

Chapter 4

Supply-Side Responses to Health Taxes

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Health taxes are typically levied on manufacturers. The impact of health taxes on consumption, and ultimately on health, depends on the extent of which taxes are transferred from manufacturers onto the prices faced by consumers, referred to as tax pass-through. We discuss the theoretical economic arguments and the empirical evidence on key factors influencing tax pass-through for tobacco, alcohol, and sugar-sweetened beverage (SSB) products, and provide general conclusions and recommendations for government policy. Key drivers of tax pass-through include strategic behaviours of manufacturers and retailers (production and marketing strategies, particularly for multi-product firms), market structure (especially the degree of concentration of a market), and supply and demand price elasticities. Based on empirical observations, taxes on tobacco, alcohol and SSBs are usually passed on to consumers through increases in market prices, sometimes exceeding the amount of the tax. The extent of tax pass-through can vary widely, depending on type of product, package size, brand characteristics, store type, etc. Furthermore, strategic firm behaviours may be triggered by features of tax design. For instance, ad valorem, or mixed specific

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and ad valorem tax structures may incentivise manufacturers to differentiate their brands and price levels, while specific excise taxes tend to reduce relative price differences between products, stifling potential substitutions. Moreover, specific taxes based on ingredients (e.g. grams of alcohol, or sugar), may incentivise manufacturers to reformulate their products, or to increase the promotion of products with a lower concentration of the taxed ingredient. The evidence presented underscores the importance for policymakers to carefully adjust the design, and closely monitor the impacts, of health taxes, to ensure that health benefits are not hindered by firms' strategic responses.

4.1. Introduction

Health taxes alter the conditions in which the markets for the taxed products operate. Markets adjust to the introduction of health taxes through changes on both the demand and the supply sides. Although we discuss changes, or responses, on the two sides separately in this book (demand-side responses are discussed in Chapter 3), they are closely interdependent. In this chapter, we discuss supply-side responses, limiting the focus on the actions undertaken by manufacturers and retailers to safeguard the profitability and sustainability of their businesses in the jurisdictions in which health taxes are introduced. The responses discussed in this chapter are purely the economic responses, involving aspects of the production and marketing of the products concerned, and strategic industrial decisions regarding aspects of the firms' core business. These are distinct from, but often complementary to, the political responses examined in Chapter 12, and they exclude illicit responses.

In theoretical economic models assuming perfectly competitive market dynamics, demand and supply adjustments following the introduction of consumption taxes are largely automatic. In these markets, individual firms are price takers and there is little scope, if any, for discretionary action. In real-life circumstances, and especially in the markets for the products that are typically targeted by health taxes, competition is far from perfect (see Chapter 12 for an assessment of market concentration). In fact, a significant

scope exists for supply-side players to act strategically in response to the introduction of health taxes in order to mitigate any adverse consequences on their businesses.

Health taxes, as other excise duties, are usually levied on manufacturers and not on final consumers. Taxing manufacturers reduces the administrative burden and the risk of non-compliance. However, this also increases opportunities for suppliers to shape the market impacts of health taxes, potentially undermining the effectiveness of a tax in the pursuit of public health goals. The impact of health taxes on consumption, and thus health, is dependent on the degree to which market prices for the taxed products are increased. A key determinant of the effect of health taxes is the degree to which taxes, or tax increases, are transferred onto the prices faced by consumers, which is often referred to as tax pass-through. When the pass-through rate is greater than 1, there is overshift of the tax (i.e., prices rise above the tax increase) while if it is lower than 1, the tax is under-shifted (i.e., prices rise below the tax increase). The final tax pass-through rate is determined as the ratio between the price increase faced by consumers and the amount paid for the tax at the relevant tax point. Intermediate pass-through rates can also be calculated — e.g. at the manufacturer's level — but what matters the most in the case of health taxes is the final pass-through rate. When health taxes are *ad valorem* (see Chapter 8 for a detailed discussion of *ad valorem* versus specific excise taxes), the pass-through rate is still calculated as a proportion of the amount paid for the tax. The percentage increase in prices faced by consumers should not be expected to match the tax rate in the case of *ad valorem* taxes. Health taxes are in fact typically levied on manufacturers (i.e., on ex-factory or ex-customs prices) and the prices paid by manufacturers do not reflect the prices faced by consumers, as they typically exclude transport and distribution costs and retail mark-ups. It is important to note that retail mark-ups may be set as a percentage of manufacturer prices, so they may inflate pass-through rates. In this case, a portion of the price increase

faced by consumers is paid to retailers, independently of manufacturers' pass-through strategies.

Industry pricing policies in response to health taxes are to some extent predictable because they are driven, or at least influenced, by market forces and by tax design. However, the markets in which health taxes may be applied vary widely. The specific characteristics of those markets may influence the responses of commercial players to a degree that could significantly impact the ability of the tax to fulfill its public health purpose. The planning of effective health taxes requires full consideration of possible responses from the industries concerned as well as from consumers (discussed in Chapter 3) and requires careful design (discussed in Chapter 8).

