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Excise Taxation for Domestic Resource Mobilization

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Excise Taxation for Domestic Resource Mobilization

Abstract

Most governments will have to raise additional resources to deal with the aftermath of the corona crisis. This paper argues that excise duties on drinking, smoking, gambling, sugar-sweetened beverages, plastics, fossil fuels, motoring, telecoms and platforms are the preferred instruments. In nearly all cases, excise duties improve the efficient allocation of resources, while reliance on them is consistent with an equitable tax system. Also, excise duties can be administered more easily than income and value added taxes. Current excise duties are way below efficient levels. It should be possible to triple their yield, especially in developing countries.

JEL-Codes: H210, H230, H250.

Keywords: excise duties, resource mobilization, smoking, drinking, gambling, sugar-sweetened beverages, plastics, fossil fuels, motoring, telecoms, platforms, luxury consumption.

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1 Introduction and Findings

The corona crisis leaves high budget deficits and national debts in its track. More tax revenue is urgently needed, particularly in developing countries. In many Sub-Saharan countries, for instance, the total tax intake is not much more than 15 percent of Gross Domestic Product (GDP) – barely sufficient to finance essential government functions, basic education and healthcare, and to service the national debt – with next to nothing to spare for poverty relief and essential infrastructure. Among a range of options, excise duties may be the preferred tax instrument to augment government revenues. They can be collected at low administrative and compliance costs, designed to promote economic efficiency and to enhance the progressivity of the tax system. Excise duties also tend to meet with a higher degree of public acceptance than most other taxes. Unlike broad-based income and consumption taxes, increases in excise duties need not delay economic recovery.

This paper surveys the excise duty field, explores the rationale of the various duties and examines the scope for increasing tax collections. In doing so, it adopts a broad definition of excise duties as all taxes, related levies and charges on selective goods, services and activities, which serve a distinct purpose in enhancing social and market outcomes. Accordingly, excise duties may be said to comprise the following four main tax categories:¹

Traditional ‘bads’

- tobacco products
- alcoholic beverages
- games of chance

New ‘bads’

- sugar-sweetened beverages (SSBs)
- plastics

Climate control and transportation

- fossil fuels
- roads, water and airways

Income-elastic goods and services

- luxury products
- telecoms and platforms

The analysis yields the following conclusions for an optimal excise duty policy, that is, a policy that raises more revenue at the lowest possible economic and social costs, considering external

¹ Generally, this enumeration follows the terminology of the Organization for Economic Co-operation and Development (OECD 2019), by defining excise duties as all selective taxes on the production, sale, transfer, leasing and delivery of goods and the rendering of services (item 5120 in the OECD classification), as well as all selective taxes on the use of goods, or on the permission to use goods or perform activities (item 5200), other than general taxes on goods and services (item 5110). By this definition, import and export duties can also be considered excise-type levies, but they are not dealt with in this paper.

and internal effects, and heeding society's income redistribution goals. The estimates take account of the administrative constraints faced by developing countries.

- Higher excises on fossil fuels (or, equivalently, emission permits sold at auction) could yield an additional 2.5% of GDP of tax revenue. Coal, petroleum products and electricity are by far the most important excisable products in terms of yield, economic efficiency and feasibility.
- Higher or new taxes on traditional and new 'bads,' that is, tobacco products, alcoholic beverages, games of chance, SSBs and plastics, could yield an extra 2.1% of GDP of revenue, based on a sample of 16 developing countries.
- A well-designed system of road, water and airway user charges could contribute an additional 1-2% of GDP to the fisc.
- Excise duties (or higher-than-standard VAT rates) on luxury products are not recommended as the effect on revenue and the progressivity of the tax system would be too small to make the administrative effort worthwhile. Separate taxes on cars, yachts and private airplanes are exceptions to this dictum. So are telecommunication services and digital platforms, although their tax position should also be the subject of income and value-added taxation.

If the excise duties are to meet the revenue, efficiency and equity targets mentioned above, it is advisable to heed the following aspects in designing and administering the duties:

- gradually raise excise duties to efficient levels, which are not necessarily revenue-maximizing levels;
- focus on accounting for the internalization of externalities and internalities, not on reducing consumption (although a welcome side-effect) or effects on the income distribution (to be taken care of elsewhere in the tax-and-expenditure system);
- include positive internal effects in evaluating the (regressive) burden distribution of excise duties – not just who pays the tax;
- subject tax substitutes of potentially harmful products, such as the energy produced by windmills and solar panels, paper bags, e-cigarettes, lotteries, pure-fruit drinks, and artificial sweeteners, to excise duty only if they cause demonstrable external and internal costs;
- include imports in the domestic excise duty base and apply the value-added tax (VAT) to the import-and-excise duty inclusive price of excisable products;
- tax physical quantities, not prices, of products that cause external and internal costs, as they are directly related to social and individual damage;
- correct the specific rate automatically for increases in the general price level;
- apply physical controls as much as possible to ascertain the excise duty liability and to ensure compliance with excise duty obligations;
- address difficulties in dealing with illicit and small-scale production, and smuggling;
- make regulations on registration, production, sale, availability, information provision, etc., an essential complementary part of a focused excise duty policy.

Section 2 presents the case for the greater use of excise duties on the grounds that they are more feasible, efficient, equitable and acceptable than most other taxes. Next, Section 3 dwells on issues in excise duty design and administration: the choice of duty rate, the need for complementary regulations and coordination, the issue of earmarking excise duty proceeds, and the basics of excise administration. Following, Sections 4 through 7 review each of the excisable goods and services listed above, distinguishing traditional bads, new bads, climate control and transportation, and luxuries, respectively. Section 8 concludes.

2 The Case for Excise Taxation

Excise duties, long the stepchildren of tax policy, have recently come to the fore as highly revenue-efficient tax instruments, easy to collect, economically justifiable, and socially desirable.²

2.1 Excise duties are easy to collect

Most excise duties can be collected at lower administrative and compliance costs than nearly any other tax. Studies indicate that, for the same amount of revenue, the cost of collecting excises is merely a quarter of the costs of doing so by way of the VAT. Excise duties on tobacco, alcohol, SSBs, motor fuel, motor vehicles, and fossil fuels are good potential sources of revenue because the products are easy to identify, the volume of sales is high, and the fact that there tend to be few producers simplifies collection. Also, there are few substitutes that consumers and users would find equally satisfactory, so that consumption, and by extension revenue, remains high despite excise-induced price rises. In short, quoting the IMF (2011): “excises can be among the simplest taxes to implement...”

Despite these ‘easy-to-collect’ characteristics, excise tax receipts merely account for some 10% of total tax revenue or 1½-2% of GDP in most developing countries,³ suggesting that their revenue potential tends to be underutilized. That this is so is shown in a recent paper by Davis, et al. (2019) who ask themselves: “For 16 LMIC [lower- and middle-income countries], what amount of additional government revenue could have been generated in 2016 if higher excise tax rates had been imposed on tobacco, alcohol, and SSBs?” The ‘pragmatic-scenario’ simulations of the authors indicate that raising prices through excise duties by 50%, assuming full pass through, and illustratively hypothesizing that excise tax administrations are only effective at collecting one-third of the taxes due, could generate *additional* revenues

² This and the following section draw on Cnossen (2010), which provides a more elaborate review of the issues. For more on the rationale, design and administration of various excise duties, see also the contributions in Cnossen (2005) and (2006a).

³ See IMF (online). It should be noted that excise duty receipts seem to have declined in recent decades. However, much of this decline should be attributed to the (correct) imposition of VAT on excise-inclusive product prices, whereas the turnover and other sales taxes levied previously generally were not imposed on excisable products. Accordingly, upon introduction of the VAT, excise duties were lowered to maintain the same total tax burden; hence, collections declined statistically.

amounting to 2.8% of GDP in Côte d'Ivoire, 1.5% in Rwanda, and 1.4% in Tanzania.⁴ Note that these estimates do not include any additional tax revenue from increasing excise duties on fossil fuels and road use, which would likely be greater than the extra collections from the three bads (tobacco, alcohol, SSB's) examined by Davis, et al. (2019).

When increasing revenue through higher excise duties, the focus should be on efficient rates not on revenue maximizing tax rates (RMTR), which are raised to the point at which the additional revenue from the higher rate of duty on the excisable unit is exactly offset by the tax revenue lost on the reduction in consumption caused by the higher rate. Generally, the efficient rate will be lower than the RMTR.⁵

2.2 cause few economic distortions

In addition to feasibility arguments, the taxation of specified goods and services also has a strong economic rationale. The absence of close substitutes for addictive or indispensable products, such as tobacco, alcohol and energy, implies that the demand for them is inelastic. In turn, this means that the potential for distorting economic decisions by the imposition of excise duties is relatively small. In economic jargon, the non-distortionary income effect outweighs the distortionary substitution effect. More generally, Ramsey (1927) has shown that, under very restrictive conditions, the optimal tax rate on each good is proportional to the inverse of the price elasticity of demand for that good. The intuition is that the least distortionary tax system hits harder those goods for which demand is invariant to its own price. This minimizes the economic cost, referred to as excess burden or deadweight loss, of product taxation.

Another efficiency aspect that favors excise taxation is the hypothesis by Corlett and Hague (1953) that if leisure as opposed to paid work is not taxed, the solution to this market failure lies in taxing goods and services that are complementary to leisure at a relatively high rate (or, conversely, taxing goods and services that are complementary to paid work at a relatively low rate). Products found to be complementary with leisure (in the sense of time not in paid work) and hence candidates for excise duties include domestic fuel, tobacco, and public transport (Crawford, et al., 2010). On balance, this argument is not as strong as the previous one. Generally, product demands in terms of hours worked are small, and there are evident practical costs of implementing differential excise duties to tax leisure indirectly.

2.3 correct for market failure

A very strong argument in favor of excise duties is that they can serve as proxies for the costs that users or consumers of the excisable products impose on society – costs that are not reflected in price. Without an appropriate excise duty, the price of gasoline would not take

⁴ Other countries included in the analysis (and the extra revenue as % of GDP) are: Congo DR (0.8%), Ethiopia (0.8%), Haiti (7.7%), India (1.2%), Lao PDR (3.1%), Moldova (3.8%), Myanmar (2.9%), Niger (0.9%), Papua New Guinea (2.1%), Senegal (0.3%), Sierra Leone (2.0%), Tajikistan (1.8%), and Togo (0.7%).

