TaxDev

Hazel Granger, Overseas Development Institute
Vedanth Nair, Institute for Fiscal Studies
Harshil Parekh, Overseas Development Institute
David Phillips, Institute for Fiscal Studies
Daniel Prinz, Institute for Fiscal Studies
Edris Seid, Institute for Fiscal Studies
Ross Warwick, Institute for Fiscal Studies

IFS Report R197

'Green' motor taxation: issues and policy options in sub-Saharan Africa

UKaid from the British people

IFS Institute for Fiscal Studies

ODI

‘Green’ motor taxation: issues and policy options in sub-Saharan Africa

Institute for Fiscal Studies
Vedanth Nair, Research Economist
David Phillips, Associate Director
Daniel Prinz, Research Economist
Edris Seid, Country Advisor
Ross Warwick, Senior Research Economist

Overseas Development Institute
Hazel Granger, Senior Research Fellow
Harshil Parekh, Research Associate

Published by **The Institute for Fiscal Studies**

ISBN 978-1-80103-051-9

Preface

This report has been prepared by IFS and ODI researchers under the auspices of the Centre for Tax Analysis in Developing Countries (TaxDev). TaxDev aims to promote more effective tax policymaking in low- and middle-income countries through research, applied analysis, and partnerships with policymakers. Financial support for TaxDev via UKAID from the UK government is gratefully acknowledged. The views expressed in this report are, however, those of the authors and do not necessarily reflect the views of the funders nor of IFS, which has no corporate views.

The Institute for Fiscal Studies
7 Ridgmount Street
London WC1E 7AE, United Kingdom
Tel: +44 (0) 20-7291 4800
Fax: +44 (0) 20-7323 4780
Email: mailbox@ifs.org.uk
Website: http://www.ifs.org.uk

Contents

Executive summary

Recent decades have seen growing ownership and use of motor vehicles in sub-Saharan Africa (SSA). Although, compared with developed countries, SSA countries still have relatively few cars and those cars are concentrated in the largest cities, problems associated with motoring are a growing concern in the region. These include congestion, pollution, and road traffic deaths. They arise in part because when making decisions about whether to drive, when to drive and what type of vehicle to drive, people generally only consider the private costs and benefits of their decisions and not the costs and benefits for wider society. These differences between private and social costs and benefits are termed ‘externalities’ by economists.

Taxes can be used to better align the private costs and benefits of motoring with the social costs and benefits. This report sets out some key issues and policy options for ‘green’ motor taxes in SSA. It provides an overview of the principles of motor taxation, describes the policy context in SSA, and discusses the potential for policy options that could improve existing tax systems in the region.

Principles of motoring taxation

The externalities associated with motor vehicles – including congestion, local air pollution, road traffic fatalities and global climate change – are associated with the use of a vehicle and may vary substantially based on the time and place of driving, as well as the fuel efficiency and other characteristics of vehicles. Thus, the ideal tax would vary with time, place and emissions to account for all of these costs at once. However, such a tax is not administratively feasible in practice.

Among feasible taxes, fuel taxes and congestion charges are relatively well targeted at pollution and congestion, respectively, though congestion charges have relatively high set-up and running costs. Vehicle ownership taxes that vary with emissions and location can also help to address local externalities such as particulate pollution and congestion. They do, however, involve collecting taxes from potentially millions of vehicle owners, which may be challenging. Taxes on vehicle purchase and import are the least well-targeted option, as once the vehicle is purchased they do not stop the driver from driving as much as they want, and they incentivise drivers to keep old, and potentially more polluting, vehicles. However, their collection largely at the border has administrative advantages.

Existing policies

Taxes levied on vehicles and fuels contribute significant sums of tax revenue in SSA (at least judged on countries for which data are available). Despite low levels of motorisation, as a share of GDP such revenues are comparable to those in high-income countries. In general, though, the configuration of motoring taxes in SSA does not match the principles discussed above.

Taxes on vehicle purchase are generally very high, though with substantial variation across countries. On average, they exceed those of middle- and high-income countries, but, apart from South Africa, no country bases purchase taxes on vehicle emissions, whereas taxes based on emissions (both carbon emissions and those causing local pollution) are the norm in middle- and upper-income countries.

Official tax rates on fuel are typically low in SSA relative to higher-income countries, but again there is significant variation in tax levels. Under-collection, subsidies and fuel price stabilisation programmes often mean that the effective tax on fuel is much lower than the official tax rate.

The majority of SSA countries do not have vehicle ownership taxes, and those that do typically set them at very low levels.

For most SSA countries, taxing vehicles at the point of import or purchase therefore represents the main form of vehicle taxation. Although taxes on vehicle purchase are a less efficient way to deal with the externalities of motoring, they are likely popular for the following reasons: industrial policy issues (tax rates on vehicle kits for assembly are generally set lower than those on assembled vehicles); perceived progressivity (in many countries, vehicles are categorised as a luxury good and receive a tax in line with other luxury goods, as opposed to fuel); and ease of administration, as most vehicles are taxed at the border (as opposed to vehicle ownership taxes or congestion charges, which require more administrative oversight).

Policy options

This disconnect between the principles of motor taxation and existing policies in SSA suggests a number of avenues for reforms that can help to better manage motorisation, and in some countries raise additional revenue. Though policy options are necessarily context-specific, a number of common themes emerge from this research. Broadly, we suggest moving towards taxes that better target vehicle use, including effective higher taxes on fuel, either by addressing under-collection and subsidies or by increasing *de jure* tax rates. While congestion charging schemes are likely to carry prohibitive administrative costs, geographically differentiated ownership taxes or parking fees could be a way of addressing growing congestion problems. At the same time, some countries could rationalise and even potentially reduce taxes on imports and purchases to facilitate the replacement of older, lower-quality vehicles.

While our focus is on the design of tax measures applied to motoring, non-tax policies clearly also play an important role in managing motorisation. For example, roadworthiness tests on imported cars are a good policy option to improve vehicle quality, whilst taking steps to improve road safety and licensing is important to reduce road fatalities.

Lessons for the reform process

Reform experiences suggest that the policy options we describe, particularly reforms that increase fuel prices, are likely to be politically difficult to implement. Well-designed mitigating measures to protect lower-income households are important both politically and from the perspective of equitable taxation.

Case studies on previous reform experiences suggest that beyond having well-designed mitigating measures (preferably in the form of transfer programmes), governments need to build broad consensus around the reform process. They also need to help citizens understand the connection between price-raising reforms and mitigating measures, and ideally should introduce new measures gradually.

Key findings

1. With the exception of relatively high-income nations in southern Africa, countries in SSA have few vehicles on average (26 per 1,000 people) relative to the rest of the world (182 per 1,000 people). However, economic growth and rising household incomes mean that this number is growing and is likely to continue doing so.

2. Despite the low number of vehicles per capita, the social costs of motoring are high in SSA countries. Deaths from air pollution are higher (187 per 100,000) than the world average (114 per 100,000), as are deaths from road traffic accidents (28 versus 16 per 100,000). Congestion is estimated to cost as much as 4% (in Kampala) and 7% (in Lagos) of citywide GDP. Motoring taxation should be designed to help manage these social costs, which depend on the amount, time and place of vehicle use, and the type of vehicle used.

3. In contrast to many other categories of taxation, motoring taxes are not a category where SSA countries lag behind the rest of the world in terms of revenues raised. In the countries where revenue information could be obtained, motoring taxes raised between 0.8% and 2.1% of GDP, which is a comparable range to that for EU countries.

4. The composition of these revenues is not always well targeted towards the social costs of motoring, however. Taxes on import or purchase are higher in SSA than in high-income countries: for instance, a five-year-old 1,600cc vehicle costing $5,000 pre-tax attracts an average tax of $3,840 in SSA, compared with $2,410 in middle- and upper-income countries. This may reflect industrial policy or administrative considerations, but these taxes do not target the marginal social costs of vehicle use well, and many countries could consider reducing these taxes.

5. Taxes on fuel are better targeted at the social costs of motoring. These taxes are low in many SSA countries, with the average less than a third of that in middle- and high-income countries, although there is wide variation across SSA countries. Some SSA countries

could increase official fuel taxes, eliminate under-collection or make fuel price stabilisation programmes transparent and sustainable. Such reforms are administratively feasible and would be progressive too, although mitigating measures may also be needed for low-income households.

6 SSA countries rarely use vehicle ownership taxes, and they could consider increasing or introducing them in a way that differentiates across location (to capture congestion externalities) and vehicle emissions (to capture pollution externalities).