In this chapter, we discuss the theoretical economic arguments and the empirical evidence on key factors influencing the degree to which taxes are passed on to consumers. We also discuss the extent to which these factors vary across products, countries or other relevant dimensions.

Basic economic theory suggests that prices are set at the level at which demand and supply meet. In competitive markets, taxes are passed through to consumers (up to full pass-through, depending on the underlying demand and supply price elasticities) when there is a constant marginal cost of production. However, the markets in which most tobacco, alcoholic and non-alcoholic beverages are sold tend to have levels of concentration that set them apart from competitive markets. In more concentrated markets, suppliers have market power and therefore more scope for exercising their discretion in responding to health taxes. In practice, this often translates into an over-shifting of taxes onto consumers. However, suppliers may decide to adopt different strategies leading to different levels of pass-through. Suppliers decision will depend on the characteristics of the demand they face, on their production costs, on their product portfolio and on the competitive environment in which they operate. This is because in less competitive markets prices are set above marginal cost. Therefore, manufacturers can under-shift the tax and still have positive margins or over-shift the tax to maintain revenues in the face of declining sales volume.

In addition to market structure, other factors potentially affecting the effectiveness of a tax are strategic behaviours of manufacturers and retailers (e.g. production and marketing strategies, particularly for multi-product firms), supply and demand elasticities, the characteristics of the jurisdiction in which the tax is applied and the design of the tax (e.g. specific or ad valorem; tiered rates, etc.). In the next section, we illustrate several considerations concerning the above elements that are of general value and can be applied to all categories of products that are typically targeted by health taxes. In the following sections, we present more specific considerations that apply to specific product categories.

While some industry responses can hinder the effectiveness of health taxes, others can align with price incentives. This happens, for instance, when health taxes lead to product reformulation that may mitigate the detrimental health impacts of the products concerned. A special focus by White et al. associated with this chapter focuses on the use of taxation as an incentive to product reformulation, using the example of the Soft Drinks Industry Levy in the United Kingdom. Health taxes can also create an incentive for producers to shift advertising and promotion to non-taxed (or lower taxed) products. This is another example of alignment between industry responses and price incentives when taxes are designed in a way that penalise less healthy products (e.g. taxes targeting alcohol or sugar level).¹

In the final section of this chapter, we draw some general conclusions and recommendations for government policy highlighting the similarities and differences between the markets for the three main product categories targeted by health taxes.

4.2. Factors affecting supply-side responses to health taxes

While supply-side responses largely translate into different degrees of pass-through of health taxes, firms' decisions on pass-through are driven by a large and complex set of factors and strategic considerations. Whoever design and

implement health taxes must be aware of those in order to ensure taxes are effective in the pursuit of health goals. Firms will aim at safeguarding the profitability of their businesses against risks that may derive from changes in competitors' and consumers' behaviours following the introduction of health taxes.

In perfectly competitive markets, individual firms are price takers and face a perfectly elastic demand curve. They will only be able to sell their products at one price, the market-determined price. Tax pass-through in those settings is also determined at the market level and individual suppliers can only adapt to the new price level and sell whatever quantity of the product they are able and willing to sell at that price. As previously mentioned, however, many of the markets for products typically targeted by health taxes are characterised by a reduced level of competition and this of course is not merely incidental. Reduced levels of competition are typically the result of specific features of a market, such as barriers to entry or product heterogeneity, which limit opportunities for existing and potential competitors to contest other firms' market position. Heavy regulation of an industrial sector, unless specifically aimed at preventing firms from acquiring dominant positions, contributes to creating barriers to entry into the markets in which firms in that industry operate. In such markets, firms strive to acquire a critical mass and critical assets (especially intangible assets such as knowledge and, arguably, lobbying and influence capacity) to operate in a regulated environment and withstand the burden of regulation. Health taxes can also create an incentive for increasing levels of concentration (i.e., reducing levels of competition) in the markets in which they are applied. As we discuss below, this type of development is also in keeping with the strategies that firms are likely to adopt to minimise risk from consumer responses to health taxes.

4.2.1. Health taxes and the firm's competitive environment

Competitors' responses to health taxes may jeopardise a firm's business. One example in which a firm's business can be threatened by competitors'

responses to health taxes is when a competitor has the capacity to influence the design of the tax in a direction that particularly suits their business (e.g. by setting the tax base in a way that excludes some of their products or setting tax rate thresholds at convenient levels). Another example is when competitors are in a better position to reformulate their products (e.g. because of a technological advantage) and mitigate the impact of taxation on their sales and customer base. In the situations described here, larger players have an advantage over smaller ones. In fact, firms that enjoy a competitive advantage are able to contain price increases following the implementation of health taxes. On the other hand, other firms will either lose market shares because their prices are no longer competitive, or be forced to reduce their pass-through rates in order to remain competitive, but most likely with detrimental consequences on the profitability of their business.

An alternative scenario may occur in situations in which no competitors are able to enjoy meaningful technological or market advantages and relatively few larger firms operate in the market. In this scenario, cooperation between larger firms, effectively operating as a cartel, may lead to higher degrees of pass-through. This will translate to higher prices for consumers in the presence of a relatively inelastic demand.