⁵ For useful discussions of these rates, see Bird and Wallace (2006) on alcohol taxation and Smith (2006b) on road transport taxes. Smith points out that the calculation of the RMTR is still useful to ensure that the excise duty has not been raised to counter-productive levels.

account of the fact that burning it raises global temperatures from which all people suffer. The effect on the utility or production possibilities of some other consumer or producer is called a negative externality. It implies that the marginal cost of an individual consumer or producer's action is less than the marginal cost of his or her action to society and, as a result, the individual engages in more of the activity than is socially optimal. Charging consumers or producers for external costs, which should induce them to reduce their activities to the socially optimal level, is known as the Pigouvian prescription (Pigou 1920).⁶

The literature is replete with examples of smokers, drinkers, gamblers, sweet addicts, polluters and drivers who impose financial, physical and psychological costs on others without being charged for them directly or indirectly (e.g. through higher insurance premiums). Marginal costs are often difficult to identify and measure, however, because they depend on who does what, where, and under what circumstances. In practice, therefore, average external costs are estimated and a 'pooling' approach (akin to insurance) is adopted in charging for these costs. Perpetrators as a group meet the costs by paying a uniform excise calculated as the total external costs divided by, say, the number of packs of cigarettes smoked, drinks consumed, or liters of fuel used.

This average-cost approach seems acceptable if damage – for example, through smoking or fossil fuel burning – is approximately proportional to cost. But measurement problems arise if there are threshold levels of consumption below which adverse effects are absent or attenuated – one or two glasses of wine per day may be good for you, or occasionally buying a lottery ticket does not deprive your family of the means to buy groceries. In these situations, ideally, Pigouvian taxes should be non-linear in the level of consumption; hence they are exceedingly complex to design. Nevertheless, as argued by Pogue and Sgontz (1989), even uniform taxation may still improve overall welfare if the reduction in external costs, caused by heavy drinkers in their example, is greater than the loss in consumer welfare of moderate drinkers.

2.4as well as individual failure

Information failures are other instances that justify government intervention, even in the absence of explicit external costs. If the young are not fully cognizant of the detrimental health effects of smoking, drinking or consuming soft drinks, then the excise could be used to raise the price of tobacco, alcohol and SSBs for them and thus reduce their consumption. Apparently, this approach can be successful since research has indicated that the price elasticity of demand for cigarettes, alcoholic beverages and soft drinks among the young is, on average, twice the price elasticity among adults (see, e.g. Chaloupka and Powel, 2018).⁷

⁶ Sandmo (1976) has shown that Ramsey and Pigouvian taxes can be applied sequentially: the least distortionary tax is levied on each good according to the Ramsey rule and then additional Pigouvian taxes are imposed on those goods which generate negative externalities. In many instances, goods eligible for Ramsey and Pigouvian optimal taxes are the same. There is a presumption, therefore, that the level of taxation on these goods should be rather high.

⁷ As another example, using repeat cross sections for the period from 1991 through 2005, Carpenter and Cook (2008) report that the large tobacco tax increases in US states during those years could be associated with significant reductions in smoking participation by youths.

Alternatively, or additionally, other instruments could be applied, for example better dissemination of information on the health hazards of smoking and drinking, coupled perhaps with legislation restricting the supply or place of consumption.

Until recently, it was widely agreed among economists that the irrationality of the young (information failures) and externalities should be the only reasons for government intervention. Beyond this government intervention should be rejected as a form of paternalism. After all, the principle of consumer sovereignty implies that a rational person who weighs up all the costs and benefits of his or her actions should be free to smoke, drink, gamble, pollute and drive as long as he or she is fully informed about the consequences of his or her choice and does not impose costs on other people. The classic reference is to the Becker-Murphy (1988) ‘rational addiction’ model.

At the start of this century, however, the assumptions of the rational addiction model have been questioned by Gruber and Köszegi (2001, 2008), among others. The authors argue that many people are not aware or not sufficiently aware of the consequences of their behavior, or are simply myopic and tend to discount the short-term costs and benefits of their actions at a higher rate than the long-term effects.⁸ ‘I’ll smoke less next year,’ they say, ‘but not yet,’ with the ‘next year’ remaining the next year. Self-control is a scarce commodity. Therefore, in addition to external costs (damage to third parties), there are ‘internal costs’ (damage to oneself in the form of, for instance, reduced health or a shorter life span) insofar people have not rationally traded the costs of that damage for the value of the enjoyment of a cigar, drink, bet, cookie, drive, or whatever else gives rise to internal effects.⁹

2.5and enhance progressivity

A problem with excisable products, especially if they are addictive, is that the demand for them is generally relatively inelastic. As a result, people on lower incomes with the same quantitative level of consumption as people on higher incomes will pay more tax as a percentage of income than those on higher incomes. In other words, the burden distribution appears regressive with respect to income. On these grounds, politicians often object to the introduction or increase of excise duties. In recent literature, however, it has been pointed out that people on lower incomes will benefit relatively more from an internal-cost internalizing excise duty (in the sense of better health, for example) if they consume relatively more than

⁸ The rejection of the a priori assumption of 100 percent rationality has received support in the economics literature. O’Donoghue and Rabin (2003), for instance, counsel that economists should be more realistic about the nature of errors people make:

The possibilities that 15-year olds err in becoming tobacco addicts or that 25-year-olds err in borrowing heavily on their credit cards or that 35-years olds err in too wildly playing the stock market with their retirement savings all strike us as profoundly plausible and of great policy relevance.

⁹ There is no consensus in the literature as to whether policy makers should or should not respect the short-term and long-term preferences of consumers in order not to fall into paternalistic interventions (Bernheim and Taubinsky, 2018).

higher-income groups and the price elasticity of demand is higher for them.¹⁰ This appears to be the case for many products subject to excise duty. In this sense, then, the impact of excise duties that restrain consumption of harmful products by people on lower incomes are progressive.

In addition to the ‘progressivity’ argument, there is the traditional case for using excise duties to tax luxury goods and services, whose income elasticity of demand exceeds unity, differentially higher than other goods and services. Many developing countries do so, although, as argued below, the case for the extensive use of excise duties to enhance progressivity in taxation may not be worth the cost of the administrative effort.

3 Excise Duty Design and Administration

Excise duties can be imposed at specific rates (based on some physical characteristic of the excisable product) or ad valorem rates (based on its value). Specific and ad valorem rates differ in effect, depending on the market situation, revenue requirements and non-revenue objectives. Non-revenue objectives can also be achieved through regulations, which can often be targeted more precisely than excise duties. Other issues that arise when imposing excise duties are the earmarking of the proceeds of excise duties and trade discrimination.

3.1 Specific rate superior to ad valorem rate

Under imperfectly competitive competition – the most common market form for excisable products – the choice between specific and ad valorem taxation depends on whether the primary aim of excise duty policy is to discourage consumption or to raise revenue, and on whether improvements in product quality are deemed desirable or not (Cnossen and Smart, 2005). By taxing marginal revenue, an ad valorem tax, t_a , increases the firm’s perceived demand elasticity by the multiplier $1/(1-t_a)$ and so diminishes incentives for the firm to raise price above marginal cost. Thus, one might expect consumer prices to be lower under ad valorem than under specific taxation. An additional consideration is that the pass-through of tax increases to consumer prices should be greater under specific than under ad valorem taxation (Delipalla and Keen 1992).

Just as ad valorem taxation seems to induce firms to cut prices, it also creates a clear incentive to downgrade product quality (Barzel 1976), because the multiplier effect of ad valorem taxation makes improvements in product quality more expensive for the firm. The cost of catalytic converters, for example, which purify the car’s exhaust from harmful substances, is subject to the multiplier effect of an ad valorem tax on car purchases. This is a clear drawback of ad valorem taxation if harmful exhausts are to be reduced. Likewise, ad valorem taxation reduces incentives to invest in advertising, promotion, and other demand-enhancing fixed

¹⁰ Note that the principle of optimal taxation (Atkinson and Stiglitz, 1976) prescribes that if differences in consumption can be attributed to causal income differences, goods should not be taxed or subsidized for redistribution purposes. We have the income tax for that. However, if differences in consumption can be attributed to differences in preference between different income levels, then those differences are a ‘tab’ that can be useful for redistribution purposes.

costs of production. In contrast, specific taxation does not directly distort manufacturers' decisions to invest in product quality.

The Pigouvian perspective supports the case for specific taxation. The damage caused by (over) consuming an excisable product is, at any point in time, independent of the price at which the product is sold, so that correction of externalities favors specific over ad valorem taxation. Furthermore, other, more immediate, considerations might govern the choice of tax structure. Thus, a specific tax can be imposed at the manufacturer's or importer's stage where it is easiest to collect, whereas, under a system of free trade prices, an ad valorem levy must be collected at the retail stage if trade distortions and tax avoidance are to be avoided. In short, specific taxation – by reference to the weight, number, volume, strength, or whatever product characteristic is causing the damage – appears to have the edge over ad valorem taxation. It should be emphasized, however, that specific rates have to be adjusted periodically for changes in the general price level, preferably automatically, if the real value of excise duty collections is to be maintained.

3.2 Coordination and correct application are important

In international trade, excise duties follow the destination principle, that is, exports are freed of tax and imports are taxed on par with domestically produced commodities. Exceptionally, taxes on environmentally harmful emissions by production units should be levied on an origin basis (that is, in the country where the emissions take place) although this may harm the competitive position of domestic energy-intensive industries if their foreign counterparts do not face the same levy. Accordingly, this situation requires international coordination.

While origin-based taxes can harm a country's competitive position, destination-based excise duties can discriminate by origin. Discrimination by origin occurs when a country levies an excise on a product, which is mainly imported, at a higher rate than the excise on a similar domestically produced product. An example from the EU (Cnossen 2007) is the high excise on grain-based spirits (gin, whisky) which France used to levy while grape-based spirits (cognac, calvados) were subject to a lower duty. Not surprisingly, the European Court of Justice ruled that the excise duty on spirits had to be based on alcoholic strength. More subtly, again in the EU, expensive imported tobaccos are discriminated against in southern Member States, which levy high ad valorem excise duties on cigarettes produced from their own, cheap home-grown tobaccos (Cnossen & Smart 2005).