7 The administration costs of congestion charging schemes are almost certainly prohibitive except in the largest cities. Elsewhere, a simpler but labour-intensive way of addressing city congestion and pollution could be parking charges and permits.

1. Introduction

Over the last 20 years, sub-Saharan African (SSA) countries have experienced significant economic growth and consequently growing levels of motorisation. Though overall levels of motorisation in SSA are still relatively low, with a high number of poor-quality vehicles concentrated in large cities, social and environmental problems associated with motoring are becoming more pressing. Because individual drivers do not consider the wider social impacts of their motoring, governments need to intervene to achieve efficient motoring outcomes.

Government policies to address the problems arising from motoring can include non-tax policies, including regulation and enforcement. For example, roadworthiness tests on imported cars are a good policy option to improve vehicle quality (UNEP, 2020), whilst taking steps to improve road safety and licensing are important to reduce road fatalities (WHO, 2018). However, in this report, we focus on the use of tax policy to appropriately price the externalities of motoring.

This report contributes to ongoing policy debates on motoring taxation in SSA by describing the principles of motoring taxation and key issues and policy options for the region. Where appropriate, we draw on case studies, including from the TaxDev programme's four partner countries (Ethiopia, Ghana, Rwanda and Uganda). Case studies are useful to understand particular design issues and challenges in more detail.

We begin in Chapter 2 by discussing the principles of motor taxation. We set out the main externalities associated with motoring and assess how well targeted the main categories of vehicle taxation – taxes on fuel, congestion charges, taxes on vehicle ownership and taxes on the purchase of vehicles – are at addressing them. Successful motoring taxes are also simple to administer, and raise revenue in a sustainable way. We also draw on microsimulation data from Rwanda and Ghana to document the potential progressivity of motor taxation.

In Chapter 3, we describe the economic and environmental context under which decisions on appropriate motoring taxes need to be made in SSA, and compare this context with the rest of the world.

In Chapter 4, we review the existing configuration of motoring taxes in SSA. We present new data on the level of fuel taxes, taxes on vehicle ownership and vehicle purchase taxes in the region, and compare tax levels with those in middle- and high-income countries. We also present data on fuel and vehicle import tax revenues for Ethiopia, Ghana, Rwanda and Uganda.

In Chapter 5, we detail reform experiences in SSA, with case studies of fuel subsidy reform in Ghana, Mauritania, Namibia, Niger and Nigeria, and of motor taxation reform in Malawi, Uganda and Mauritius. In all of these case studies, we document the key lessons that can be drawn on by other governments.

We conclude in Chapter 6 by discussing potential policy options for countries in SSA. Differences in existing tax structures mean the options for different countries differ – with some having scope to raise substantial additional revenues, while others should focus more on improving the efficiency and design of their motoring tax systems.

2. Principles of motor taxation

The manufacture and especially the use of motor vehicles imposes a wide range of costs not borne by the purchaser and user, including via accidents, congestion, noise, pollution, and road damage. As drivers are unlikely to take account of the full impact of these wider costs (termed 'externalities') when they make their decisions, they will drive more than is socially optimal, and purchase and use more polluting and less fuel-efficient vehicles than is socially optimal. However, the tax system can be used to help correct for this market failure, by ensuring drivers face a 'price' (via a so-called 'Pigouvian' tax) for the costs that they impose on others when they choose to drive. Moreover, as we explain below, motoring taxation can also be an important contributor to overall revenues, and may also play a role in redistributive tax policy.

It is important to state from the outset that we do not consider the role of motoring taxes in industrial policy in this report. This may in fact be a major influence on policy in SSA – in particular, in the form of taxes on the importation of vehicles, which might be motivated by a desire to encourage the development of a domestic car manufacturing industry. While the theoretical case for industrial policy can be strong in some cases (Rodrik, 2008), broadly the literature suggests that it is difficult for governments to choose the right tax / subsidy and trade policies and to 'pick winners' (Harrison and Rodríguez-Clare, 2010; Warwick, 2013). Moreover, this literature suggests that 'hard' policies focusing on directly changing relative prices are less effective than 'soft' interventions that foster productive collaborations between and across governments, industries and clusters.

In light of this, the rest of this report focuses squarely on the environmental and other social costs (and benefits) of motorisation, and their implications for tax policy. This chapter sets out the economic principles for motoring taxation, and identifies which types of tax (such as taxes on use, ownership and purchase) are best targeted at addressing the negative externalities associated with motoring. It also discusses how issues such as administrative feasibility may constrain which taxes can be used in practice.

2.1 Externalities, efficiency and equity

There are three main reasons for taxing motor vehicles and motoring differently from other goods and services:

- the 'externalities' associated with the manufacture and especially the use of motor vehicles;
- the potential for motoring taxes to represent an efficient form of taxation if they are difficult to avoid or evade and / or if consumers are less responsive to them than to other taxes;
- the potential for motoring taxes to help increase the progressivity of the tax system, if the purchase or use of motor vehicles is particularly concentrated amongst affluent population groups.[1]

Externalities: the social costs of motoring

An individual's choice of whether to purchase and use a motor vehicle will be based on weighing the benefits they receive (such as the speed and convenience of driving relative to other forms of transport) against the costs they incur (such as the purchase price of the vehicle and the cost of fuel). However, the cost of purchasing and running the vehicle typically does not capture the wider costs that their vehicle purchase and driving impose on wider society. These external costs, or *externalities*, include congestion, local air pollution, road deaths and the contribution to climate change.

[1] In the standard optimal tax setting with separable preferences between leisure and consumption and the presence of a non-linear income tax, differentiated consumption taxes are always suboptimal (Atkinson and Stiglitz, 1976), as redistribution is more efficient via a non-linear income tax. However, if the use / purchase of motor vehicles is particularly unresponsive to taxation, and / or acts as a 'tag' that helps to identify individuals with high ability or resources, motor taxes could improve the 'efficiency of redistribution'. This may be especially likely to be true in SSA, where income information and income taxation are limited. Motor taxation could also improve progressivity if there are constraints on the extent of redistribution with other tax instruments, e.g. for political economy reasons.

Congestion

An additional vehicle on the road may increase journey times for other drivers. This time has an economic value: instead of sitting in traffic, drivers and passengers could be working or enjoying their leisure time; taxi and goods transport drivers lose income; and emergency vehicles may take longer to respond to accidents, crimes and fires. In addition, congestion exacerbates air pollution: traffic jams both increase overall levels of emissions as journeys take more time and fuel, and lead to a concentration of emissions in those areas where the jams occur. Although the cost of congestion is mostly felt by other motorists who are themselves contributing to congestion, it is still an externality arising from motoring, as each individual motorist is unlikely to consider the effects that their driving has on the journey time of *other* motorists.

However, these congestion externalities only exist when a road is at least moderately busy – when there are few vehicles on the road, an additional vehicle will not increase journey times for other motorists. As such, the cost of congestion varies substantially depending on where a vehicle is driven (congestion is more likely in densely populated urban areas than in sparsely populated rural areas) and the time the vehicle is driven (congestion is more likely at peak travel times than in the middle of the night).

Local air pollution

Motor vehicles emit pollution in the form of small particulates: PM10, referring to particulates less than 10 microns in diameter, and PM2.5, referring to particulates less than 2.5 microns in diameter. These particulates are small enough to enter the lungs, leading to respiratory and cardiovascular health problems, especially in the young and elderly. PM2.5 particulates are small enough to enter the bloodstream, and have been identified as possible causes of cancer (WHO, 2013). In addition, cars with internal combustion engines also produce nitrogen oxides, which have also been linked to respiratory problems in children.[2] Even all-electric cars contribute to particulate pollution, due to the brake and car tyre dust that all cars create when driven, especially on poorly surfaced roads.

[2] https://www.who.int/news-room/fact-sheets/detail/ambient-(outdoor)-air-quality-and-health#:~:text=%22WHO%20air%20quality%20guidelines%22%20estimate,related%20deaths%20by%20around%2015%25.

The World Health Organisation (WHO) estimates that globally 4.2 million people die prematurely due to air pollution each year around the world. The contribution of motoring to air pollution varies substantially both across and within countries, but it has been estimated that in Africa, 17% of PM2.5 pollution and 34% of PM10 pollution originates from road traffic (Karagulian et al., 2015).