4.2.2. Health taxes and firms' expectations of consumer response

The behaviour of competitors is only one of the factors taken into consideration by firms in their response to health taxes. Consumer behaviour is at least as important, and demand-side responses to health taxes can be even more nuanced than competitors' responses. It is legitimate to expect that firms possess information on the price elasticity of the demand for their products. However, price elasticity is a simple number that summarises the outcomes of a relatively complex array of behaviours triggered by price changes. Every product has its own market, but consumers make their consumption choices considering the prices of different products and making trade-offs between different types of consumption, based on their

cross-price elasticities. This creates a dynamic equilibrium in which choices are constantly adapted following price fluctuations and preference changes, and the introduction of health taxes causes further adaptation in consumer choices. Trade-offs made by consumers translate into substitutions between products and types of consumption. A price hike for a given product category due to the introduction of a health tax may trigger at least three different types of substitutions,² as follows:

- a. a switch to cheaper products in the same product category, often termed 'trading-down';
- b. a switch to alternative products that are close substitutes for the products originally consumed (examples may include artificially sweetened beverages for sugar-sweetened ones, different types of alcoholic beverages or tobacco products, etc.);
- c. a switch to different and unrelated types of consumption.

The higher the price elasticity for a particular product, the more likely consumers are to engage in substitutions when the price of that product increases. An inelastic demand (elasticity between 0 and 1, in absolute value) means that after a price increase, consumers will end up spending more on the product in question and consuming less of it (the reduction in quantity is not large enough to offset the impact of the price increase). Therefore, consumers will be left with less available income after purchasing the product in question and will be unlikely to increase the consumption of other products. On the other hand, an elastic demand (elasticity larger than 1, in absolute value) for a product whose price is increased will be associated with a decreased spend on that product (in this case the reduction in quantity does offset the impact of the price increase). This means that consumers will increase their demand for other products, effectively engaging in substitutions. Price elasticity is partly determined by the inherent preferences of consumers, but it is also largely influenced by market characteristics, chiefly, the availability and prices of close substitutes on the market. Other

things being equal, an inelastic demand constitutes an incentive for firms to pass taxes through to consumers. By doing so, firms increase their revenues and maximise their profits with a limited risk of seeing consumers switch to alternative products. The opposite is true when firms face an elastic demand.

4.2.3. Health taxes, firm size and market structure

As describe previously, the price elasticity of demand may be a sufficient guide for determining pass-through rates in the short term. However, when health taxes are applied over a long period of time and become a structural feature of a given market (as in the case of markets for tobacco products and alcoholic beverages) firms are likely to develop strategies to ensure the sustainability of their business in the face of future tax hikes. There will be a push towards market concentration and product differentiation that will enable firms to capture consumers engaging at least in the types of substitutions described in (a) and (b) in Section 4.2.2. Multi-product firms operating in dominant market positions are common in markets for products targeted by health taxes. These firms are typically in a position to offer similar products under different brands with different market profiles and prices, as well as close and not-so-close substitutes to taxed products. Therefore, a large part of the substitutions triggered by health taxes will occur within the firm's product portfolio, with reduced or no loss of revenue for the firm. In established markets such as those for tobacco and alcohol products, portfolio diversification has been pushed to include new product concepts, such as electronic cigarettes or non-alcoholic beer or wine. Firms with diversified product portfolios are likely to favour high pass-through rates even in the presence of a less inelastic demand, because they have less to fear from consumer substitutions than smaller, single-product firms. Similarly, at the retail level, there is evidence that larger retailers pass through more of the tax than independent retailers.³

4.2.4. Health taxes and tax pass-through patterns

Evidence shows that health taxes are usually passed onto consumers as price increases and are sometimes over-shifted (specific examples by product category are provided in the sections below). This can occur across all products or just in specific segments of the market, for example higher price products and private labels, as the demand for those is usually less price-sensitive⁴⁻⁷ or smaller package sizes compared to large package sizes.⁸⁻¹² This might reflect producer's strategies to keep the level of consumption high without discouraging the consumption of large package beverages, which are more penalised by the excise tax⁹ and have a more price-sensitive demand.⁸

Moreover, due to the imperfect competitive nature of the market, we observe asymmetric pass-through, which tends to be higher after a tax increase than after a tax cut. For example, pass-through rates for beer of 1.34 (over-shift) for tax increases and 0.27 (under-shift) for tax reductions have been reported,¹³ as well as pass-through rates for sugar-sweetened beverages (SSB) taxes of between 1.6 and 1.8 after a tax increase and between 0.9 and 1.2 after a tax reduction.¹⁴

Pass-through is reduced when more opportunities exist for tax avoidance, both for consumers and producers. For instance, when substitutes for taxed products are available and consumer demand is price-sensitive or when it is easy to buy products outside the taxing jurisdictions. Evidence shows that a lower pass-through is observed for tobacco,¹⁵ alcohol^{16,17} and SSBs^{13,18,19} sold in stores near borders with low-tax jurisdictions and for products like cigarettes sold by the carton, for which cross-border avoidance is greatest.¹⁵ To avoid this strategic behavior, in Catalonia, a regional jurisdiction in Spain where a tax was applied on SSBs, the legislation included a mandatory requirement of complete pass-through to consumers.²⁰