In the context of international trade, therefore, excise duties should be coordinated with other countries, whether tacitly or deliberately. Within countries, however, excise duties should also be coordinated with import duties and VATs. The function of import duties is to protect domestic industry, while excises are imposed to account for external and internal costs. By contrast, the VAT's function is to raise revenue. Logically, in terms of coordination, the protective import duty should be imposed first on the c.i.f.-value of imports. This puts imports competitively on par with similar domestically produced goods if these need to be protected. Subsequently, to ensure equal treatment, externality- and internality correcting excises, assumed to be specific, should be levied at the same rate on imports and similar domestically produced goods. Finally, the VAT should be imposed on the import- and excise-duty

inclusive value of goods to put these goods on par with other goods not subject to import and excise duties. This prescription assumes, of course, that the protective import duty and the corrective excise reflect correctly determined external costs and as such should be subject to the VAT.

3.3 Regulations are indispensable complements

Excise duties, whether specific or ad valorem, are not the only and often not the best instrument to influence the behavior of smokers, drinkers, gamblers, sweet addicts, polluters and drivers. Depending on circumstances, regulations are an appropriate alternative. A tobacco tax cannot deal in a cost-effective way with the effects of passive smoking; (inflexible) bans on smoking in public places are necessary to deal with this externality. Similarly, the alcohol excise is an inadequate instrument to restrain people from getting behind the wheel of their car after they have had a drink. Drink-driving breath tests are better targeted to deal with this situation. Yet other examples are the regulation of the age at which people are allowed to gamble, the circumstances under which the discharge of pollutants is permitted, or the prohibition of soft drink vending machines in schools. These examples imply that there is an important role for regulations alongside taxes in alleviating externalities (Christiansen and Smith, 2009).

3.4 Generally, earmarking is not advisable

It is often asserted that excise revenues should be earmarked to finance health expenditure, projects that stimulate the production and consumption of clean energy or repair the degradation of the environment, or to pay for the building and maintenance of the road transport system. Earmarking is suspect in the case of the tobacco, alcohol or sugar excise duty. It would be difficult to isolate health expenditures on tobacco-, alcohol- and obesity-related diseases, and finance them by excise duties, because moderate smokers, drinkers, and sugar consumers would be asked to pay for the health and other social costs attributable to abusive consumers.¹¹

The case is stronger for earmarking the proceeds from taxes on road transport for infrastructure purposes, as argued by Gwilliam and Shalizi (1999). In various countries the tie between road taxes, particularly fuel duties, and road spending has served a valuable political purpose, allowing road users to see a connection between their taxes and the benefits of the road system. It should also be kept in mind that the cost of maintaining the original condition of the road system through regular maintenance – an important feature of a road fund's program – is only one-third to one-fifth of the cost of restoring the road in its original condition (Harral and Faiz, 1988). Moreover, the savings in vehicle operating costs of well-maintained roads are two to three times the road maintenance costs (Heggie, 1995).

In short, there are good arguments that may tip the balance in favor of earmarking fuel duties for a road fund. Although overall fiscal control and allocational efficiency may suffer somewhat, operational efficiency might improve because with a stable source of revenue road infrastructure management can make better use of more-efficient private sector contracting

¹¹ For a detailed analysis of various forms of earmarking and their pros and cons, see Bird and Jun (2007).

arrangements for road maintenance. Nevertheless, a lock-in effect remains because past arrangements weigh heavily on current realities, which may indicate that it would be better to shift resources to alternative modes of transportation, such as public transport. Therefore, the case for earmarking, even if the benefit rationale is quite strong, remains tenuous at best.

3.5 Physical controls are more feasible than accounting checks

Last but not least, it should be emphasized that excise-duty compliance control tends to be simpler and more straightforward than the administration of a VAT or a business income tax. Excise officials are akin to customs staff, who inspect goods, classify them, determine the characteristic on which the duty is imposed, or appraise their value for tax purposes. Under excise taxation, compliance control is often ensured through physical controls, such as metering devices or bar codes. Further, excise staff may be stationed in large production units to ensure that no goods leave or enter the premises without their consent. Generally, taxpayer cooperation for assessment purposes is not needed and there are almost no collection arrears.

In short, excise duties emerge as an especially certain form of taxation. There is little room for arbitrary decisions and interpretations by the tax authorities as the base is very obvious.¹² In this respect, excises pose a sharp contrast with VATs and business income taxes whose bases are open to various interpretations and which rely on accounting controls for assessment and enforcement purposes. Auditing financial accounts is much more difficult and requires more sophisticated skills, hard to come by in developing countries, than ascertaining physical quantities of excisable goods.

4 Traditional ‘bads:’ smoking, drinking, gambling

Excise duties on smoking, drinking and gambling are often called ‘sin’ taxes because they purport to punish the consumer of tobacco, alcohol and gambling services for his transgressions.¹³ Although the author does not share the connotation, it does indicate that it is abusive consumption that leads to individual and social harm.¹⁴ Against this background, this section discusses the various excise duties on these goods and services with a view to raising their yield (see also Savedoff and Lopert, 2020).

4.1 Tobacco products

The World Health Organization (WHO, 2019, 2020) considers smoking a deadly disease, which ranks among the five leading health risk factors. Worldwide, tobacco kills more than 8 million people each year, of which one in six from being exposed to second-hand smoke. Four out of five smokers live in low- and middle-income countries. Cigarette smoking is the most common form of tobacco use, but other tobacco products are also harmful, including

¹² For more on registration and licensing, supervision and measurement of production, definitions and classifications, exemptions and rate concession, see Cnossen (2006c).

¹³ For a useful review of the issues in taxing smoking and drinking, see Bird (2015).

¹⁴ For a detailed review of the health costs of the consumption of tobacco, alcohol and SSBs, see Chaloupka and Powell. (2018).

waterpipe tobacco, various smokeless tobacco products, cigars, cigarillos, roll-your-own tobacco, pipe tobacco, bidis and kreteks.

Smoking is the primary cause of lung cancer, emphysema, and chronic bronchitis, and a major cause of heart disease and stroke; it is also associated with other diseases and other forms of cancer. Smoking by pregnant women in particular is known to lead to low-birth-weight babies, neonatal death, and sudden infant death syndrome (Chaloupka and Warner, 2000). Smoking therefore gives rise to a number of economic costs, related primarily to the expense of treating smoking-related illnesses, as well as the well-being and market earnings that are lost as a consequence of smoking-related illnesses and death.¹⁵

Smokers usually have shorter lives than non-smokers, which saves on pension and social benefits and healthcare costs for old-age ailments. Warner et al. (1995) point out that these savings must be deducted from the costs caused by smokers. From an economic perspective, it is therefore the net costs that are important. Based on this reasoning, Tiihonen et al. (2012) conclude that the life-cycle costs of Finnish smokers are lower than those of non-smokers. Smokers live 8.6 years fewer than non-smokers and they miss 7.3 years in retirement. However, if a value would be attributed to the loss of life years, then not smoking would yield a benefit of 70,000 euros per individual. A similar reasoning applies to other harmful tobacco products.

The health risks of smoking can be reduced by providing smokers with the nicotine to which they are addicted without the smoke that harms their health (Royal College of Physicians, 2016). This can be done by administering medical nicotine but also by taxing e-cigarettes, which prove to be a potentially effective substitute for the nicotine that smokers need, lower than ordinary cigarettes. Although traces of carcinogens, oxidants and other harmful substances have also been found in e-cigarettes, their health risks do not appear to be greater than 5% of the comparable risks of smoking ordinary cigarettes. E-cigarettes appear to be a successful bridge to the complete cessation of smoking, especially if they are used as an alternative rather than as a complement to cigarettes.

Excise duties internalize the external and internal cost of smoking and, in view of the low elasticity of demand for cigarettes, reduce tobacco consumption. Under its Framework Convention on Tobacco Control (2005), ratified by nearly all countries around the world, the WHO calls for a total tax burden (specific and ad valorem excises, VAT, and import duties) on cigarettes of 75 percent of the retail price of the most common brand – 300 percent of the price, excluding tax. Out of 161 countries, 38 countries have implemented the WHO's recommendation, including Brazil where the total tax burden on cigarettes is

¹⁵ Various studies have estimated the total costs of smoking at around 0.5% of GDP. In Germany (Neubauer et al., 2006; 2003 data) and Sweden (Bolin et al., 2011; 2007 data), the total costs (healthcare, mortality, lower productivity) of smoking are estimated at 0.36% and 0.82% of GDP, respectively. Projecting these figures on to the Dutch situation and correcting for differences in smoking prevalence (Tobacco Collaborators, 2017) and years of observation, Cnossen (2020) estimates that the total costs of smoking would amount to approximately 0.5% for the Netherlands.

close to 83% of the retail price (Task Force, 2019). In 61 countries, the United States included, the total tax level ranges from 25% to 50% of the retail price, suggesting scope for increasing revenue through tobacco excise taxation.

A 10% excise-induced price increase of cigarettes increases revenue by about 5% in low- and middle-income countries and reduces demand by about the same percentage. In recent years, various developing and middle-income countries have already raised the total tax burden on cigarettes above 50% of the retail price. These countries include China (56%), India (54%), and the Russian Federation (56%). Raising excise duties is likely to result in greater tax evasion (smuggling and counterfeit production) and tax avoidance (bootlegging: buying in a low-tax country for consumption in a high-tax country), and thus undermines revenue and health policies. It is estimated that one in every 10 cigarettes consumed globally is illicit (Task Force, 2019). Finally, more attention should be paid to the tobacco excise duty structure. Based on tobacco content, cigars, cigarillos and roll-your-own tobacco tend to be (grossly) undertaxed compared with cigarettes. Also, differentiating tobacco tax structures by taxing filter-tipped cigarettes higher or lower-priced cigarettes lower violate the principle that the excise should solely reflect external costs rather than other attributes of cigarettes.

4.2 Alcoholic beverages

In countries where alcoholic beverages are not forbidden on religious grounds, alcohol tends to permeate the whole culture: it is used before, during and after meals, when celebrating a birth and when mourning, to socialize or relax, or to just get drunk. As an example (Cnossen, 2020), more than 70% of Dutch adults (15+) drink, on average, some 12 liters of pure alcohol per year. Converted, this corresponds per adult to 727 bottles of beer (0.33 lt/5%), 133 bottles of wine (0.75 lt/12%) or 49 bottles of spirits (0.70 lt/35%). Two drinks (10 mg ethanol per consumption) per day for a man and one drink for a woman are not considered medically harmful. However, 14% of the people who drink have four to six glasses daily; they are heavy drinkers. Another 5.5% are addicted to alcohol (more than six glasses per day), so one in five drinkers is drinking too much. Men drink twice as much as women on average. One in five youngsters attending school is a binge drinker (five glasses on a single occasion).