The quantity of particulates emitted depends on a range of factors, including fuel efficiency, but also whether a vehicle is fitted with a catalytic converter or other filters, to filter out polluting substances. However, these devices must be properly maintained (Nieuwenhuis, 2017), and are sometimes removed before export to lower-income countries (UNEP, 2020).

The impact of a given quantity of emissions will also vary across places, depending both on existing pollutant levels (with significant health impacts once emissions exceed certain benchmark levels) and on the number of people who live or work close by and hence are exposed to the ill effects of the emissions. This means greater negative externalities from driving on already busy roads in areas with high population or employment density.

Road deaths

There would be no road deaths without vehicles on the road, and the social impact of vehicles includes the costs of the accidents caused by vehicles. Whilst other policy tools, such as road design, drink-driving policy and the quality of healthcare, are important to reduce road deaths, WHO (2018) also points to the need to address vehicle quality.

Climate change

The vast majority of cars use fossil fuels in internal combustion engines, and therefore emit carbon dioxide when driven. This contributes to climate change, which is affecting and will continue to affect people worldwide.

Globally, emissions of carbon dioxide from road transport account for 11.9% of all greenhouse gas emissions.[3] And though, as highlighted later in the report (see Figure 3.6), this percentage is smaller in sub-Saharan Africa, this does not mean the

[3] https://ourworldindata.org/emissions-by-sector.

negative effects associated with each additional kilogram of carbon dioxide emitted are any lower than elsewhere in the world.

The majority of carbon dioxide emissions come from a vehicle’s fuel use, and will depend on the fuel efficiency of a vehicle. However, 11% of all carbon dioxide emissions over the lifetime of the vehicle are ‘embedded’ emissions that are associated with the manufacture of the vehicle (Transport and Environment, 2020[4]). Tax policy must therefore be set considering both the reductions in emissions – due to greater fuel efficiency, for example – and increases in emissions – due to manufacture and delivery – associated with the manufacture and purchase of new motor vehicles.

Other negative externalities

Driving is also associated with other external costs including:

- increased street noise, which is not only a nuisance, but may also have negative health and economic consequences, especially where it interferes with sleep (Bessone et al., 2020);
- wear-and-tear of road surfaces, requiring maintenance that is typically funded from general government revenues rather than the users of specific roads.

Table 2.1 summarises the types of negative externalities, and how they vary based on the time and place of the driving, or the type of vehicle.

[4] Figure for mid-sized petrol car in the European Union, using Transport and Environment’s online tool: https://www.transportenvironment.org/what-we-do/electric-cars/how-clean-are-electric-cars.

Table 2.1. Summary of motoring externalities

Externality	Varies by:
Congestion	Time and place of driving
Greenhouse gases (contribution to climate change)	Fuel efficiency of the vehicle
Local air pollution	Time and place of driving Fuel efficiency and emissions standards of the vehicle
Road traffic accidents	No clear variation[5]
Street noise	Time and place of driving Noise of the vehicle
Road maintenance	Weight of the vehicle

Positive externalities: mobility and agglomeration

The examples noted above are all negative externalities. However, vehicle use may also have certain positive social impacts. As shown in Chapter 3, vehicle ownership is much lower in sub-Saharan Africa than in the rest of the world, and rural areas in particular might benefit greatly from increased vehicle use. Low mobility in rural areas has consequences for wider economic development, with farmers having to resort to carts and bicycles to get goods to markets, and citizens facing long journeys to access education, healthcare and other important services.[6] To the extent that motorisation facilitates access to these services, which themselves generate positive social returns, there is a case for encouraging vehicle use. Motor vehicles may also increase market connectedness and market size, and allow potential agglomeration benefits to be exploited. Especially in countries with very low levels of motorisation, policymakers therefore need to weigh the negative costs of vehicle use against its developmental benefits.

5 UK data suggest that more accidents happen in urban areas but more fatal accidents happen in rural areas (Cabrera-Arnau, Prieto Curiel and Bishop, 2020).

6 https://www.ukcdr.org.uk/case-study/low-mobility-in-rural-africa/.

Estimates of the costs of negative externalities

Designing tax policy to properly address these external costs requires estimates of their scale, i.e. the monetary equivalent of the additional marginal social cost that vehicle purchase and use impose on top of private costs. These estimates then determine what amounts should be levied on top of the market price of a vehicle or fuel, or as a fee in order to use roads in particular places at particular times, to restore market efficiency. Estimates of these monetary values are typically obtained either by surveys of how much people are willing to pay to avoid facing the externality in question (such as the noise or pollution) or by inferring values from observed economic data (such as market wages for the time lost to congestion). In practice, though, both approaches are difficult and time-consuming, and any quantification of overall motoring externalities for countries in SSA is beyond the scope of this report.

In theory, whether these costs vary across different contexts depends on the externality considered. The externality of global climate change, for instance, is a global externality which does not depend on where and when a greenhouse gas is emitted. This would suggest that efficient tax policy would price this externality from motor vehicle usage equally around the world.[7] For other externalities, the marginal social cost in a given context is likely to vary more. As suggested above, market wages are often used to value the time lost to congestion; thus, in lower-income countries, the absolute value of this externality will be lower, implying lower taxes in absolute terms. Quantifying externalities associated with health risk is understandably more controversial but is typically related to a population's willingness to pay for risk reductions; this again suggests that policymakers should select tax *levels* that are increasing in local incomes. On the other hand, pollution, congestion and accidents are higher in lower-income countries, and the marginal social cost of these issues likely increases with how much is produced (a level of pollution below the WHO limit may be fine, whereas a level of pollution five times greater than the WHO limit is a significant risk to health). This would justify taxes being higher as a *proportion* of local income than in high-income countries.

[7] This is true for a policymaker considering the full social cost of the greenhouse gas emission. If only considering the social cost imposed on their own country – the citizens of which bear a fraction of the global cost – then policymakers might opt for lower-than-optimal taxes on this externality.

Table 2.2. Contributions of different externalities to the overall social costs of driving in Chile (Santiago), India (Delhi) and the UK

	Externality as a proportion of total externalities					
	UK, 2015		Santiago (Chile), 2015		Delhi (India), 2005	
Type of externality	Off-peak	Peak	Off-peak	Peak	Off-peak	Peak
Congestion	61%	84%	63%	89%	40%	93%
Greenhouse gases (contribution to climate change)	10%	4%	3%	1%	N/A	N/A
Local air quality	3%	1%	17%	5%	34%	5%
Accidents	24%	10%	13%	4%	8.5%	1%
Noise	1%	0.4%	3%	0.8%	17%	1%
Road maintenance	1%	0.4%	0.0%	0%	N/A	N/A
Marginal external cost of motoring (2019$/km)	0.12	0.29	0.16	0.54	0.023	0.16

Note: The papers use slightly different methodologies.

Source: Adam and Stroud, 2019; Rizzi and De La Maza, 2017; Sen, Tiwari and Upadhyay, 2010. Exchange rate and CPI inflation data from the World Bank.

Table 2.2 provides an overview of the costs associated from three studies considering Chile (namely, its capital Santiago), India (again, its capital, Delhi) and the UK (the whole country). It shows that across all countries considered, congestion is the single largest source of motoring externalities, and this externality is substantially larger at peak times. For example, in the UK, the cost to wider society of a kilometre (km) driven is estimated to be $0.12 during off-peak times, but this more than doubles to $0.29/km at peak times, when an additional vehicle on the road has a much larger effect on other drivers' journey times. This effect is even higher in urban areas, where the cost can reach $1.10/km driven at peak times.

After congestion, the next most significant externalities are accidents, which vary between 8.5% and 24% of off-peak externalities, and local air quality, which is 17% and 34% of total externalities in the developing countries of Chile and India respectively.

In developing countries, wage levels are lower so the value of each hour spent in traffic is lower. However, in Santiago and Delhi, this is offset by the fact that the level of congestion is much higher than in the UK as a whole. This means not only does each driver spend more time stuck in traffic, but also their presence on the road has a bigger knock-on effect for other drivers' journey times. As a result, the motoring externalities in Santiago and Delhi at peak times are $0.54/km and $0.16/km respectively, despite lower wage levels (much lower in the case of Delhi).

Raising revenues efficiently and equitably

Taxes on vehicles to deal with the externalities associated with motoring also generate revenue for the government. This means that even if the manufacture and use of motor vehicles were not associated with any negative externalities, higher taxes on motor vehicles and motoring than on other goods and services may still be justified if they enable the government to raise revenues more efficiently and equitably. When the UK adopted its fuel and vehicle taxes in the early 20th century, the main goal was to raise revenue, as knowledge about the environmental and social costs of motoring was limited (Mirrlees et al., 2011).