The elasticity of supply, which is based on the amount of competition among manufacturers and retailers, has also an impact on pass-through.¹⁹ When competition is higher and the margins are lower, pass-through is also lower and this happens, for example, in smaller jurisdictions.²¹

Finally, the presence of a more complex tax structure (e.g. ad valorem or mixed specific and ad valorem taxes) can provide more opportunities for manufacturers for a strategic differentiation of brands and price levels.⁵

4.2.5. Health taxes and state monopolies

In many countries, the markets for tobacco and alcohol products are dominated by state monopolies. When the first edition of the WHO Tobacco Atlas was published in 2002, an estimated 40% of cigarettes worldwide were being consumed in countries that had state monopolies,²² but the number of countries with monopolies had been on a long-term declining trend. State monopolies remain mostly in countries in North Africa and the Middle East, China, South-East Asia and in some eastern European countries. However, given the increasing prominence of the Chinese tobacco market, the share of the global cigarette market they account for has not declined. Tobacco monopolies have different characteristics in different countries and may cover production and imports as well as sales of tobacco products. A smaller number of countries have state monopolies for alcohol products, especially in North America, northern and central Europe. These monopolies today mostly control the sale of alcohol products for off-trade consumption.²³

Commercial responses triggered by health taxes in countries where state monopolies exist can be significantly different from those described elsewhere in this chapter. Governments that set taxes in markets in which they have monopolies also have the power to determine, or largely influence, the way taxes affect the businesses involved and the consumers of the taxed products. There is at least some evidence that state monopolies operate differently from private monopolies when taxes are introduced or raised. Tax pass-through to consumers ranges from low levels in instances of tobacco tax increases in China²⁴ to higher levels (e.g. in Egypt, Ref.²⁵) but with no reported evidence of over-shifting, which would be expected in a private monopoly or highly concentrated market.

Alcohol monopolies were often established to control the social externalities of alcohol consumption, so their pricing policies tend to be consistently geared towards that overarching goal, independently of taxation. In line with this, price promotions and discounts are uncommon in sales monopolies.²⁶ Evidence from Finland shows that tax pass-through rates have been higher in the off-trade sector (covered by the state monopoly) than in the on-trade sector, but differences in pass-through between beverages in the off-trade sector have been even larger than differences between on-trade and off-trade rates, ranging from 0.77 (for beer) to 1.44 (for spirits), on average, between 2002 and 2011.²⁶

In a larger number of countries, governments exercise monopolistic powers by reserving the right to license the production or sale of tobacco and alcohol products to independent commercial entities. These arrangements, however, confer a more limited degree of control to the state compared to the production and sale monopolies discussed earlier. Their impact on business responses to health taxes is mainly through the increased levels of concentration they produce in the relevant markets.

4.3. Supply-side responses to the introduction of tobacco taxes

Tobacco companies, as other oligopoly industries, use a number of strategies to respond to tax increases and other tobacco control efforts by governments and in the US smokers bear approximately 52% of cigarette excise taxes.²⁷

Evidence from countries with different level of income shows that, across the tobacco market as a whole, taxes are usually passed through to consumers and can be over-shifted in high-income countries.²⁸ Keeler et al.²⁹ estimated that a 1 cent increase in cigarette taxes would increase retail prices by 1.1 cents, on average, in the United States.

However, industries adopt differential *pricing strategies* and while taxes on low-price brands are not always fully passed onto consumers

(under-shifting), taxes on higher-price brands are over-shifted (i.e., consumer price increase more than the tax).^{4,28,30–32}

The tobacco market tends to be concentrated in the low-price and the mid-price segments.^{4,33} As the demand is less inelastic in this segment of the market, price is usually not increased after a tax increase, while it is over-shifted in higher price market segment where demand is less price sensitive. Manufacturers adopt this strategy to cross-subsidise low-price brands with excess profit earned from high-price brands. By attracting more price-sensitive smokers to buy cheaper products, they keep or even expand overall market, thus undermining the intended public health impact of the tax policy.

In South Africa, for example, there is evidence that taxes were over-shifted before 2010 but seem to have been under-shifted since then. The high margins created by the over-shifting before 2010 attracted new businesses to the market which competed largely on price. The presence of lower price cigarettes in the market in more recent years and the increased level of competition made it more difficult for industries to pass tax increases onto the consumers.³⁰

A study based on an extensive literature review and analysis of survey and commercial data in the United Kingdom found that industries over-shifted taxes by an average of more than 4.00 pence per annum on all brand segments, but price increases were higher for more expensive brands.⁴ More recent evidence from the United Kingdom shows that despite regular tax increases, prices for the cheapest tobacco products (like factory-made and roll-your-own) remained steady from 2013 while sales increased.³⁴