Just as in many other countries, alcohol is a problem in the Netherlands. Heavy drinking can lead to violent behaviour, can cause accidents and can have harmful consequences for health (organ damage, birth defects). The costs for public health are estimated at 2.3–2.9 billion euro (Cnossen, 2020). Alcohol-related deaths amount to 900 per year (about the same as the number of people living longer due to moderate alcohol consumption). Based on Anderson and Baumberg (2006), Cnossen (2007) calculated the external costs of alcohol abuse at 0.5–0.7% of GDP, with a lower limit on direct costs (healthcare, crime, traffic accidents) and an upper limit that also includes the costs of productivity loss and premature death. He calculated the low and high costs per adult (158 and 241 euros, respectively) and per liter of pure alcohol (16 and 24 euros, respectively). The excise duties, however, were only 64 euros per adult and the effective tax per liter of pure alcohol was merely 6.60 euros.

Worldwide, the abusive consumption of alcohol kills 5 million people each year, including 320,000 young people between the ages of 15 and 29 (WHO, 2018). Alcohol is the third leading risk factor for poor health (e.g. liver cirrhosis, mental problems) contributing up to 5% of the global burden of disease and injury. In no country do excise duty collections cover the costs of alcohol abuse. A complicating factor is that the costs of alcohol abuse, unlike smoking, do not increase linearly with the increase in consumption, but exponentially. The top 10% of the drinking population, which consumes between one-third and one-half of all alcohol, is responsible for 90% of the costs. Moderate drinkers, however, hardly incur costs. Hence, an increase in excise duty to reduce the high costs of excessive drinkers reduces the consumer surplus of moderate drinkers.

In low- and middle-income countries, a 10% excise-induced price increase would increase revenue by some 5%. Consumption would be reduced by 6% (Sornpaisarn, et al. 2013), which means fewer vehicle fatalities, homicides, robberies, and instances of spouse and child abuse. Overall, the effect would be a 3.5% decline in all harms associated with alcohol-related diseases and injuries (Wagenaar, et al. 2009). Among 74 countries, alcohol excise duties average merely 20% of the retail price (WHO, 2014), suggesting substantial scope for an across the board duty increase. Task Force (2019) estimates that doubling the total tax on alcohol could generate US\$9 trillion in additional revenue (2016 discounted value) over 50 years. This is more than 10 times the GDP of the Netherlands.

In most countries, the excise duties on spirits, wine and beer differ according to alcohol content. Spirits are taxed relatively heavier than wine or beer. Griffith et al. (2019) show that this is optimal if there are heterogeneous consumption externalities in differentiated product markets. If heavy drinkers have a preference for spirits over wine or beer, then a relatively higher excise duty per unit of alcohol on spirits is an effective way to reduce the amount of ethanol purchased by heavy drinkers, without having to confront moderate drinkers of wine and beer with higher excise duty costs. Seen in this light, the common excise duty differentiation according to alcohol content between spirits, wine and beer appears to be justified.

The use of excise duty differentiation to reduce heavy (episodic) drinking should be supplemented with regulations aimed at specific problem groups, such as young and heavy drinkers. Cost-effective measures that have a noticeable effect on alcohol abuse (and thus reduce the need for an increase in excise duty) are limited physical availability and a ban on drink-driving. In addition, legal liability in connection with the sale of alcohol to minors or alcoholics is important. The cost-effectiveness of limiting alcohol abuse through regulatory measures has been exhaustively investigated by Babor et al. (2003).

4.3 Lotteries and casinos

Engaging in games of chance (mainly lotteries and casinos) has much in common with smoking and drinking; there even seems to be some co-morbidity (Petry et al. 2005). Like smokers, gamblers mainly bear the negative consequences of their actions themselves, although their family members may also suffer. As with alcohol, restrictions on participation in games of chance (due to excise duties or supply regulations) will be at the expense of the

consumer surplus of recreational players. The demand elasticity of recreational players, as well as moderate drinkers, is high, suggesting a high excess tax burden. Lotteries are hardly addictive because the possibility of immediate repetition does not occur (Griffiths, 1999). Lotteries and casinos are often public companies where supply restrictions increase the price, while dividend payments substitute for taxes with similar qualitative effects (Clotfelter, 2005).

In many developing countries, excise duties to internalize external and internal costs of gambling are not levied, although these costs undoubtedly occur (Abbott, 2017). Examples of external costs are questionable ways of obtaining play money and the loss of income of financially dependent family members. Internal costs are the lack of self-control insofar as the risk of loss has not been rationally accepted, which appears to be rare (Forrest, 2008). An indication of high internal costs is also that the prevalence of suicide is greater among problem gamblers than among all other forms of addiction (Rosenthal and Fong, 2004).

Worldwide, problem gambling prevalence ranges from 0.2% to 6.0% of gamblers with two to three times as many people experiencing less serious sub-clinical problems (Calado and Griffiths, 2016). A not unimportant point to note is that lower-income groups spend a disproportionate share of their income on participating in lotteries (Smith, 2008). Taxes on gambling are therefore regressive. This effect is enhanced if the proceeds from lotteries, as is often the case, are spent on, for example, education and the arts (Feehan and Forrest, 2007) – in other words, income-elastic items of consumption.

Gambling has become socially acceptable around the world and has increased greatly with the rise of internet transactions. The possibility and temptation of continuing to gamble by displaying frequent near-win situations fosters addiction. Slot machines are known as the crack cocaine of the gambling world. External and internal costs are primarily due to financial impacts, damage to health and (family) relationships, and adverse effects on work and education. A New Zealand study (Browne, et al., 2017) estimated that the costs of gambling were 2.5 times higher than those of diabetes. For Victoria State in Australia, Browne et al. (2016) estimated that the costs were of a similar magnitude as those of alcohol misuse.

On this basis, there seems much to be said for making games of chance subject to excise duty, although it should be considered that the consumer surplus of recreational players is considerable. A limiting factor is that the chance that an excise duty would be avoided has increased greatly due to the rise of internet gambling. It is virtually impossible to monitor online gambling for tax purposes. Finally, games of chance should be included in the VAT base by taxing lottery tickets and imputing VAT to pay-outs. Casino visitors should be subject to VAT on the difference between the values of chips played and returned, the so-called margin (Schenk, 2010).

5 New ‘bads:’ SSBs and plastics

In recent years, two new ‘bads’ have been added to the traditional list, i.e. SSB’s and sugar, and plastics. The analysis applied to smoking, drinking and gambling is also applicable to these products.

5.1 SSBs and sugar

The Netherlands levies an excise tax of 8.83 euros per hectolitre on fruit juices, vegetable juice, mineral water, mixtures of fruit and vegetable juice, and lemonades. Apart from the revenue, the excise duty, which is based solely on volume, lacks a clear justification. Mineral water contains no sweeteners, and fruit and vegetable juices contain vitamins and minerals that are healthy. Elsewhere, policies are better focused, although not always. In about 40 countries in the world, soft drinks, also called sugar-sweetened beverages (SSBs), are subject to excise duty because their over-consumption is associated with tooth decay, being overweight, obesity, and heart and vascular disease.

The World Health Organization recommends limiting free sugar intake to 50 g per day. Compliance with this guideline in the Netherlands leaves something to be desired, especially among children (Sluik et al., 2016). With an average of 102.5 g per day, the Dutch consume twice as much as the recommended limit (Euromonitor, 2019), making it the third largest sugar-consuming country in the world. The situation is worse only in the United States and Germany.¹⁶ The International Diabetes Federation (2019) reports that, worldwide, 9.3% of adults aged 20–79 years – a staggering 463 million people – are living with diabetes. A further 1.1 million children and adolescents under the age of 20, live with type 1 diabetes.

In a recent highly sophisticated study for the United States, Allcott et al. (2019) estimate the optimal excise duty on SSBs at US\$0.01–0.021 per ounce (= 28.35 g): US\$0.08 for external costs, US\$0.01 for internal costs (inflated by 20% due to the progressive effect of the correction), and a reduction of US\$0.05 due to the regressive incidence of the financial costs of the excise duty. On balance, the authors come up with an excise duty of approximately US\$0.015 per ounce, roughly 4-euro cents per 100 g of sugar. For policymakers who prefer to ignore internal costs, they say that a duty of US\$0.04 per ounce internalizes external costs.

SSB taxation has been successful in raising revenue in several US cities, but some research indicates that their effect on purchases is mixed. For Oakland, California, Cawley, et al. (2020) do not find evidence of substantial changes in overall consumption of SSBs or of added sugars consumed through beverages for either adults or children after the city introduced a tax of US\$0.01 per ounce. The authors found a slight increase in the volume of local purchases and a light increase in out-of-city purchases, on balance resulting in a statistically insignificant decrease in purchases. This is against the backdrop of a nationwide decline in the consumption of sweeteners, as pointed out by Valizadeh, et al. (2019). Interestingly, this may mean that the risk belief of sugar consumption has acted as an excise. Higher risk beliefs are most effective when the elasticity of demand for SSBs is large.¹⁷

¹⁶ See Walvin (2018) for an entertaining, informative and extremely bleak global history of sugar that corrupted the world.

¹⁷ This paper is mainly concerned with raising revenue through excise taxation. If health concerns dominate, the UK levy on SSBs with tiered thresholds may be an example to follow. As of March 2019, drinks with ≥ 8 g of sugar per 100 ml are charged £0.24 per liter and those with ≥ 5 g but < 8 g per 100 ml are charged £0.18 per liter.

Another issue concerns narrow base of SSBs. Although the volume of SSB consumption is large, SSBs rank 1726th in terms of sugar content per 100 g foodstuffs compared with other selected foodstuffs (US Department of Agriculture, 2018). Indeed, there are many foodstuffs with considerably more sugar per 100 g of weight than SSBs, such as candy, honey, pudding, junk food, etc. Therefore, if a reduction in sugar consumption is to be taken seriously, then the excise net must be cast further than SSBs. If substitutes (e.g. chocolate, candy, ice-sugar products) are not included in the base, the burden distribution of the excise duty might also be more regressive, because higher-income groups spend as much or more on these products than on cold drinks with carbon dioxide. For these reasons, several countries, including Denmark, Finland and Norway, have included sugar and confectionery in the excise duty base, in addition to SSBs.