There are three reasons why higher taxes on fuel and vehicles could be justified, even if fuel and vehicles did not create externalities:

1. Fuel and vehicles are typically imported and sold by state-owned institutions and large businesses (Kojima, 2016), so taxes on them are harder to evade (Liu, 2013).
2. Demand for fuel is relatively unresponsive to the price of fuel, so the government can set a high level of tax without creating economic distortion and losing revenue through lower demand.
3. Fuel and vehicles are more likely to be consumed by the rich, at least in low- and middle-income countries, so taxing them is progressive.

The fact that taxes on fuel and vehicles are hard to evade is particularly likely to be true in sub-Saharan Africa, where the vast majority of vehicles and fuel are imported, allowing for taxation at the point of import. Annual taxes on vehicle ownership cannot be collected in this way, but vehicles are observable physical assets, and in some cases are status goods that owners want to be observed. This may mean vehicles and especially luxury vehicles can be used as an indicator of or proxy for income and wealth, helping to address issues relating to non-declaration or under-reporting of incomes in income tax returns.

In addition, taxes on fuel in particular have relatively small distortionary effects. Taxes are said to cause economic distortion when individuals, who are willing to pay the pre-tax price, are unwilling to pay the post-tax price. Demand for fuel is fairly unresponsive to a change in the price of fuel – Huntington, Barrios and Arora (2019) find that, on average for low- and middle-income countries, a 10% increase in the price of fuel leads to a 1.2% reduction in demand for fuel (in the long term), which is generally lower than elasticities on other goods.

More generally, taxes on motoring are typically progressive in low- and middle-income countries, as richer individuals are more likely to purchase, own and drive vehicles. For the same reason, subsidies are often regressive, benefitting richer individuals more. For example, an IMF study (Coady, Flamini and Sears, 2015) on global fuel subsidies found that, on average for Africa, 73% of the direct benefit of subsidies for petroleum / gasoline accrue to the top 20% by consumption, whilst only 1.5% of subsidy benefits accrue to the bottom 20%.[8] Box 2.1 discusses how expenditure on motoring and vehicle ownership varies across the household consumption distribution in Ghana and Rwanda.

8 Subsidies for kerosene are relatively more progressive.

Box 2.1. Motoring taxes are progressive in sub-Saharan Africa: Ghana and Rwanda

Figure 2.1 shows the share of consumption that public transportation, vehicle purchases, and petrol and diesel purchases represent by overall household consumption decile in Ghana. It suggests that the richest households spend by far the largest share of their budgets on motorised transportation. On average, the top decile spends 3.1% on petrol and diesel, 4.7% on vehicle purchase, and 6.5% on public transit. The bottom decile spends just 1.0%, 0.7% and 2.2% respectively on each of the categories.

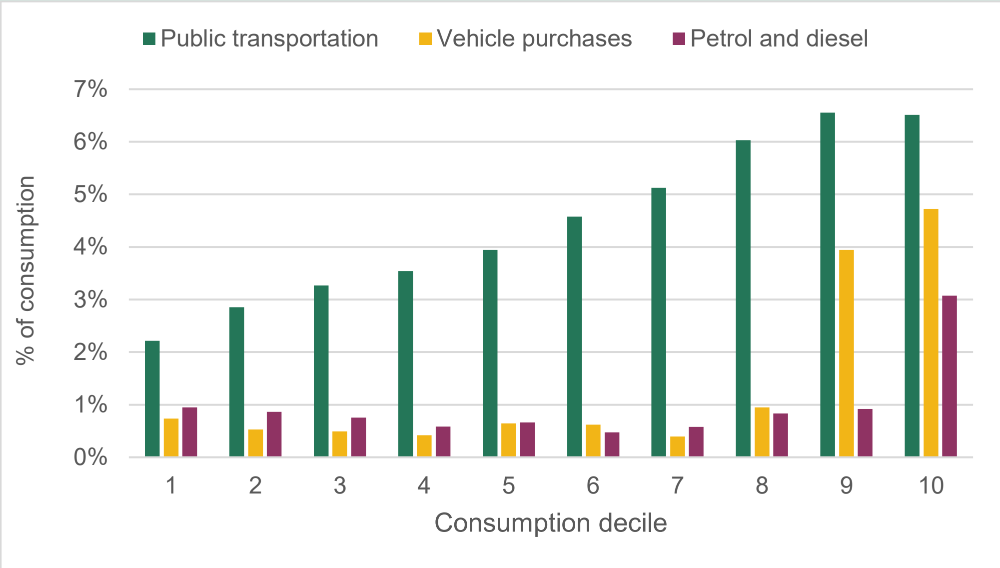
This analysis suggests that motoring taxes would be progressive in the sense that a larger burden would fall on better-off households. Nevertheless, some of the burden would fall on low-income households, especially if public transit became more expensive.

Figure 2.2 shows that car ownership is highly concentrated in the top deciles, with 23% of households in the top decile of the consumption distribution owning a car, whereas poorer households are more likely to have motorcycles.

Figure 2.3 repeats the analysis from Figure 2.1 for Rwanda. The concentration of vehicle purchases and petrol / diesel consumption is even higher in Rwanda, with it being almost exclusively accounted for by the top two quintiles. As with Ghana, consumption of public transportation is more evenly distributed across the consumption distribution.

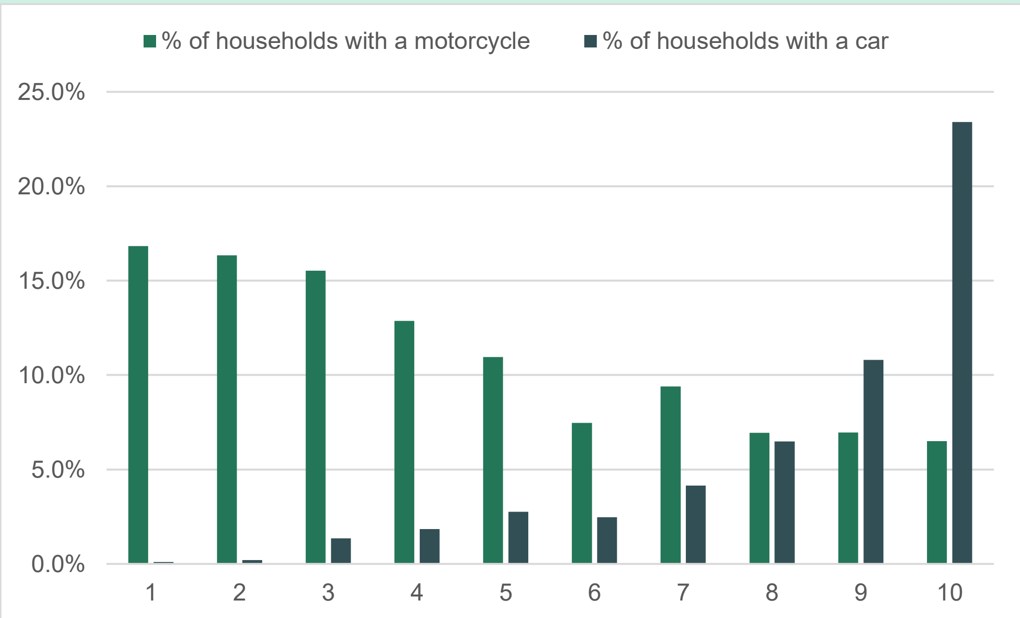
The results from Ghana and Rwanda suggest that motoring taxes can be highly progressive as direct consumption of fuel and vehicles (specifically cars) is strongly concentrated at the top of the distribution. However, the poor may suffer indirectly, if higher taxes lead to increased public transportation prices (or prices in other vehicle-related sectors), so governments will still need to think carefully about the distributional effects of increases in taxation of fuel in particular.

