten through eighth grade.⁸⁹ Based on US sales tax data, mixed evidence exists on the association of state-level sales taxes and body weight outcomes among adolescents and adults; however, these were relatively small sales taxes.²²

A number of recent simulation studies have provided evidence on the expected impact of SSB taxes on health outcomes and have found associations with reduced health risks related to type 2 diabetes,^{30,90–93} dental carries,^{94,95} cardiovascular disease^{93,94} and obesity.^{30,91,94,96,97} For example, one recent study assessed the expected impact of the SSB tax in Mexico on diabetes and obesity based on changes in volume in SSB consumption associated with the tax and estimated that 10 years post-tax implementation body weight would fall, on average by 0.15 kg/m² per person, equivalent to a 2.54% reduction in the prevalence of obesity and that by 2030 there would be 86,000–134,000 fewer cases of diabetes.⁹¹

A number of studies have examined the association between ‘fast-food’ prices and body weight outcomes in the United States among both adults and children. A review²² of this literature reveals that, for adults, the results generally found no associations. However, one study found that among lower income (proxied by food assistance eligibility) adults higher fast-food prices were significantly associated with lower BMI. Similarly, while there were no significant associations found for younger children generally, higher fast-food prices were found to be statistically significantly associated with lower BMI among low-SES children. For adolescents, however, there was consistent evidence that higher fast-food prices were significantly associated with lower weight outcomes, particularly among those who were low to middle SES and among those adolescents who were in the upper tail of the BMI distribution.

3.5. Conclusion

Health taxes are intended to reduce the consumption of products that are associated with health risks and other adverse outcomes. Governments worldwide have a long history of using tobacco and alcohol taxes and are

increasingly using taxes on SSBs and other selected foods and nutrients as policy tools for the prevention of non-communicable diseases. This chapter provided evidence from both demand models and tax evaluations that showed that higher prices and taxes on products such as tobacco, alcoholic beverages, SSBs and other selected foods are associated with lower demand. The evidence for tobacco and alcohol, along with other selected foods, reveals that demand is price responsive but generally inelastic (price elasticity less than 1), whereas the demand for SSBs is, on average, more price responsive (price elasticity equal to or greater than 1). However, with regard to the demand for tobacco, it should be noted that there is limited evidence for emerging products such as electronic cigarettes and no evidence to date for heated tobacco products. For tobacco, SSBs and other selected foods, the evidence suggests that lower income populations are relatively more price sensitive compared to their higher income counterparts, whereas for alcohol there does not appear to be a consistent differential pattern in price sensitivity by SES. Additionally, there is limited available evidence for alcohol from low- and middle-income countries. Further, there is consistent evidence that youth smoking is more sensitive to higher prices, and tobacco taxes have been shown to be effective in reducing smoking initiation.

This chapter also highlighted the importance of understanding potential substitution and tax avoidance from taxes that may dampen the intended effects and ultimate effectiveness in improving health outcomes. For example, it was shown that in the face of higher prices individuals may substitute to lower priced brands of the taxed products. And, that it is important that taxes are comprehensive in the coverage of alternative forms of the given products otherwise individuals are likely to substitute across product types. Evidence was also presented on the presence of tax avoidance measures such as cross-border shopping and it was shown to potentially dampen the impact of the tax, but it is only of particular relevance where taxes are implemented at the local level or in nations with soft borders.

The body of evidence linking prices/taxes to health and other outcomes is not as extensive as that for demand of the taxed products and it tends to be more widely available for HICs. For tobacco, there are numerous studies that show that higher cigarette taxes and prices are associated with reduced disease, premature deaths and other smoking-related adverse outcomes such as low-birth weight. A substantial and robust body of literature demonstrates that higher alcohol taxes and prices are associated with reduced disease and death (such as from liver cirrhosis) and a host of other adverse outcomes related to excessive drinking such as motor vehicle crashes, sexually transmitted diseases, crime, violence and workplace accidents. Although simulation estimates suggest that SSB taxes will reduce outcomes such as type 2 diabetes and obesity, and policy evaluations show a reduction in demand, the direct link between SSB taxes and prices and health outcomes has not yet been established; in part, because SSB taxes that raise prices by a significant amount are only recently beginning to emerge.

Overall, the evidence shows that health taxes reduce the harmful consumption of products such as tobacco, alcohol and SSBs and are an important tool that policymakers can implement to achieve goals of reducing the burden of non-communicable diseases and other consumption-related adverse outcomes.

Key messages

- Evidence from both demand models and tax evaluations show that higher prices/taxes on products such as tobacco, alcoholic beverages, non-alcoholic sugar-sweetened beverages (SSBs) and other selected foods reduce the consumption of these products.
- Compared to the demand for sugary beverages, which is generally more price sensitive and suggests a price elasticity greater to or equal to one, the demand for tobacco, alcohol and other selected foods, is generally inelastic with a price elasticity less than one.

- The extent to which demand responds to prices/taxes varies by demographic and socioeconomic characteristics, with lower-income populations and younger populations generally more price sensitive.
- Evidence shows that it is important for policymakers to be aware of tax avoidance behaviors as health taxes are associated with some degree of cross-border shopping.
- While tobacco and alcohol taxes are associated with advantageously reduced health and social outcomes (e.g. lowered respiratory diseases, liver cirrhosis and accidents), there is less evidence on the effectiveness of taxes on sugary beverages and other foods on health outcomes.
- In terms of gaps in the literature, with regard to tobacco, there is limited evidence on emerging products such as electronic-cigarettes and no evidence to date for heated tobacco products. Further, there is limited available evidence on the effects of alcohol taxes in low and middle-income countries, as well as limited evidence that links sugary beverage prices/taxes to health outcomes.

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