5.2 Stray plastic and packaging

The world is drowning in plastic. As stated at the World Economic Forum (2019), the world produced 311 million tonnes of plastic in 2014, a volume that is expected to triple by 2050 if nothing is done to limit production. The environmental damage caused by plastic litter is enormous. Every square kilometre of ocean now contains 13,000 pieces of plastic waste that end up in the sea, and hence also in the animal and human food chain. Plastic has been found in the stomachs of sperm whales, in tap water and in table salt. It has recently been observed that microplastic moves through the air and can therefore be inhaled. As another example, the production of four plastic bottles generates a quantity of greenhouse gas emissions that corresponds to a mile's drive in a medium-sized gasoline-engine car.

The most immediate problem concerns single-use plastic products – bags, cotton buds, cutlery, plates, straws, stirrers – that make up 70% of all plastics; these forms of plastic are also called maritime plastics because they litter beaches all around the world. The Ellen MacArthur Foundation (2018) estimates the cost of single-use plastics along with greenhouse gas emissions during production at US\$40 billion. Excise duties, along with regulations and covenants (such as the New Plastics Economy Global Commitment¹⁸ announced by the UN Environment Programme and the Ellen MacArthur Foundation in October 2018) should be able to reduce the problem to a manageable size.

Information on developing countries is scarce, but several European countries link the imposition of an excise tax on plastics used as packaging material to the simultaneous prohibition of single-use plastics. The ban is aimed at prohibiting the thinnest and least durable single-use plastics, on the philosophy that thicker plastic bags will encourage reuse. The Irish PlasTax law of 2002 (Anastasia and Nix, 2016), which initially imposed a surcharge of 15-euro cents per bag (now 22 euro-cents per bag), is one of the more successful examples of reducing the use of plastics in Europe. Within just six months, the use of single-use plastic bags decreased by 90%. In the first three months after the introduction of the ban, stores

¹⁸ See <https://www.newplasticseconomy.org/projects/global-commitment>.

issued 277 million plastic bags fewer than the year before. Plastic bags used for food safety and hygienic purposes are exempt from the excise duty.

As part of a larger packaging tax introduced in 1994, Denmark taxes plastic bags to promote the use of reusable bags. However, the tax is paid by retailers when they buy the bags instead of by shop visitors, which produces less impressive results than the Irish PlasTax. This is in line with the finding by Hogg and Sherrington (2011) that levies on plastic bags are usually more successful when they are charged directly to consumers. Nevertheless, the consumption of plastic bags in Denmark has fallen by 66%. From 2022, the United Kingdom intends to levy a tax on packaging plastics that contain less than 30% recycled plastic, making recycled plastic cheaper than new plastic that costs less without the new tax.¹⁹ Belgium levies an eco-tax on disposable plastic bags, disposable kitchen utensils, food foil and aluminium foil.

The European Commission (2015, 2018) has developed a comprehensive action plan for a circular economy, including a *Strategy for Plastics*, with specific recycling targets. The directives based on this plan have to be implemented by the member states by mid-2020. This action plan may be an example for developing countries to consider.

6 Climate Control and Transportation

Environmental problems through the burning of fossil fuels have led to a burgeoning literature on the use of ‘corrective’ excise duties to restrain harmful emissions, which cause global warming and damage health. Multiple externalities occur in the transport sector, which deserves separate analysis.

6.1 Global warming

The world still has 5 to 9 years left to limit global warming to 1½° C compared to pre-industrial times, as agreed to at the Paris 2015 United Nations Climate Change Conference.²⁰ With a target of 2° C, the CO₂-budget (that is, the maximum cumulative emissions) will run out in 18 to 33 years (Stern and Stiglitz, 2017). This implies that the consumption of fossil fuels (defined to include gasoline, diesel fuel, dual use kerosene, natural gas, coal and electricity), which are the main culprits of global warming, has to be contained. To prevent excessive global warming, CO₂-emissions need to be priced at an increasing rate, starting from 40 to 80 euros per ton of CO₂ for all emissions in all sectors, thereafter growing steeply at a rate of 3.75% per annum. Higher CO₂-prices should preferably be coordinated internationally to prevent the relocation of carbon-intensive production processes to countries with lower taxes.²¹ An internationally coordinated climate control program is also needed to

¹⁹ See the 2019 Consultation outcome by HM Treasury, Plastic packaging tax, available online at <https://www.gov.uk/government/consultations/plastic-packaging-tax>.

²⁰ This paragraph has benefited from an excellent paper by Van der Ploeg (2020).

²¹ This leakage effect is estimated at 20% of the reduction in emissions due to the carbon excise duty (IIPC, 2001). Leakage can be combatted by imposing import duties on carbon-intensive products from non-cooperating countries.

limit the risk of stranded fossil fuel reserves, which might be sold at bottom prices and thus contribute to rather than restrain global warming, called the green paradox. A full treatment of the issues can be found in IMF, Fiscal Affairs Dept. (2019), which recommends a CO₂-price of US\$75 per ton.

The CO₂ price can be implemented in the form of carbon duties or tradable emission permits, sold at auction, as under the European Emissions Trading System (ETS). In theory, duties and permits are equivalent. After all, in an efficient, competitive auction market, the price for each permit would be expected to equal the rate of environmental duty per unit of emissions reduction. However, carbon excise duties and permits differ regarding the impact of uncertainty. A system of tradable permits guarantees the envisaged quantitative reduction in emissions but at an uncertain cost, while an excise duty has an uncertain impact on the quantity of emissions but fixes the marginal cost of emission controls for emitters. A drawback of emission permits is that they tend to deter new firms from entering the market dominated by large firms that are able to buy emission licenses in excess of the firms' cost-minimizing requirements. Nevertheless, cap & trade is the carbon pricing option favored by the Paris Agreement.

Coady, et al. (2019) have estimated the global gap between efficient and actual fossil fuel prices, which they label subsidies. Pre-tax consumer subsidies arise when the prices for fossil fuels paid by consumers (households and firms) are below the cost of supplying energy. Post-tax consumer subsidies arise when the price paid by consumers, called the efficient price, is below the supply cost of energy plus an appropriate corrective tax that reflects the environmental damage associated with energy consumption and an additional VAT. Post-tax consumer subsidies are typically much higher than pre-tax consumer subsidies, primarily due to the large environmental costs of energy consumption.

Coady, et al. (2019) estimate worldwide energy subsidies at 6.5% of global GDP in 2017. This reflects the pervasive and substantial underpricing of fossil fuels by not internalizing external costs. Coal prices, for instance, are well below half their efficient level, and road fuels are 20% below their efficient level. Subsidies on natural gas are 10% of price and electricity 4%. If prices worldwide had been set at their efficient level in 2015, tax revenues (excise duties plus VAT) would have been higher by 3.8% of global GDP, or 2.5% if, illustratively, it is assumed that about one-third of the yield would be avoided. The price rise would have reduced global CO₂ emissions by 28% and air pollution deaths by 46%.

Nearly all developing (and developed) countries have stated their intention to abide by the Paris Accord (although one of the most important polluters, the United States, has withdrawn). A carbon price reform, through excise duties or a cap & trade regime would substantially reduce the adverse environmental, fiscal, macro-economic, and social consequences of energy subsidies. A reform would mainly be in the interest of individual countries themselves as about three quarters of global subsidies are due to domestic factors (Coady, et al., 2019) in the form of underpriced local air pollution (almost half of total costs), inadequate road pricing (15%), not accounting for VAT (7%), and subsidized supply costs (7%).

The case for the use of excise duties or emission permits over conventional regulatory policies based on technology or emission standards is well established (Smith, 2006a). If firms are faced with different marginal costs of abatement, excise duties can achieve a given level of abatement at lower total abatement costs. Excise duties can also sidestep the need for the regulatory authority to acquire detailed information on the abatement costs of individual sources. In addition, excise duties provide a continuing incentive for emitters to seek ways to reduce emissions. They are more robust to negotiated erosion ('regulatory capture') and insulate emitters from the risk that regulatory requirements might involve excessive abatement costs.

6.2 Road transport

A properly designed road fuel and use tax system can raise substantial revenues for general budget purposes and should exhibit a progressive tax burden distribution in developing countries. At current rates, motor fuel duties do not cover the multiple external costs of road use in developing countries or, for that matter, in most other countries.²² Following a brief review of the multiple externalities caused by motoring, this section discusses specific excises on motor fuel and motor vehicles.

Multiple externalities

Road users cause multiple externalities (which they should pay for) in the form of:

- global air pollution (carbon dioxide, methane, nitrous oxide), which contribute to climate change; global warming costs for gasoline can be estimated at about US\$0.10 per liter;²³
- local air pollution, which increases the incidence of respiratory and cardiopulmonary disease; costs are of about the same magnitude as global warming costs;
- congestion costs (the extra journey time which road users impose on each other), which is a tax on labor estimated at around half the average wage attributable to the time spent in traffic (Small, 1992); congestion costs are often higher than global and local air pollution costs combined;²⁴
- accident costs, which often exceed congestion costs;²⁵
- road damage, particularly by heavy trucks; see Coady, et al. (2019);
- noise pollution and landscape degradation for which no cost estimate is available.

²² For an early but still useful analysis of road transport taxes in Africa, see Smith (2006b). For an excellent analysis of the Dutch situation, see Vrijburg & Geilenkirchen (2020) who conclude that congestion pricing in the form of cordon fees are socially desirable in the Netherlands. External costs, other than congestion and greenhouse gases can be internalized through a levy of 3-euro cents per kilometer. Variabilization (see below) is not recommended.

²³ The cost estimates in this paragraph are from Coady, et al. (2019).

²⁴ Congestion costs are so location specific that they are not dealt with in this paper.

²⁵ An example is South Africa, where the economic cost of road traffic accidents, including the cost of hospital treatment, property damage, lost income and traffic delays to other road users has been estimated at 1.8% of GDP (Pretorius Prozzi et al., 2002, cited in Smith, 2006b). The authors note that South Africa had 500 000 road accidents in 1997 and nearly 10 000 people were killed.