Figure 2.1. Motoring as a share of household consumption in Ghana



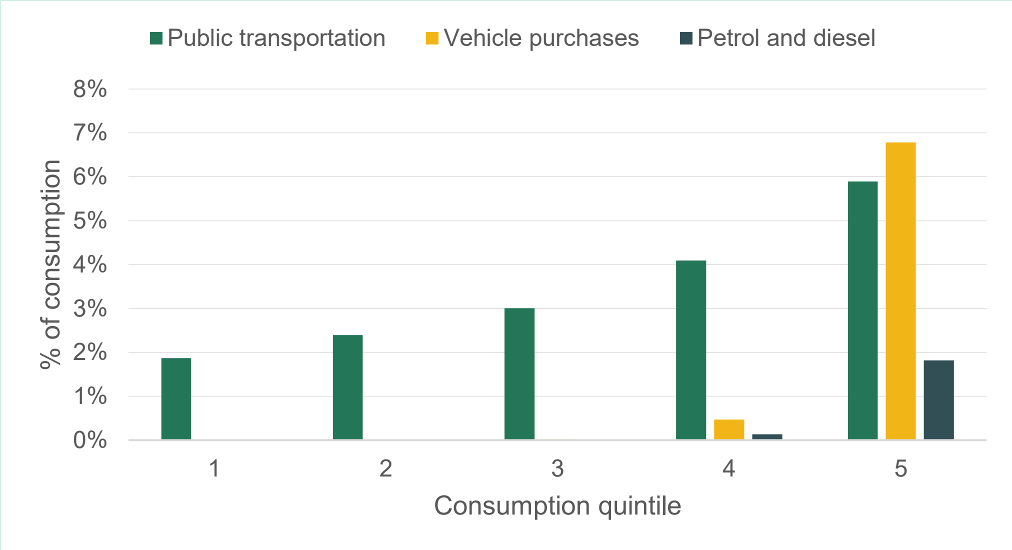
Note and source: Ghana Living Standards Survey 7. Consumption measure is that constructed by the statistical office. It includes consumption of own production. Expenditure variables only include monetary expenditure (non-monetary expenditure is very tiny for these categories).

Figure 2.2. Vehicle ownership by consumption decile, Ghana



Source: See Figure 2.1.

Figure 2.3. Motoring as a share of household consumption in Rwanda



Note and source: Integrated Household Living Conditions Survey, EICV5 (2016/17). Expenditure includes purchases (food, non-food and annualised durable goods) and not own production. Aggregated using weighted survey micro-data. Consumption includes subsistence and own food production. Aggregated using weighted survey micro-data. Expenditure and consumption refer to households only. Public transportation includes moto-taxis. Quintiles are defined by the statistical office.

2.2 The role of different tax instruments

The fundamental issue in the design of motor taxation is that the externalities arising from motoring vary depending on the time and place of driving, the type of vehicle being driven, the manner of driving and how frequently the vehicle is changed. In principle, technology could be used to track each driver and vehicle, and charge a tax that varies according to the fuel efficiency of the car, the type of fuel, the time and the place of driving (and perhaps even the income level of the driver). However, in practice, this type of system would be incredibly difficult and expensive to design and operate, may be subject to evasion (e.g. if tracking devices could be removed) and could prompt major privacy concerns among citizens.

In the absence of such a system, motoring taxes must necessarily target proxies for the externalities caused by motoring. Tax instruments that do this include:

1. taxes on the fuel used by vehicles;

2. taxes on driving motor vehicles, which may depend on the time and location of use – such as congestion charges;
3. fees for parking motor vehicles on public highways;
4. taxes on vehicle ownership, such as annual registration or licensing fees;
5. taxes on vehicle purchase, such as excise taxes.

Each of these instruments targets different externalities to different extents, and they can play different roles in helping ensure an efficient and equitable tax system.

Taxes on motor fuel and vehicle usage

The majority of the externalities described in the previous section are related to vehicle *use*: apart from the carbon emissions and other pollution generated during its production, a parked car does not harm anyone. Therefore, taxes related to vehicle use, such as taxes on fuel or congestion charges, most closely target the main negative externalities associated with motor vehicles.

Taxes on fuel

Greenhouse gas emissions are almost directly proportional to fuel consumption, and, as such, a tax on fuel is well targeted at this externality. Fuel consumption is also correlated with total distance driven, and through this is correlated with congestion, noise, air pollution, accidents and road deterioration. A tax on fuel will therefore incentivise drivers to drive less, reducing congestion, accidents and road deterioration.

Fuel taxes are not perfectly targeted at these other externalities, however. Drivers with fuel-efficient vehicles are equally likely to cause congestion, accidents and road deterioration as drivers with fuel-inefficient vehicles, but are taxed less under a fuel tax. As Table 2.2 showed, the costs of congestion vary dramatically depending on whether a vehicle is driven at a peak or off-peak time, but a fuel tax is the same for peak and off-peak driving (except to the extent that some fuel is used while stuck in traffic). As such, a fuel tax on its own will result in a less than optimal level of driving in quieter areas / times, and a more than optimal level of driving in busier areas / times. Furthermore, as shown in Appendix Figure A1.1, fuel efficiency is generally correlated with lower particulate emissions, but this correlation is very far from perfect. As such, taxes on fuel only partially target the externality associated with local air pollution.

Turning to equity issues, as Figures 2.1 and 2.3 showed, fuel consumption is concentrated at the top end of the consumption distribution, such that taxing fuel is progressive. However, public transport is less concentrated, so exemptions / rebates could be made for public transport (and other vehicle-intensive sectors) to maximise the progressivity of the fuel tax.

One further potential benefit of fuel taxation worth noting is that because fuel is either imported or refined at large refineries (Smith, 2006), administration and compliance issues and costs are generally lower than for taxes that need to be collected domestically from a high number of individual taxpayers. However, schemes to provide rebates, discounts or exemptions for particular types of users – such as commercial vehicle operators or farmers – can add significant complexity to administrative arrangements and significantly increase the risk of tax evasion through onwards sale of fuel to other consumers.[9]

Congestion charging / parking fees

Another type of tax on vehicle use is congestion charging. Congestion charging schemes charge drivers to enter a certain location at a certain time. For example, in London in the UK, drivers are charged approximately $20 to enter central parts of the city between 7am and 10pm every day.[10]

Congestion charging better targets the congestion externality than other types of taxes, but is still not perfect given that congestion is not constant across the zone and over time. More complex road pricing schemes are possible, such as in Singapore, where drivers are charged a varying fee based on the road they drive on and the time of day.

In terms of targeting and progressivity, it is possible and common to give exemptions or reduced rates to taxi drivers, motorcyclists, public transport (e.g. buses / coaches), and goods transport drivers, such that the tax is focused on the drivers of private cars, a typically very affluent group in SSA.

9 In the UK, diesel fuel for agricultural and non-road vehicles is taxed at a lower rate. To prevent fraud through resale to road vehicles, the fuel is dyed red and police have the power to check a vehicle's fuel colour. Evasion still persists, however.

10 https://tfl.gov.uk/modes/driving/congestion-charge.

The main disadvantage of a congestion charge is the high cost of setting up and operating such a system. Congestion charges typically involve setting up automatic number plate recognition cameras on the border of the congestion charging zone, which are able to track vehicles coming in and out. Drivers pay the congestion charge online, and non-payers are tracked and fined. In London, up-front investment was $245 million, and ongoing costs are around $70 million, in comparison with annual revenues of $350 million (van Amelsfort and Swedish, 2015). Given the high cost of set-up and administration of a congestion charging scheme, it is probably less feasible in all but the largest and / or most developed cities in SSA: traffic volumes and fee levels are less likely to be sufficient to cover costs.

Increasing parking charges can also be used to reduce congestion, by increasing the effective cost of driving in the city. Although the government or city authorities may not have control over off-street parking, they often do have control over on-street parking, and the Institute for Transportation and Development Policy notes that on-street parking charges in East Africa are substantially cheaper than off-street equivalents (ITDP, 2021).

Parking charges can also be differentiated by location and by time of day. As operating parking charges is more labour-intensive and less technology-intensive than congestion charging, it may be a more feasible policy option than congestion charging.

Rather than implement charges, some developing countries have implemented restrictions on vehicle use in particular areas. For example, Delhi introduced a rule that banned car use on alternate days based on whether a licence plate number was odd or even. Kreindler (2016) found that this system was easily abused, as most drivers either bought an additional vehicle or bought an additional licence plate that they would switch daily. Similar evasion outcomes were found in response to the same policy in Mexico City (Davis, 2008). The city of Jakarta implemented a slightly different policy that all cars driving at peak times on certain roads must carry at least three passengers (Hanna, Kreindler and Olken, 2017). The disadvantage of these types of bans, when compared with a congestion charge, is that they do not raise revenue, and they apply to everybody irrespective of how much they value driving. A congestion charge allows those who really value it to continue to drive. On the other hand, a concern with congestion charges is that they only allow the rich to drive.