Conversely, data from China show that after the 2015 tax increase, the State Tobacco Monopoly Administration also raised cigarette prices on average by 11%, with the cheapest products increasing by 20% and the more expensive ones by less than 10%.²⁴

Sometimes tobacco companies can decide to under-shift tax increases as a temporary strategy to limit reduction in demand and retain price-sensitive consumers. For example, in Ukraine prices of cigarettes fell by 11% between

2007 and 2008 while excise taxes rose by 6% in the same period of time, while they rose by more than the tax after 2009.³⁵

When considering the prices effectively paid by consumers, after accounting for strategic consumer behaviours such as trading down (e.g. brand down-switching) or cross-border shopping, there is some evidence that light and occasional smokers end up facing slightly larger price increases following tax increases.³⁶

4.3.1. Impact of tax structures on prices

Simple tax structures like a uniform specific tax (*i.e.*, *monetary value per quantity*) reduce industries strategic behaviours compared to multi-tiers or ad valorem taxes (*set as a percentage of the value of the product, e.g. as a percentage of the price*)^{37–39} leading to higher tax pass-through.⁴⁰ Specific excise taxes are therefore more effective than ad valorem taxes in reducing price variability and the potential switching between products and thus at reducing overall consumption.⁵ On the other hand, ad valorem taxes can have little impact on prices if the tobacco industry lowers the ex-factory price as in the case of Vietnam.⁴¹

A study looking at all European countries has found that northern European countries apply mostly specific taxes, while southern European countries prefer ad valorem taxes favouring the production/selling of domestic products. The study shows that specific taxes always have a greater effect on prices than ad valorem taxes.³⁷

When differential tax increases are introduced (e.g. for premium versus economy brands) companies can apply pricing strategies to maintain their market share. For example, they can reduce the price of their products to avoid the tax increases, or, in the case of multi-product firms, they can use portfolio pricing strategies to optimise revenues by accounting for likely substitutions across products. The tobacco industry can also change the tobacco attributes (e.g. weight, length) or tobacco processes relabelling products to avoid tax.³⁵ Where multi-tiered tax based on price level is in

place, for example, in Egypt and Pakistan, prices of tobacco products tend to cluster near the top of each tier.³³

4.3.2. Introducing cheap products or lowering prices

Tobacco manufacturers have used a variety of price-related marketing strategies like multi-pack discounts, or couponing, to counter the effects of tax increases. Similar pricing strategies became widely used in the United States in the 1980s and 1990s in response to competitive pressures following a series of federal tax increases.²⁷ A large US tobacco manufacturer offered coupons to some of its most price-sensitive consumers (e.g. women, youth) allowing them to buy cigarettes at discounted prices just before an excise tax increase in 2009.³⁵ Evidence has shown that these practices have been successful in increasing tobacco use (e.g. Ref.⁴²).

In response to actual or foreseen tax increases, tobacco manufacturers have also introduced new low-price or ultra-low-price products in the relevant markets, or reduced pack size for some of their products to ensure the availability of cheap options to consumers. In the United Kingdom, ultra-low-price products were introduced in 2006 and their market share doubled in 3 years.⁴ In the United States, the market share of 'branded generics' — cigarettes combining value attributes with an association to a reputable brand — increased threefold after a tax increase in 1983²⁷ and branded generics came to dominate the discount cigarette market from the 1980s onwards.

4.4. Supply-side responses to the introduction of alcohol taxes

As in the case of tobacco, the alcohol market is highly concentrated. The oligopoly status, which is mainly within a specific sector, i.e., beer and spirits, allows industries more freedom to set their prices and avoid high tax burdens and allows them to spend considerably in marketing creating significant barriers to entry for new companies.⁴³

The alcohol market is more diverse and segmented than tobacco with different types of beverages (e.g. beers, spirits and wine) as well as different brands and consumption location (i.e. off premise versus on premise). Moreover, alcohol taxes account for a smaller proportion of the alcohol prices (7% on average in the United States) when compared with tobacco. However, this proportion varies substantially between location (from 3.65% to 10.2% in different US states) and across beverage types from 4.7% for scotch to 10.2% for whiskey.⁴⁴

Many studies show that alcohol taxes are more than fully passed-through to consumer prices.^{10,45,46} However, there is heterogeneity in tax pass-through across types of beverages, product size, packaging, brands, stores, size of tax change and border effects.¹⁰ Tax pass-through varies also across products based on their price and point of sale, with lower pass-through in the off-trade sector⁴⁴ and for cheaper alcoholic beverages.^{6,47,48}

A recent systematic review and meta-analysis of alcohol tax pass-through conclude that beer taxes are over-shifted and wine-spirits taxes are fully shifted, however, full-shifting of taxes cannot be rejected based on bias-corrected meta-regressions for any beverage and all alcohol.¹⁷ The study also found that the effect of tax changes on price occurs within a few months and can vary considerably at borders.^{16,17}

For beer, there is a strong border effect, with stores far from the border over-shifting taxes to consumer prices and stores closer to borders under-shifting them,^{13,16} while this is not the case for spirits.¹³