In the event, more than one tax and regulatory instrument will have to be used to address the various external costs that can be associated with road use. Taxing instruments include excise duties on motor fuels differentiated by type of fuel (petrol vs diesel, leaded vs unleaded fuel), vehicle license fees differentiated by type of vehicle (cars vs trucks) and vehicle characteristics (weight, engine capacity), tolls and congestion charges, taxes on the purchase of new vehicles, and perhaps duties on insurance premiums to account for accident costs. Regulatory measures include compulsory checkups and catalytic converters. VAT should be applied to the total of supply and external costs with credit for VAT on transactions at intermediate stages of production and distribution. Coady, et al. (2019) estimate the VAT component of raising the efficient rate on fossil fuels at US\$0.10-0.30 per liter (including agricultural and industrial use).

Road user charges can be set to cover the total costs of operating the road network or the difference between the marginal social cost and the average private cost of road use. The duties, charges and regulatory provisions apply to consumers as well as producers. This does not violate the Diamond-Mirrlees (1971) theorem, which prescribes that, subject to certain general conditions, intermediate goods should not be subject to revenue-raising taxes (if they were, producers would incur excess burdens in trying to pass the tax on to consumers in addition to the tax itself). By contrast, externality-correcting taxes should be imposed (at the same rate) on both intermediate and final uses or consumption. For example, the fuel excise imposed on production inputs is a proxy for the cost of government-provided road services and internalizes the pollution costs borne by other people. A charge on personal and business use, even if indirect, is therefore appropriate.

Motor fuel

Appropriately designed motor fuel excises should be the backbone of financing the road system in developing countries and the general budget. Experience indicates that the behavioral impact of motor fuel excises is likely to be small (Goodwin, 1988). Higher motor fuel taxes (for gasoline and diesel) tend to reduce vehicle use and encourage the purchase of more fuel-efficient motor vehicles. The impact should be greater on fuel use and vehicle emissions than on vehicle use and congestion. The excise duties on gasoline should be used to encourage the take-up of unleaded gasoline and ultra-low sulfur and sulfur-free versions of gasoline and diesel (not only low sulfur gas oil). In combination with appropriate regulations, in many countries this policy has resulted in the full replacement of leaded and sulfur-rich types of fuel by cleaner fuels with less environmental harm. As a rule of thumb, developing countries might tax unleaded and sulfur-free fuels at half the rate of the duty on leaded and sulfur-rich fuels (if not prohibiting these fuels outright).

In nearly all countries, diesel fuel is excised at a lower rate than gasoline. Presumably, this reflects the policy maker's concern about the impact of high diesel excises on the cost of industry and agriculture, and on the use of diesel fuel in commercial vehicles. Although there is no justification for imposing revenue-raising excises on intermediate uses (which are inputs to production) of diesel, diesel-powered commercial vehicles (as well as diesel used in industrial and agricultural machinery) should always bear appropriate externality-correcting taxes, because the latter should be passed on in price if the fuel excise is to perform its

economic role. Diesel-powered vehicles (and machinery) emit particulates, soot, which cause health problems (respiratory ailments and cancer), particularly in urban areas.

Although the picture is complicated, on balance a differentially lower excise duty in favor of diesel fuel is inconsistent with the relative environmental damage caused by diesel- versus gasoline-engine vehicles. Beyond this, the fact that diesel-powered trucks and cars are more fuel-efficient per kilometer than gasoline-powered vehicles indicates that, per liter of fuel, diesel-powered trucks and cars impose more damage to roads than gasoline-powered trucks. Thus, diesel should be taxed more heavily, not lower, than gasoline.²⁶ Admittedly, diesel fuel is also used by buses which provide transportation for the poor, but the impact of a higher excise on fares would be so small as to have a negligible effect on the costs of transportation for any individual passenger.

If motor fuel is going to be taxed higher, then the position of kerosene should also be considered, because kerosene is partially substitutable for diesel oil. Since kerosene is mostly used by poor households for cooking, heating and lighting, an excise on it would have a regressive distributional effect. In addition, kerosene is a close substitute for wood burning. For these reasons, kerosene might be subject to a general fossil fuel tax but not to other duties. Diversion to diesel use may be forestalled by dyeing and chemical marking as well as spot-check inspections of fuel tanks.

Motor vehicle license fees

Practically all physical wear and tear to the road surface is caused by heavy trucks. In fact, road damage costs are roughly proportional to the fourth power of the axle load (Newbery, 1990). Based on this, governments may be advised to revise their motor vehicle license systems. To begin with, motor vehicle license taxes on trucks should be based on weight and raised by substantial amounts. Weights should be laden weights and axle load is a better yardstick than manufacturer's permitted gross weight.²⁷ Higher diesel excises cannot alone reflect the road damage, because the additional fuel used by a heavier vehicle is by no means proportionate to the very much higher road damage that the vehicle causes.

But there are more even weightier environmental arguments for reviewing road taxes. These taxes can and should be differentiated in ways that reflect attributes of the vehicle related to environmental friendliness (type of fuel, polluting emissions, presence of catalytic converters), passenger vs. goods transport (number of passenger seats, weight, number of axles), social considerations (exemptions for disabled people) and vehicle age. This differentiation has the potential to influence car purchasers' decisions towards vehicles meeting specific requirements as listed above and allows reflection of aspects of road use that cannot be captured by the fuel price alone.

²⁶ Santos (2017) concludes that the corrective excise duties on diesel in Europe are below their efficient level in all 22 countries included in his analysis, while gasoline is undertaxed in some countries.

²⁷ The ideal solution, of course, would be to track mileage for trucks of different weight and levy tax on mileage at a rate that depends on weight, but probably this is not feasible. Experience elsewhere shows that, if properly enforced, mileage taxes tend to have very high administrative and compliance costs.

Taxes are particularly useful for reducing CO₂ emissions, while regulations are more appropriate for limiting non-CO₂ emissions. As regards regulations, much can be learned from the 'Euro 1–6' norms, which can be imposed at import. It is recommended that developing countries should apply such regulations as have other non-European countries. Although the norms should not be prescribed for vehicles already on the road, annual inspections can ensure that they are maintained for new vehicles.

In designing the new motor vehicle tax, much can be learned from four comparator countries: Australia, Canada, the UK, and Germany, all of which base their annual motor vehicle tax on CO₂ emissions. In Germany, for instance, the annual motor vehicle tax consists of a base tax and a CO₂ tax. The base tax is 2 euro per 100 cm³ for gasoline- and 9.50 euro per 100 cm³ for diesel-powered vehicles. The CO₂ tax is linear, at 2 euro per g/km emitted above 95 g/km. Cars with CO₂ emissions below 95 g/km are exempt from the CO₂ tax component but not from the base tax. Similar taxes are found in Australia, Canada and the UK, which also adhere to the basic norms prescribed by the European Commission. However, the German tax is simplest. A program that would gradually tighten emission standards, as under the 'Euro 1–6' norms, would provide certainty about government's future plans. The CO₂ reduction program for vehicles should be implemented in conjunction with gradually tightening rules for non-CO₂ emissions. It should be noted that these standards would, by implication, encourage the purchase and use of hybrid and electric cars. In other words, no special treatment would have to be prescribed for these vehicles.

Motor vehicle purchases

In most countries, high import and excise duties on the import value of new and used motor vehicles imparts some progressivity to the tax system, because the ad valorem duties tend to be higher in absolute terms for newer and more expensive vehicles, presumably bought by the better-off. Valuation issues can be avoided by using the list prices of new and second-hand motor vehicles that foreign excise tax departments publish for imposing ad valorem purchase taxes – supported by published commercial value catalogues.

As is currently the case, VAT should also be levied on the domestic sale of motor vehicles by dealers. It would be useful to consider the application of the VAT to the dealer's margin on second-hand cars. (If second-hand cars are taxed in full, their trade would be diverted from regular channels.) Administratively the best way to achieve this is by directly taxing the trading margins. The theoretically more attractive alternative of taxing the resale in full and permitting a credit for the VAT attributable to the second-hand vehicle would be more difficult to implement.

Variabilization

Most of the external costs of motor vehicles are proportional to use, rather than ownership, which in itself generates few externalities. It may seem attractive, therefore, to switch the burden of taxation from ownership to use. Elsewhere, this is called the variabilization of road transport taxes: turning fixed costs – that is, the vehicle purchase and license taxes – into charges based on use – that is, the excise duties on fuel. At the margin, this would increase the cost of vehicle use and increase the incentive to use public transport. Variabilization is also

attractive on distributional grounds since it would tend to benefit infrequent users of motor vehicles, which may include poorer households (Smith, 2006b).

However, the impact on overall motor vehicle use and hence the environmental consequences are less clear-cut. While vehicle use by current owners would be discouraged, the cost of vehicle ownership would decrease and the number of vehicle owners increase. As a consequence, the vehicle use by these additional owners could outweigh the reduced use by existing owners. On these grounds, the environmental consequences of variabilization may be less appealing. Further, the effect of abolishing the vehicle license tax might well be that the scrapping of old vehicles that are not replaced by new vehicles would be postponed. Older vehicles are more polluting than the average, both because they were designed when standards were less strict and because wear and tear tends to reduce environmental performance. Admittedly, these effects of variabilization should be relatively insignificant if vehicle license taxes are low, but they would become more important if these taxes were increased, as they should be.

6.3 International maritime and air transport

Fuel used in international maritime and air transport is not subject to tax, although it accounts for about 5 percent of global CO₂ emissions (Keen, et al., 2013), by no means negligible. While there is no good reason why a corrective excise should not be applied, lack of an international consensus has so far prevented its introduction.

7 Income-elastic goods and services

Most developing countries levy excise duties on luxury products (or impose a higher-than-standard VAT rate on them) to impart some progressivity to the tax system, particularly if there are limits on the capacity to administer comprehensive and progressive income taxes. With a few exceptions this is not a good idea.

7.1 Luxury products

Luxury goods may be defined as products for which expenditures rise faster than income rises. In other words, the income elasticity of demand for luxury goods is higher than unity (moreover, to limit substitution, own price elasticities of demand should be low). Products that are considered luxury goods include toiletries, cosmetics, perfumes; jewelry, precious stones; leather and fur products; watches, clocks; cameras, binoculars; radios, TVs, recorders, videos; motor vehicles, pleasure boats, and firearms and ammunition. Not surprisingly, they are found in the excise tax (and VAT) legislations of most developing countries.