It should be noted that toll roads are more common than congestion charges. They typically apply to stretches of highways or bridges (e.g. Kampala–Entebbe highway, Uganda’s first toll road). Although toll roads do discourage driving by making it more expensive, they are not a ‘congestion charge’ as they do not necessarily target the most congested roads. Tolls are usually implemented to finance a new road rather than for congestion management; however, by adjusting them by the time of day and type of vehicle, they can aid congestion management.

Taxes on vehicle ownership

Taxes on vehicle ownership refer to annual taxes on the ownership of a vehicle. Such a tax will reduce the social costs associated with driving by reducing the demand for vehicles. It is an imperfect way to address the externality, as the tax (at least as typically implemented) does not take into account differences in the frequency of driving or differences in the fuel efficiency or particulate emissions of the vehicle.

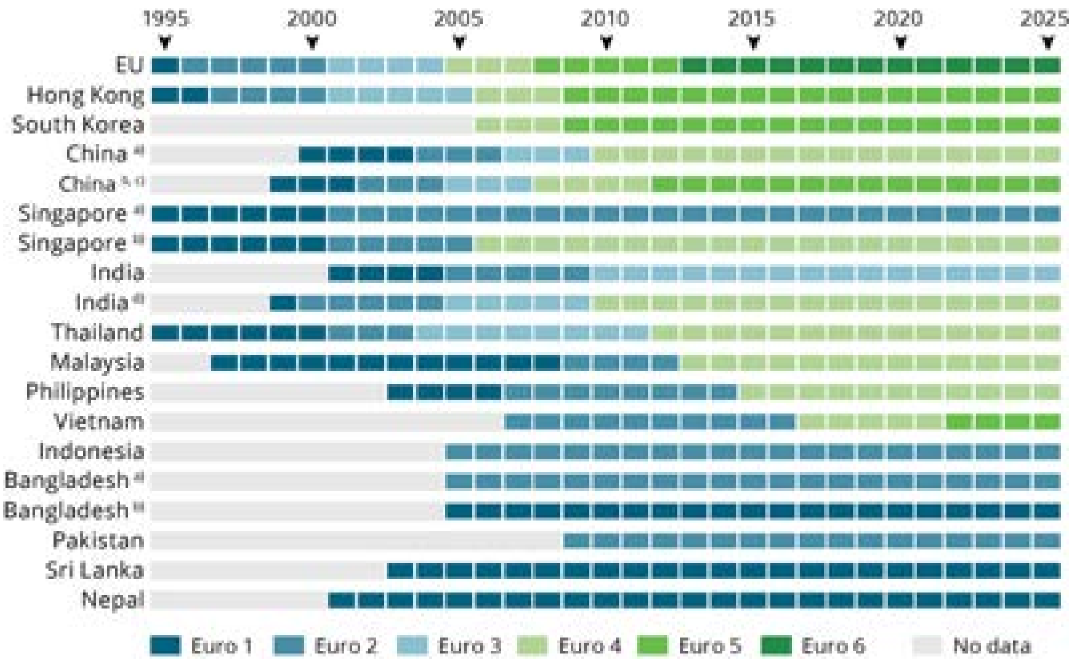
One potential advantage of a tax on vehicle ownership, compared with a tax on fuel or a tax on vehicle purchase, is that it can partially address the congestion externality, which is the single largest externality of motoring. A system that has high ownership taxes for vehicles registered in congested cities would discourage those living in cities from buying cars, whilst not discouraging those who wish to drive in uncongested rural areas. For example, the city of Brussels in Belgium has higher rates of vehicle ownership tax than its surrounding rural areas. However, differentiating vehicle ownership taxes by region creates an enforcement issue, as drivers may register vehicles in low-tax neighbouring regions.

While it is possible to vary taxes directly with emissions, many low- and middle-income countries opt to instead vary taxes based on vehicle age or even to ban the import of older vehicles. The reasoning is that older vehicles are more likely to have poorer fuel efficiency, have higher particulate emissions and be more poorly maintained. (Banning or limiting the importation of older second-hand vehicles may also form part of industrial policy in countries that want to encourage the domestic production of new vehicles.) The relationship between vehicle age and fuel efficiency, and between vehicle age and particulate emissions, however, is not clear. As shown in Appendix Figures A1.2 and A1.3, there are many vehicles from the 1990s and early 2000s that have better fuel efficiency and lower particulate emissions than some vehicles produced recently. A tax that only increases with vehicle age will discourage people from buying older low-emission vehicles, but will not discourage the driving of newer high-emission vehicles.

A tax that varies based on actual fuel efficiency and emissions data, rather than a tax (or ban) that varies by age, would more accurately target externalities related to fuel efficiency, emissions and air pollution. One potential solution would be to base the tax on which variant of the so-called ‘Euro emissions standards’ the vehicle meets. All cars sold in the European Union (EU) after 1992 are required to meet the Euro emissions standards, and these standards have become tougher over time. In addition, many countries outside the EU have made the Euro standards legally binding (Figure 2.4), with lower-income countries generally adopting earlier (less stringent) versions of the standards.

In Africa, Morocco and Rwanda have adopted the Euro 4 emissions standard, whilst Ghana, Nigeria and South Africa have adopted the Euro 2 emissions standard (UNEP, 2020).

Figure 2.4. Adoption of Euro emissions standards in Asia, by country



Note: a) For gasoline cars only. b) For diesel cars only. c) Entire country. d) Select cities.

Source: European Union, via https://www.eea.europa.eu/data-and-maps/figures/number-of-international-environmental-agreements-adopted-1.

A disadvantage of using Euro standards is that a vehicle only meets them at the point of production. Although Greene et al. (2017) find that well-maintained cars do not lose fuel efficiency as the total distance they are driven increases, poorly maintained cars will lose fuel efficiency – a similar trend is likely for particulate emissions. UNEP (2020) notes that cars imported into Africa are often poorly maintained, and many have had their catalytic converter removed (catalytic converters remove gases that contribute to air pollution).

Like taxes on vehicle use, taxes on vehicle ownership are progressive in SSA, given that richer households are more likely to own vehicles. Exemptions for those who rely on their vehicle for work, such as taxi drivers, could be implemented. However, such exemptions can create distortions and open up avenues for evasion as well.

A disadvantage of taxes on vehicle ownership, relative to taxes on fuel and taxes on vehicle import and purchase, is that they cannot be collected at the border and / or predominantly from large taxpayers. Implementation requires a well-maintained database of vehicles in a country – although this is also necessary for licensing – and collecting and enforcing tax payments from potentially millions of vehicle owners. This means administration costs could be relatively high compared with revenues, and substantial evasion is possible if the collection body is under-resourced and unable to effectively monitor the purchase, transfer and destruction of motor vehicles.

Taxes on vehicle purchase

Taxes on vehicle purchase in SSA are, in fact, generally taxes on vehicle imports (most vehicles in SSA are imported). Similar to a tax on vehicle ownership, such taxes make vehicles more expensive, reducing the numbers of vehicles imported and reducing the externalities associated with those vehicles. The discussion in the previous subsection on using higher taxes for vehicles that fail to meet emissions standards, instead of higher taxes based on age, also applies to taxes on vehicle purchase.

From the perspective of the cost of collection, a tax on vehicle imports can be integrated with existing customs and excise tax collection systems. More general purchase taxes could be integrated with domestic sales and excise tax systems. While enforcement of a purchase tax would be more difficult in the second-hand market within the country, governments may not wish to tax the purchase of second-hand vehicles since such purchases do not increase the overall numbers of vehicles (and these vehicles would already have been taxed on their initial purchase).

If a government wanted to protect low- and middle-income people who rely on vehicles for their occupation, such as taxi, minibus and goods transport drivers, an exemption / discount system could be set up, though it should be noted that exemptions can distort economic decisions and can lead to evasion.

The major disadvantage of a tax on vehicle purchase, relative to taxes on vehicle ownership, are that individuals who already own highly polluting cars are disincentivised from replacing them, as taxes are only applicable at the point of initial import or purchase.

2.3 Summary

While motoring can have benefits in terms of increased connectivity and agglomeration, it is also associated with significant negative externalities: carbon and particulate emissions; congestion; accidents; noise; and wear-and-tear of roads. The most efficient system to correct for these externalities would therefore be a system by which drivers are taxed depending on the vehicle they use, how much they drive, and the time and place of driving. However, given administrative, technological and political constraints, some efficiency must be sacrificed to create a feasible tax system.