A modelling study using data for 27 OECD countries from 2003 to 2016 shows that taxes for wine, cognac and the liqueur 'Cointreau' are over-shifted being respectively 2.51, 1.71 and 1.14; while there is more variation in the degree of pass-through for other alcoholic beverages, including beer, gin and Scotch whisky.⁴⁸ In South Africa, the excise tax on beer is over-shifted to consumers. The pass-through coefficient is estimated at 4.83 (95% CI: 4.02; 5.64) for lager, and at 4.77 (95% CI: 4.04; 5.50) for all beer (which includes dark beer).¹⁰

The large differences in tax pass-through across different types of alcoholic beverages and brands reflect different demand elasticities for different products. There is evidence that pass-through is higher for higher priced products^{6,48,49} and higher income consumers.¹⁶ For example, evidence from the United Kingdom shows that alcohol retailers appear to respond to increases in alcohol tax by under-shifting their cheaper products and over-shifting their more expensive products for all types of alcoholic beverages. In the off-trade sector, the under-shift for the cheapest products is larger for beer (0.85) and spirits (0.86) and it is seen for the cheapest 5% of products for beer and for the cheapest 15% of products for spirits.⁶ In the on-trade sector, the under-shift is larger for wine and sparkling wine (respectively 0.55 and 0.75 at the lowest quintile) and the over-shift is evident only for the most expensive beverages in the top quintile.⁴⁹

In terms of sales volume, cheap alcohol represents the majority of the units in the market, 67% and 31% respectively for beer and spirits in the United Kingdom⁶ and it is vastly consumed by high-risk groups with low income. Therefore, the under-shift of the tax for these products is likely to produce smaller consumption reductions and implementing other policies like minimum price or restriction on price promotions may increase the effectiveness of the tax policy.

Evidence from the United States shows that the burden of beer taxation increases across the income distribution. Higher income consumers are more affected by increase in beer tax rates than lower income consumers. While the prices paid by low-income households do not change after the tax increase, the pass-through increases with income, from 0.125 for middle-income households to 0.265 for high-income households. The negative changes in prices paid by low-income consumers can sometimes be explained by drinkers downgrading to lower quality products.¹⁶

The level of pass-through may also vary according to the location of consumption, but the evidence is quite mixed. In Alaska, average pass-through rates were found to be around 2 for off-premises spirit sales and

close to 4 for on-premises sales while pass-through is around 2 for both on-premises and off-premises sales of beers.⁴⁵

Beer excise duties are under-shifted in Ireland (0.5 off-trade, 0 on-trade) and Finland (0.8 off-trade, 0.7 on-trade), and over-shifted in off-trade sales in Latvia (1.9) and Slovenia (2.5).²⁶ For spirits, excise duties are under-shifted in on-trade sales in Finland (0.8) and Ireland (0.1), but over-shifted in off-trade sales in Finland (1.4) and Latvia (1.3), while they are under-shifted in off-trade sales in Ireland (0.7) and Slovenia (0.7).²⁶

4.4.1. Impacts of tax structures on prices

Excise tax structure has an impact on alcohol tax pass-through and a combination of specific and ad valorem taxes has more predictive power for prices, than a single type of tax. Similarly to tobacco, a more complex tax structure is associated with greater price variability giving more opportunities to companies and consumers for tax avoidance. A recent study found that a mixed beer excise tax structure was associated with 38% greater beer price variability, whereas a mixed liquor excise tax structure was associated with 60–77% greater liquor price variability. However, wine excise tax structure was not significantly associated with price variability. This may be because the pricing strategy for wine is different from that of other alcoholic beverages; as the origin of the wine, instead of the quality, plays an important role in pricing.⁵⁰

Specific taxes applied to all alcohol products would make alcohol less affordable and would decrease the volume of alcoholic beverages consumed, but not necessarily reduce the volume of alcohol consumed (as consumers may switch to stronger alcohol products). On the other hand, a tax based on alcohol content would be more effective at reducing alcohol consumption. A dose-tax system can also incentivise producers to reformulate their products reducing the alcohol content and/or to increase the advertising from higher to lower alcohol products. For example in South Africa, beer

advertising has been moving towards lower alcohol beers coinciding with the increased incentive towards producing lower alcohol beer.¹

4.5. Supply-side responses to the introduction of food and non-alcoholic beverages taxes

The non-alcoholic beverages market is also highly concentrated. Usually, food and beverage manufacturers pass the full or near to full amount of taxes onto consumers^{19,21} or they increase the price by an even bigger amount.^{12,51–53}

For example, there is evidence of over-shifting for excise taxes on soft drinks in Denmark where the three largest grocery chains account for 85% of total sales^{13,14} and in Saudi Arabia where two companies account for 92% of the sales.⁵³ Similarly, the pass-through for the SSB tax implemented in Mexico in 2014 was between 0.96 and 1.20 for carbonated soft drinks (where two firms are responsible for 85% of the sales) compared to a value between 0.53 and 0.74 for non-carbonated soft drinks. The latter has a lower market share compared to soft drinks and higher price elasticity of demand which can explain the reduced level of pass-through of the tax.⁵⁴