The wide application of excise duties to luxury goods, however, does not necessarily mean that they should be recommended. For the promotion of progressivity to be appreciable and the revenue worthwhile to collect, obviously, consumption by higher income classes should be significant. It should also be possible to break taxable goods down into sub-groups, permitting the application of graduated rates that differ on the basis of variations in

consumption patterns between rich and poor. This requires precise definitions to facilitate their application. Finally, the consumption of higher-taxed products should widely be viewed as a sign of affluence (Cnossen, 2006b).

It is readily apparent that most of the luxury goods listed above are not suitable for separate excise duties for the following reasons.

- Class-differentiated consumption patterns that are helpful in excise duty design for imparting progressivity hardly exist in many low and middle-income countries;
- Analyses of household budgets shows that expenditures on luxury products tend to be rather limited – hardly comprising more than 1-2 % of total consumption expenditures. Consequently, the effect on progressivity and revenue is insignificant;
- Separate excises add to the costs of administration and compliance; the definitional refinements that are required to tax luxury items more heavily usually give rise to casuistic disputes on interpretation;
- Higher-income groups can easily purchase various taxable luxury products abroad. Subsequently, their importation could be concealed (for example, an expensive wristwatch) or would fall within the limits of the personal exemption;
- Progressivity in the tax burden distribution can be better achieved through the income tax, which is more comprehensive in coverage and more adaptable to the individual circumstances of taxpayers.

However, there are a few important exceptions. Cars and yachts (as well as residential housing) are good candidates for differentially higher product (and property) taxes. If governments wish to use the taxation of products to impart some progressivity to the tax system, then the excise duties and motor vehicle license fees on cars (new and imported) should be increased, as well as the excise on motor fuel.

7.2 Telecoms and platforms

Many developing countries levy an excise on airtime services, which has become an important source of revenue-raising, equivalent to about 0.3 percent of GDP. Phone penetration in most countries is around 80 percent, guaranteeing a broad base.²⁸ For illustrative purposes, the total fiscal and regulatory revenues (including VAT) raised by the telecom sector in Malawi averaged 1.3 percent of GDP during 2013–15. Liberia raises about 0.6% of GDP from this source. According to Jensen (2007), airtime connectivity has substantial positive externalities and, therefore, should not be taxed at the level of traditional excisable goods, such as tobacco and alcohol. For this reason, excises on network access – on handsets and initial connection charges – should not be contemplated. The IMF (2011) suggests that auctioning licenses is in principle the best way to tax the potentially substantial rents in the telecom sector.

²⁸ For an exposition of the taxation issues and what countries do, see Deloitte (2017). Also, see Matheson and Petit (2017), who discuss taxes applicable to the telecommunications sector.

Similar taxing opportunities arise in the case of Amazon, Google, Facebook, YouTube, Uber Auto Leas and Airbnb, but for these platforms VAT and profits taxes may offer more appropriate solutions.

8 Concluding Comments

This paper has shown that raising revenue from excise duties probably is a good way for developing countries to increase tax revenues in times of the corona pandemic. Firstly, excise duties are relatively easy to collect and enforce, a major advantage over other taxes that have to rely on accounting checks for compliance control purposes. Secondly, excise duties improve the efficient allocation of resources by internalizing the external and internal costs associated with the consumption and production of potentially harmful products. Thirdly, excise duties improve the progressivity of the tax system in the sense that their effect is most beneficial for people on low incomes who consume relatively more of the harmful product and whose elasticity of demand is higher than that of people on higher incomes. Last but not least, excise duties tend to be less harmful to economic growth than broad-based income and consumption taxes. No other tax or duty shares all of these advantages.

To summarize, the paper draws the following broad conclusions:

- Revenues from excise duties can be tripled in most developing countries.
- The excise duty approach (specific rates, physical controls) should be extended to SSBs, plastics, fossil fuels, telecoms, and road use in countries that have not already done so.
- There is considerable scope for efficiency-enhancing changes in the level and structure of excise duties.
- Increased reliance on excise duties is consistent with an equitable tax system.
- Excise duty administration can be substantially improved by codifying and disseminating current best practices in the developing world.

References

- Abbott, M. (2017), Th epidemiology and impact of gambling disorder and other gambling-related harm, *Discussion Paper* developed for the WHO Forum on Alcohol Drugs and Addictive Behaviours, 26-28 June, World Health Organization, Geneva, Switzerland.
- Allcott, H., B.B. Lockwood, and D. Taubinsky (2019), Should we tax sugar-sweetened beverages? An overview of theory and evidence, 33 *Journal of Economic Perspectives* 3.
- Anastasia, M. and J. Nix (2016), Plastic bag levy in Ireland, Institute for European Environmental Policy, available on the internet.
- Anderson, P. and B. Baumberg (2006), *Alcohol in Europe*, Institute of Alcohol Studies, London.
- Atkinson, A. B. and J. B. Stiglitz (1976), The design of tax structure: direct versus indirect taxation, 6 *Journal of Public Economics*.

- Babor, T. F. et al. (2010), *Alcohol: No Ordinary Commodity: Research and Public Policy*, 2nd ed., Oxford, Oxford University Press.
- Barzel, Y (1976), An alternative approach to the analysis of taxation, 84 *Journal of Political Economy*.
- Becker, G. S. and K. M. Murphy (1988), A theory of rational addiction, *Journal of Political Economy* 96.
- Bernheim, B. D. and D. Taubinsky (2018), Behavioral public economics, Chapter 5 in B. D. Bernheim, S. DelleVigna and D. Laibson (eds), *The Handbook of Behavioral Economics*, Elsevier, Amsterdam.
- Bird, R. M., and S. Wallace (2006), Taxing alcohol: reflections from international experience, in S. Cnossen (ed.), *Excise Tax Policy and Administration in Southern African Countries*, UNISA Press, Pretoria, South Africa.
- Bird, R.M. and J. Yun (2007), Earmarking in theory and Korean practice, in S.L.H. Phua (ed.), *Excise Taxation in Asia*, National University of Singapore, Singapore.
- Bird, R.M. (2015), Tobacco and alcohol excise taxes for improving public health and revenue outcomes: Marrying sin and virtue? *Working Paper Series 7500*, World Bank Group, Washington DC.
- Bolin, K., B. Borgman, C. Gip, and K. Wilson (2011), Current and future avoidable costs of smoking – estimates for Sweden 2007, *Health Policy*, 103, 83–91.
- Browne, M., M. Bellringer, N. Greer, K. Kolandai-Matchett, V. Rawat, E. Langham...M. Abbott (2017), *Measuring the burden of gambling harm in New Zealand*, Central Queensland University and Auckland University of Technology.
- Browne, M., E. Langham, V. Rawat, N. Greer, E. Li, J. Rose...T. Best (2016), *Assessing Gambling Related Harm in Victoria: A Public Health Perspective*, Victorian Responsible Gambling Foundation, Melbourne, Australia.
- Calado, F., and M.D. Griffiths (2016), Problem gambling worldwide: An update and systematic review of empirical research 2000-2015, *Journal of Behavioral Addictions* 4.
- Carpenter, C., and P.J. Cook (2008), Cigarette taxes and youth smoking: new evidence from national, state and local risk behavior surveys, 27 *Journal of Health Economics* 2.
- Cawley, J., D. Frisvold, A. Hill, and D. Jones (2020), Oakland's sugar-sweetened beverage tax: Impacts on prices, purchases and consumption by adults and children, 37 *Economics and Human Biology*, May.
- Chaloupka, F.J., and L.M. Powel (2018), Using Fiscal Policy to Promote Health: Taxing Tobacco, Alcohol, and Sugary Beverages, prepared for the Task Force on Fiscal Policy for Health, March.
- Chaloupka, F. J. and Warner, K. E. (2000), The economics of smoking, Chapter 29 in A. J. Culyer and J. P. Newhouse (eds), *Handbook of Health Economics*, Volume 1, Elsevier, Amsterdam.

- Christiansen, V., and S. Smith (2009), Externality-correcting Taxes and Regulation, *Working Paper 09/06*, Institute for Fiscal Studies, London.
- Clotfelter, C. T. (2005), Gambling taxes, Chapter 4, in S. Cnossen (ed.), *Theory and Practice of Excise Taxation: Smoking, Drinking, Gambling, Polluting, and Driving*, Oxford, Oxford University Press.
- Cnossen, S. (ed.) (2005), *Theory and Practice of Excise Taxation: Smoking, Drinking, Gambling, Polluting, and Driving*, Oxford, Oxford University Press.
- Cnossen, S. and Smart, M. (2005), Taxation of tobacco, in S. Cnossen (ed.), *Theory and Practice of Excise Taxation: Smoking, Drinking, Gambling, Polluting, and Driving*, chapter 2, Oxford, Oxford University Press.
- Cnossen, S. (ed.) (2006a), *Excise Tax Policy + Administration in Southern African Countries*, University of South Africa, Pretoria.
- Cnossen, S. (2006b), Impact of consumption taxes, Chapter 6 in S. Cnossen (ed.), *Excise Tax Policy + Administration in Southern African Countries*, University of South Africa, Pretoria.
- Cnossen, S. (2006c), Excise tax administration, Chapter 7 in S. Cnossen (ed.), *Excise Tax Policy + Administration in Southern African Countries*, University of South Africa, Pretoria.
- Cnossen, S. (2007), Alcohol taxation and regulation in the European Union, *International Tax and Public Finance*, 14, 699–732.
- Cnossen, S. (2010), Excise Taxation in Australia, Chapter 10 in Australia’s Future Tax and Transfer Policy Conference, Melbourne Institute of Applied Economic and Social Research.
- Cnossen, S. (2020), Excise duties to correct market and individual failure, Chapter 22 in S. Cnossen and B. Jacobs, *Tax by Design for the Netherlands* (forthcoming).
- Coady, D., I. Parry, N-P Le, and B. Shan (2019), Global Fossil Fuel Subsidies Remain Large: An Update Based on Country-Level Estimates, *IMF Working Paper WP/19/8*, International Monetary Fund, Washington, DC.
- Corlett, W.J., and D.C. Hague (1953), Complementarity and the excess burden of taxation, 21 *Review of Economic Studies*.
- Crawford, I., M. Keen, and S. Smith (2010), Value Added Tax and Excises, Chapter 4 in *Dimensions of Tax Design: The Mirrlees Review*, Institute for Fiscal Studies, London.
- Davis, B., W. Savedoff, and P.R. Lerouil (2019), Revenue Estimates from Taxing “Bads” in 16 Low- and Middle-Income Countries, William Davidson Institute, University of Michigan.
- Delipalla, S., and M. Keen (1992), The comparison between ad valorem and specific taxation under imperfect competition, 49 *Journal of Public Economics*,