Taxes associated with vehicle use – such as fuel taxes, congestion charges and parking fees – are relatively well targeted at the externalities associated with driving. Fuel use, for example, is correlated with emissions (especially carbon emissions), distance driven and the time an engine is running. Congestion charging directly targets the costs associated with the use of busy urban roads, but is only cost-effective in the largest cities. Parking fees are often more feasible, although they do not apply to those just travelling through a congested area.

Taxes on vehicle ownership can be made more targeted by varying them according to the location of registration and the emissions associated with a vehicle. Purchase and import taxes can also be varied according to emissions, although they can discourage the replacement of older more-polluting with newer less-polluting vehicles.

Taxes on vehicle ownership and purchase / import can be made more progressive through the use of rates that increase with vehicle value and exemptions or rebates for particular classes of user (similar schemes for fuel taxes are more easily abused). The collection of vehicle purchase and import taxes at the border also has administrative advantages given the existing infrastructure associated with customs controls and taxation.

Table 2.3 shows, for each category of taxation, how well they correct each type of externality, how effectively they raise revenue in a progressive way, and how easy they are to administer.

The exact structure and level of tax that is most appropriate will, of course, depend on the local context. Countries (or indeed regions or cities) where the externalities imposed by driving are greater would generally wish to set higher rates of tax. The level of externalities in turn depends on the level of motorisation, and the patterns of vehicle use: what vehicles are used, and where and when they are used. The next chapter discusses in further detail motoring in sub-Saharan Africa, and the scale of the externalities associated with motoring in sub-Saharan Africa.

Table 2.3. Summary of the extent to which different tax measures target motoring externalities, represent an efficient and equitable way of raising revenue, and are administratively feasible

Type of tax	Tax instrument	Correction of externality	Revenue and progressivity	Administrative ease
Taxes on vehicle use	Taxes on fuel	**High.** Fuel use is generally correlated with most motoring externalities and especially global climate pollution, but high-fuel-economy vehicles are equally likely to cause congestion, accidents and road damage as low-fuel-economy vehicles.	**Medium.** Direct consumption of fuel is heavily concentrated in the top section of the income distribution. However, higher fuel taxes would be less progressive if they increased the price of public transport / other vehicle-reliant sectors. Some governments may wish to provide exemptions / rebates to these sectors.	**High.** Fuel can be taxed on import or distribution from large-scale refineries. Exemptions / rebates to certain sectors would be more difficult to operate.
	Congestion charging / parking fees	**High.** The largest single externality is that of congestion, and a congestion charge penalises drivers who drive at congested times, whilst not punishing drivers who drive at quiet times.	**High.** Congestion charges are progressive, as richer individuals drive more, so will pay more in congestion charge. Exemptions are possible for those who rely on their vehicles for work. Congestion charging tends to generate less revenue than other taxes as it is only targeted at cities and at peak times.	**Medium.** Congestion charging is expensive to maintain. Parking fees may be a cheaper substitute in developing countries.

Type of tax	Tax instrument	Correction of externality	Revenue and progressivity	Administrative ease
Taxes on vehicle ownership	Annual tax on vehicle ownership	**Medium.** Externalities are proportional to usage of the vehicle, rather than to ownership. Taxes on vehicle ownership unfairly penalise those who only wish to drive a little, or in less congested areas. Externality correction can be improved by varying the tax by fuel economy / emissions standard. Taxes on vehicle ownership can be higher in congested cities, which is an easier way of targeting congestion than a fully-fledged congestion charge.	**High.** The tax raises revenue in a progressive way, as richer households own more vehicles. Many countries also tax vehicles progressively, such that higher-value vehicles attract higher taxes. Exemptions can be made for those who rely on their vehicles for work.	**Low / medium.** A national registry of vehicles must be created and maintained, and evasion is likely.
Taxes on vehicle purchase	Excise tax on vehicles	**Low.** Externalities are proportional to the usage of the vehicle, rather than to purchase of the vehicle. Those who already own vehicles have no incentive to get rid of them / replace them with a cleaner model.	**High.** The tax raises revenue in a progressive way, as richer households purchase more vehicles. Exemptions can be made for those who rely on their vehicles for work.	**Medium.** Imported vehicles can be taxed at the borders, but there are evasion possibilities for vehicles sold within the country.

3. The sub-Saharan African context

This chapter describes the motoring and environmental context in which motoring taxes need to be considered in sub-Saharan African. SSA countries generally have a low level of motorisation, but many countries have experienced high rates of motorisation growth, corresponding with high GDP growth. The chapter then considers the four main measures of the negative externalities of motoring discussed in the previous chapter: air pollution, road deaths, congestion and CO_2 emissions. CO_2 emissions are much lower in SSA than the world average, while air pollution deaths and road deaths are higher, although there is significant variation across countries. The chapter concludes with a discussion about the fiscal context of SSA.

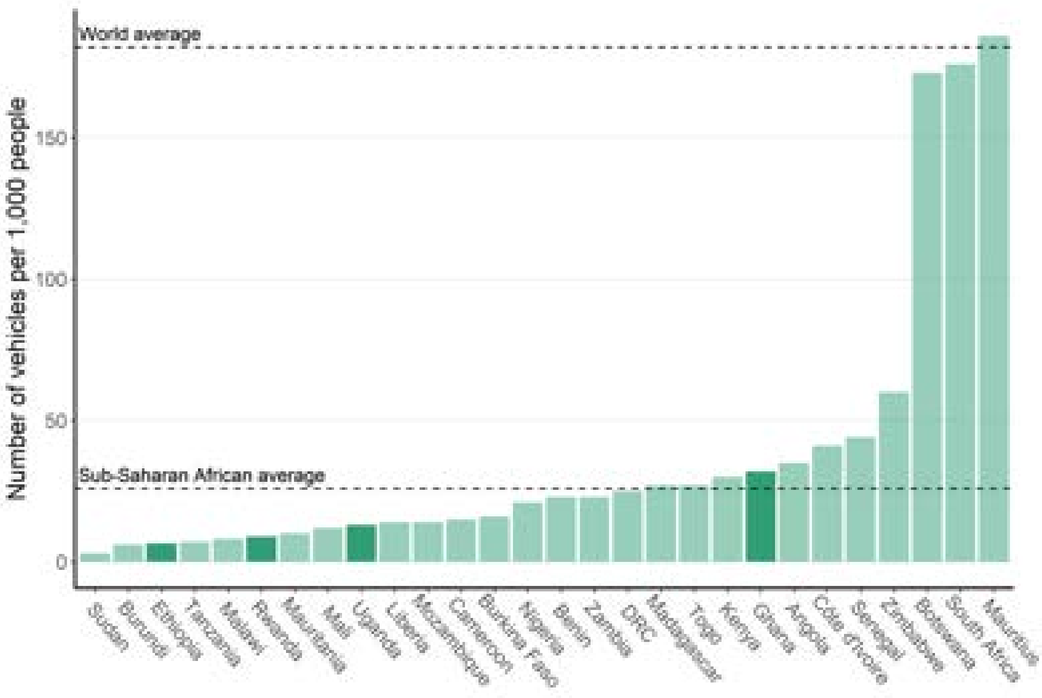
3.1 Motoring in sub-Saharan Africa

The first thing to note is that overall levels of motorisation in SSA are very low. As Figure 3.1 shows, the number of vehicles per 1,000 people was still only 14% of the world average in the middle of the 2010s (the most recent period for which comparable data are available). However, rates of motorisation vary widely across countries. With around 180 vehicles per 1,000, the Southern African nations of Mauritius, South Africa and Botswana, for example, had levels of motorisation around the world average. On the other hand, Sudan, Burundi, Ethiopia and Tanzania, the countries with the lowest rates of motorisation in the region, had fewer than 10 vehicles per 1,000 as of 2015.

Across the region as a whole, the number of vehicles per 1,000 residents increased from 20 in 2005 to 26 in 2015: a 30% increase. However, the rate of growth varied significantly across countries. Ethiopia and Ghana, for example, saw increases of over 300%, albeit from very low bases (and Ethiopia's levels of motorisation remain very low). Zambia, the Democratic Republic of the Congo and Liberia, on the other hand, have seen falls in their rates of motorisation. Figure 3.2 suggests that the relationship between growth in GDP per capita and motorisation is positive but relatively weak, with countries experiencing similar growth rates seeing very different changes in vehicle ownership. In part, this may reflect the fact that GDP growth and household income growth may not be well correlated in a region where many countries are highly reliant on natural resources.