In line with the theory presented previously, the pass-through is lower for products sold in larger containers^{8,12} as well as when the competition is higher and the margins are lower.²¹ For example, in smaller jurisdictions like in Berkeley, California, the estimated pass-through of the tax varied by products and was on average between 43.1% and 47% across all SSBs, brands and sizes.^{18,55} The pass-through increased by between 25.8% (for cases of cans) and 33.3% (for 2-liter bottles) for each mile of distance from the closest rival store selling untaxed SSBs.¹⁸ The SSB tax implemented in Seattle provides another example of a tax applied in a small jurisdiction. After the first year of implementation, the pass-through rate was 59% ranging from 55% for family-size products to 66% for individual-size products.¹¹

Non-alcoholic beverages can be considered highly differentiated products (i.e., differentiating from each other in terms of taste and quality)

and multi-product firms use portfolio pricing strategies to optimise revenues by accounting for likely substitutions across products.^{56,57}

A post hoc study after the introduction of the French soda tax in January 2012, estimated that consumer prices increased gradually. Six months after its introduction, the tax was fully shifted to soda prices (representing the vast majority — 75% — of the total supermarket sales of non-alcoholic beverages) while about 94% and 62% of the tax was passed through to consumers for fruit drinks and flavoured waters, respectively, but with a high degree of heterogeneity across retailers and brands. Taxes on private labels and small producers' brands were generally over-shifted while they were under-shifted for large producers' brands.⁷ Private label products generally have lower prices and combining this with the higher pass-through, suggest that the low-income households might be impacted the most by the soda tax in France.⁷

These results (not over-shifting) can be explained by the elasticity of demand for non-alcoholic beverages which is estimated to be significantly larger than 1 (see Chapter 3 for more evidence on price elasticity of demand). Products with the larger price elasticity and easier to substitute (i.e., water), have the lowest level of pass-through. While it is more difficult to substitute fruit drinks as pure fruit juices are significantly more expensive than taxed fruit drinks and no real substitute exists for sodas.

The rate of pass-through can also vary across different types of retailers. In France, there are two main retailing groups and there is fierce price competition between them based on low price, which can explain the low pass-through rate in big retailers versus smaller ones.⁷

Differences in tax pass-through across different types of retailers have also been shown after the introduction of a fat tax in Denmark⁵⁸ and the pass-through of SSB taxes was higher for products sold in stores than those sold in restaurants in Boulder, Colorado.⁵⁹

There is not much evidence available on the changes in **marketing strategies** after the introduction or increase of SSB taxes, but it is likely that firms use advertising strategies or increase the frequency of sale prices (coupons, discounts) in order to increase consumption or keep it at the

same level after changes in prices as shown in the case of alcohol taxes.¹ One example from Mexico shows that after the implementation of the soda tax, industries responded with aggressive in-store promotions and marketing.⁵⁴

4.5.1. Impact of tax structures on prices

Taxes on food and non-alcoholic beverages can be structured as either specific, volume-based taxes (e.g. per litre), or content-based taxes (e.g. per gram of sugar) or value-based taxes (i.e. as a % of the price). The level of pass-through varies based on the size and structure of the tax and some tax designs can also incentivise product reformulation.

Ad valorem taxes may incentivise consumers to switch to cheaper alternatives (brand down-switching) as in the case of the Barbados SSB tax. Evidence shows that the Mexico SSB tax (specific) was more fully passed on to price than the Barbados tax (ad valorem).⁶⁰

In France, a modelling study preceding the implementation of the soda tax, predicted an over-shift of 7% to 33% for a specific duty on soft drinks, while an equivalent ad valorem tax would be under-shifted by 10–40%.⁵⁷ The same was shown for a possible tax on saturated fat in the United Kingdom, leading to the conclusion that a specific rate excise tax would reduce saturated fat purchases more, and generate more substitution, than an ad valorem tax.⁵⁶

Specific taxes based on the ingredients rather than whole products incentivise producers to reformulate their products to reduce the concentration of the taxed ingredient. Therefore, the overall impact of ingredient-specific taxes, like sugar-based taxes, is more difficult to predict, as firms simultaneously must decide how to change the product content as well as pricing. The level of tax pass-through may incentivise consumers to shift to lower sugar products, but sugar intake reductions may also occur regardless of consumers changing their beverage intake if industries reformulate their products.

As recommended by WHO, several countries have introduced SSB taxes based on their sugar content.⁶¹

Recently implemented taxes in the United Kingdom and in the Republic of Ireland are two-tier taxes, with a lower tax for less caloric beverages and a higher rate for more caloric ones. This design incentivises consumers to substitute less caloric drinks for more caloric ones and incentivises manufacturers to decrease the calorie content of their beverages to move to a lower tax band as explained in the case study associated to this chapter.