- Deloitte (2017), Digital Inclusion and Mobile Sector Taxation in Niger, Report prepared for GSMA.
- Euromonitor International (2019), *Country Report – Sugar Confectionary in the Netherlands*, Euromonitor International, London.
- European Commission (2015), *A European strategy for plastics in a circular economy*, European Commission, Brussels.
- European Commission (2018), *Single-use plastics: new EU rules to reduce marine litter*, European Commission, Brussels.
- Feehan, P., and D. Forrest, (2007), The distribution of UK lottery grants across local authority areas, 14 *Applied Economic Letters*.
- Forrest. D. (2008), Gambling policy in the European Union: too many losers? in S. Cnossen (guest ed.), Fiscal Policy in Action, 64 *FinanzArchiv*, December.
- Goodwin, P.B. (1992), A review of new demand elasticities with special reference to short and long run effects of price changes, *Journal of Transport Economics and Policy*, May.
- Griffith, R., M. O’Connell, and K. Smith (2019), Tax design and the alcohol market, 172 *Journal of Public Economics*.
- Griffiths, M. (1999), Some comments on ‘Health-related correlates of gambling on the British National Lottery’ by Reid et al., 85 *Psychological Reports*.
- Gruber and B. Köszegi (2001), Is addiction “rational”? Theory and evidence, 116 *Quarterly Journal of Economics*
- Gruber, J., and B. Köszegi (2008), *A Modern Economic View of Tobacco Taxation*, International Union Against Tuberculosis and Lung Disease, Paris.
- Gwilliam, L., and Z. Shalizi (1999), Road funds user charges and taxes, 14 *The World Bank Research Observer* 2.
- Harral, C.J., and A. Faiz (1988), *Road deterioration in developing countries: Causes and remedies*, Washington DC, World Bank.
- Heggie, I. G. (1995), Management and Financing of Roads: An Agenda for Reform, *World Bank Technical Paper 275*, Washington DC.
- Hogg, D. and C. Sherrington, (2011), A comparative study on economic instruments promoting waste prevention, Final Report to Bruxelles Environnement, Eunomia, Bristol.
- IIPC (2001), Intergovernmental Panel for Climate Change, *Third Assessment Report: Climate Change 2001*, Geneva, Switzerland.
- IMF (2011), Fiscal Affairs Department, Revenue Mobilization in Developing Countries, Washington DC, International Monetary Fund.
- IMF (online), International Monetary Fund, *Government Finance Statistics*.

- IMF, Fiscal Affairs Dept. (2019), Fiscal Policy for Paris Climate Strategies – from Principle to Practice, *Policy Paper No. 19/01*, Washington DC, International Monetary Fund, May.
- International Diabetes Federation (2019), *IDF Europe Position on Added Sugar*, Brussels, Belgium.
- Jensen, R. T. (2007), The Digital Divide: Information, Technology, Market Performance, and Welfare in the South Indian Fisheries Sector, 122 *Quarterly Journal of Economics* 3.
- Keen, M., I. Parry, and J. Strand (2013), Ships, Planes, and Taxes: Charging for International Aviation and Maritime Emissions, 28 *Economic Policy*.
- Matheson, T., and P. Petit (2017), Taxing Telecommunications in Developing Countries, *IMF Working Paper 17/247*, Washington DC, International Monetary Fund.
- Neubauer, S., R. Welte, A. Beiche, H. H. Koenig, K. Buesch, and R. Leidi (2006), Mortality, morbidity and costs attributable to smoking in Germany: update and a 10-year comparison, 15 *Tobacco Control*.
- Newbery, D.M. (1990), Pricing and congestion: Economic principles relevant to the pricing of roads, 6 *Oxford Review of Economic Policy* 2.
- O'Donoghue, T., and M. Rabin (2003), Studying optimal paternalism, illustrated by a model of sin taxes, 93 *American Economic Review*, 2.
- OECD (2019), Organization for Economic Co-operation and Development, *Revenue Statistics*, Paris, OECD Publishing.
- Petry, N., F. Stinson, and B. Grant (2005), Comorbidity of DSM-IV pathological gambling and other psychiatric disorders: results from the National Epidemiologic Survey on alcohol and related conditions, 66 *Journal of Clinical Psychiatry*.
- Pigou, A. C. (1920), *The Economics of Welfare*, Macmillan, New York.
- Pogue, T.F., and L.G. Sgontz (1989), Taxing to control social costs: the case of alcohol, 79 *American Economic Review*.
- Pretorius Prozzi, J., C. Naude, D. Sperling, and M. Delucchi (2002), *Transportation in developing countries: Greenhouse gas scenarios for South Africa*, Arlington, VA, Pew Center on Global Climate Change.
- Ramsey, F. (1927), A contribution to the theory of taxation, 37 *Economic Journal*.
- Rosenthal, R. and T. Fong, (2004), The Etiology of Pathological Gambling: Report to the California Office of Problem Gambling, Sacramento.
- Royal College of Physicians (2016), Nicotine without smoke – tobacco harm reduction: a report by the Tobacco Advisory Group, Lavenham Press, Suffolk.
- Sandmo, A. (1976), Direct versus indirect Pigouvian taxation, 7 *European Economic Review*.

- Santos, G. (2017), Road fuel taxes in Europe: Do they internalize road transport externalities? *53 Transport Policy*.
- Savedoff, W., and R. Lopert (2020), Sugar, Rum, and Tobacco: Domestic Resource Mobilization for Low-Income Countries Through Excise Taxes, *GGD Policy Paper 164*, Center for Global Development, Washington, DC.
- Schenk, A. (2010), Gambling and lotteries, in R. Krever (ed.), *VAT in Africa*, Pretoria University Law Press (PULP), Pretoria, South Africa.
- Sluik, D., L. van Lee, A. I. Engelen, and E. J. M. Feskens (2016), Total, free, and added sugar consumption and adherence to guidelines: the Dutch National Food Consumption Survey 2007–2010, *8 Nutrients* 70.
- Small, K.A. (1992), *Urban Transportation Economics*, Fundamentals of Pure and Applied Economics Series, Regional and Urban Economics, Philadelphia and Reading, UK: Harwood Academic, 1992.
- Smith, S. (2006a), Energy taxation and environmental policy, Chapter 4 in S. Cnossen (ed.), *Excise Tax Policy + Administration in Southern African Countries*, University of South Africa, Pretoria.
- Smith, S. (2006b), Taxes on road transport, Chapter 5 in S. Cnossen (ed.), *Excise Tax Policy + Administration in Southern African Countries*, University of South Africa, Pretoria.
- Smith, S. (2008), Lotteries as a source of revenue, in M. Viren (ed.), *Lotteries in a Changing Market Environment*, Palgrave Macmillan, Basingstoke.
- Sornpaisarn, B., K. Shield, J. Cohen, R. Schwartz, and J. Rehm (2013), Elasticity of alcohol consumption, alcohol-related harms, and drinking initiation in low- and middle-income countries: a systematic review and meta-analysis, *2 International Journal of Drug and Alcohol Research* 1.
- Stern, N., and J. Stiglitz (2017), Report of the High-Level Commission on Carbon Pricing, Paper of the Carbon-Pricing Leadership Coalition of the World Bank Group, Washington, DC.
- Task Force (2019), Task Force on Fiscal Policy for Health, Health Taxes to Save Lives: Employing Effective Excise Taxes on Tobacco, Alcohol, and Sugary Beverages, New York: Bloomberg Philanthropies.
- Tiihonen, J., K. Ronkainen, A. Kangasharju, and J. Kauhanen (2012), The net effect of smoking on healthcare and welfare costs: a cohort study, *2 BMJ Open* 6.
- Tobacco Collaborators (2017), Smoking prevalence and attributable disease burden in 195 countries and territories, 1990–2015: a systematic analysis from the Global Burden of Disease Study 2015, *The Lancet*, 389.
- US Department of Agriculture (2028), Agriculture Research Service, Food Composition Database.

- Valizadeh, P, B.M. Popkin and S.W. Ng (2020), Distributional changes in U.S. sugar-sweetened beverage purchase, 2002-2014, *American Journal of Preventive Medicine*, on line April 30.
- Van der Ploeg, R. (2020), Climate policy: challenges and obstacles, Chapter 18 in S. Cnossen and B. Jacobs (eds), *Tax by Design for the Netherlands*, forthcoming.
- Vrijburg, H., and G. Geilenkirchen, Road pricing by design: the Dutch case, Chapter 19 in S. Cnossen and B. Jacobs (eds), *Tax by Design for the Netherlands*, forthcoming.
- Wagenaar, A.C., M.J. Salois, and K.A. Komro (2009), Effects of beverage alcohol price and tax levels on drinking: a meta analysis of 1003 estimates from 112 studies, *Addiction* 104.
- Walvin, J. (2019), *Sugar: The World Corrupted: From Slavery to Obesity*, Pegasus Books, New York.
- Warner, J. K. E., F.J. Chaloupka, P. J. Cook, W.C. Manning, J. P. Newhouse, J. P Novotny, T. C. Schelling, and J. Townsend (1995), Criteria for determining an optimal cigarette tax: the economist's perspective, 4 *Tobacco Control*.
- World Economic Forum (2019), *Plastic is a global problem. It's also a global opportunity*, <https://www.weforum.org/agenda/2019/01/plastic-might-just-be-the-solution-to-its-own-problem>.
- WHO (2005), World Health Organization, *Framework Convention on Tobacco Control*.
- WHO (2014), World Health Organization, *Global status report on alcohol and health*, Geneva, Switzerland.
- WHO (2018) World Health Organization, Alcohol, Key facts (2017),
- WHO (2019) World Health Organization, *WHO report on the global tobacco epidemic: Offer help to quit tobacco use*, Executive Summary.
- WHO (2020). World Health Organization, Tobacco, Key facts, May.