Another example of products reformulation after the implementation of a health tax comes from Hungary. In 2011, Hungary introduced the public health product tax — a tax levied on food products containing unhealthy levels of sugar, salt and other ingredients. This led many manufacturers to reduce or eliminate those ingredients in their products and consumers to switch to healthier substitutes. After one year from the implementation, approximately 40% of food manufacturers changed their product formulas to either reduce or eliminate the taxed ingredients (28% and 12%, respectively).⁶²

South Africa also implemented an SSB tax based on sugar content at a rate of around 0.15 US cents for each gram of sugar over an initial threshold of 4 g/100 mL. While the sugar content remained unchanged for prominent brands and was accompanied by less than full pass-through, other industries responded to the tax increase by reformulating their products as well as increasing their price.⁸

4.6. Conclusion

In this chapter, we have presented theoretical arguments and empirical evidence to illustrate the types of responses that businesses most directly affected by health taxes can be expected to deploy. Those responses are of great importance for fiscal and health policymakers in the planning and management of new and existing taxes. Business responses have the potential to augment or hinder the effect of taxes on the consumption of taxed products, and ultimately on health, while they have a more limited influence on tax revenues.

A key dimension of business responses to health taxes is the degree to which taxes are transferred onto the prices faced by consumers or tax pass-through. If pass-through is limited or null, consumer behaviours are unlikely to be swayed by the tax. If, on the other hand, pass-through is high, full or even greater than one (price increase larger than the tax) consumers are likely to respond to the tax by reducing their consumption of the taxed products, even when their price sensitivity (elasticity) is low.

The evidence presented in this chapter shows that key drivers of pass-through include strategic behaviours of manufacturers and retailers (production and marketing strategies, particularly for multi-product firms), market structure (especially the degree of concentration of a market) and relative supply and demand elasticities.^{52,57} However, we have also emphasised that the systematic application of health taxes on specific products causes the markets for those products to adapt and evolve in directions that are not neutral to the health impact of taxes.

Some of the market characteristics that are conducive to high pass-through rates, namely a price-inelastic demand and high levels of market concentration, are common in the markets typically targeted by health taxes. In this chapter, we discuss how applying health taxes pushes those markets towards even higher levels of concentration and often towards product differentiation. The latter is a strategy that serves several purposes. It is a way for firms to segment a market, expand their customer base but also sometimes increase their market power in specific segments. When this happens, firms can be expected to behave as if they were operating in a concentrated market, passing taxes through to consumers to a large extent. Product differentiation also allows firms to avoid losing customers who engage in product substitutions because of price increases, by offering substitutes to taxed products in addition to the taxed products themselves. This too goes in the direction of increasing tax pass-through. However, firms that have a differentiated portfolio of products have the option of redistributing price increases across a range of products, taxed and not taxed, if this proves to be the best way to optimise their profit margins.^{56,57} A similar

behaviour may make the tax less effective in reducing the consumption of the taxed products. To prevent the adverse consequences of such portfolio pricing strategies on the effectiveness of health taxes, governments need to carefully consider the nature of the firms that operate in the relevant markets, and they need to set the tax base (range of products subject to the tax) to include, if possible, products that those firms might use in a strategic pricing response.

Strategic firm behaviours may also be driven by features of tax design and by the type of jurisdiction to which they apply. In this chapter, we have discussed, for instance, how specific and ad valorem excise taxes create different incentives for tax pass-through, and how a tiered rate structure may lead to changes in product characteristics,⁴⁰ including product reformulation, also discussed in a special focus associated with this chapter. Taxes applied in small jurisdictions, where they can more easily be avoided by consumers, lead to competitive pressures to keep prices low and to reduced levels of tax pass-through. These considerations underscore the importance of a careful tax design (discussed in detail in Chapter 8), as well as wider control over marketing strategies (advertising and promotions), and potentially price regulation measures in addition to health taxes, to maximise the health benefits of taxes. An appropriate tax design has the potential to prevent, or counter the effects of, most unwarranted firm responses to health taxes. However, fiscal policymakers need to avoid designs that would unduly increase the complexity of tax administration and enforcement.

Governments cannot be expected to comprehensively predict responses by business players at the tax design stage. But it is of paramount importance that governments are aware of the range of possible responses and monitor closely the impacts of taxes as well as the characteristics of the markets in which they are applied. Regularly adjusting the design of health taxes is important to ensure their effectiveness is not hindered by changes in market structure and strategic responses.

Key messages

- Strategic behaviour of industry affects how health taxes are passed on to consumers. Depending on how the tax is designed, the impact can either hinder or promote health (e.g. through changes in product formulation and marketing).
 - Health taxes are usually passed on to consumers in three fundamental ways: (a) full pass-through where the tax hike translates into an equivalent price increase; (b) undershifted where the price increase is less than the tax increase and (c) overshifted where the price increase is more than the tax increase.
 - The degree of pass-through depends on the industry structure. The degree of pass-through is higher in more concentrated markets and for products with a very price-inelastic demand. Pass-through is reduced when more opportunities exist for tax avoidance.
 - Multi-product firms operating in dominant market positions as well as larger retailers are likely to favour high pass-through rates even in the presence of a less inelastic demand as they can offer substitute products to consumers.
 - Features of tax design can have a major influence on industry responses, including tax pass-through. A thorough understanding and clear foresight of possible responses are necessary for the design of effective health taxes.
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