Importantly, in many African countries, motorisation is very concentrated in the largest cities. As an example, Box 3.1 discusses data on the regional distribution of registered vehicles in Ethiopia. Thus, while overall rates of motorisation are low, major urban areas often suffer from significant negative externalities associated with motor vehicle usage.

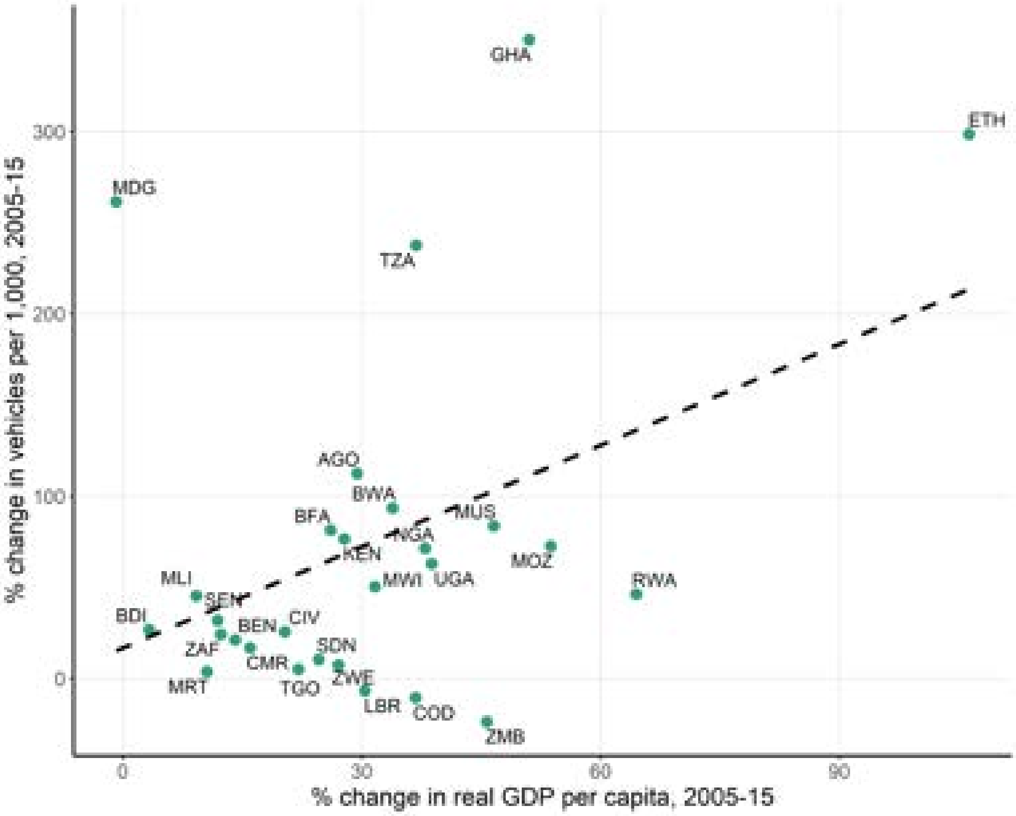
Figure 3.1. Vehicles per 1,000 people, sub-Saharan Africa, 2015



Note: 2015 is the last year for which cross-country data are available. Includes passenger vehicles (both private and for public transport) and commercial vehicles, but not motorbikes. For many countries, values are estimates.

Source: Federal Transport Authority [Ethiopia], Rwanda Revenue Authority [Rwanda], OICA [other countries].

Figure 3.2. Growth in vehicles per 1,000 inhabitants and in real GDP per capita, sub-Saharan African countries



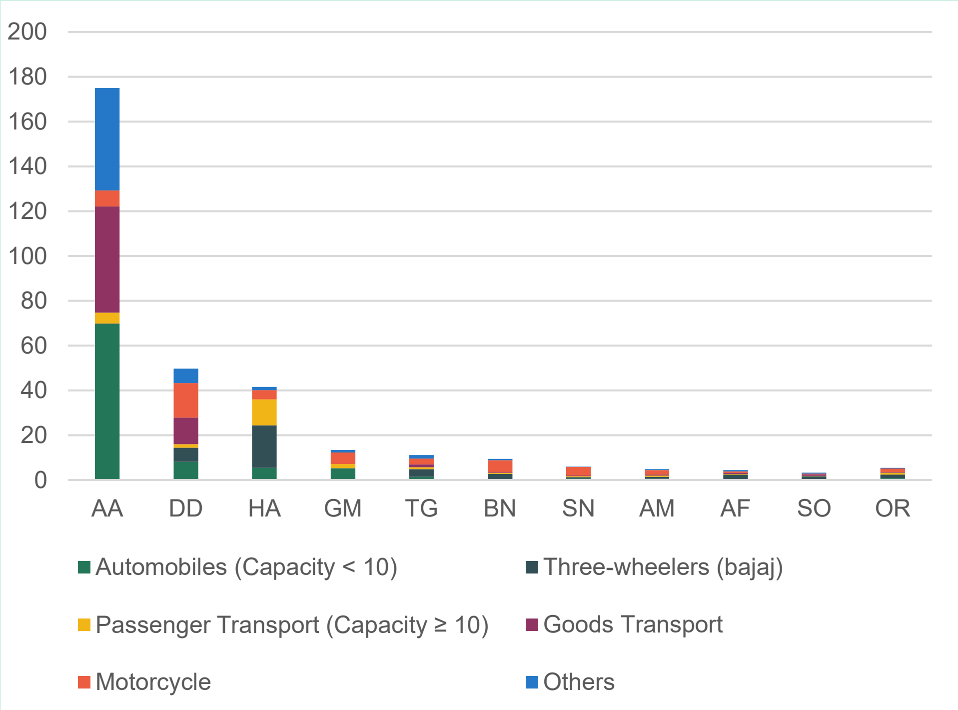
Note: 2015 is the last year for which cross-country data are available. Includes passenger vehicles (both private and for public transport) and commercial vehicles, but not motorbikes. For many countries, values are estimates. The dashed line is the least squares regression line.

Source: Federal Transport Authority [Ethiopia]; Rwanda Revenue Authority [Rwanda]; OICA [other countries]; World Bank.

Box 3.1. Geographic concentration of motoring: Ethiopia

Figure 3.3 shows the number of vehicles per 1,000 residents by region in Ethiopia, highlighting how concentrated vehicle ownership is in Addis Ababa. In the capital, there are almost 180 vehicles (excluding motorbikes) per 1,000 people, a level close to the world average. On the other hand, Oromia, a largely rural region of 37 million people, only has 230,000 vehicles, or 6 vehicles per 1,000 people. Addis Ababa accounts for half of all vehicles in Ethiopia, and 94% of Ethiopia's cars. The only category of vehicle that is more prevalent outside of Addis Ababa is three-wheelers (bajaj).

Figure 3.3. Vehicles per 1,000 inhabitants in Ethiopian regions, 2019



Note: AA is Addis Ababa; DD is Dire Dawa; HA is Harari; GM is Gambela; TG is Tigray; BN is Benishangul; SN is Southern Nations; AM is Amhara; AF is Afar; SO is Somali; OR is Oromia.

Source: Data provided by the Federal Transport Authority of Ethiopia.

This is a story that is repeated across Africa – data from Ghana show that 73% of all vehicles in 2015 were registered in Accra or Kumasi, despite having only 24% of Ghana's population (Essel, 2016). Lagos accounts for 42% of all vehicles in Nigeria (Danne Institute for Research, 2020; Nigerian National Bureau of Statistics, 2018[11]), despite having just 7% of Nigeria's population.

[11] Data for the total number of vehicles in Nigeria are only available for 2018.

It is also important to note that the prevalence of low-quality vehicles is a recurring theme in sub-Saharan Africa. SSA is heavily dependent on used vehicles from richer regions of the world, and the quality of these vehicles is questionable. UNEP (2020) found that among vehicles due to be exported to West Africa from the port of Rotterdam (the Netherlands), most would not have passed European roadworthiness tests, they had an average age of 16–20 years, and most did not meet Euro 4 standards.

3.2 Environmental and social issues

As discussed in Chapter 2, vehicle use is associated with a host of environmental and social problems, such as air pollution, congestion, road traffic fatalities and greenhouse gas emissions. The first three are significant problems is SSA despite relatively low levels of motorisation overall, and while greenhouse gas emissions are relatively low, many countries have an aim of reducing the carbon intensity of their economies.

Air pollution

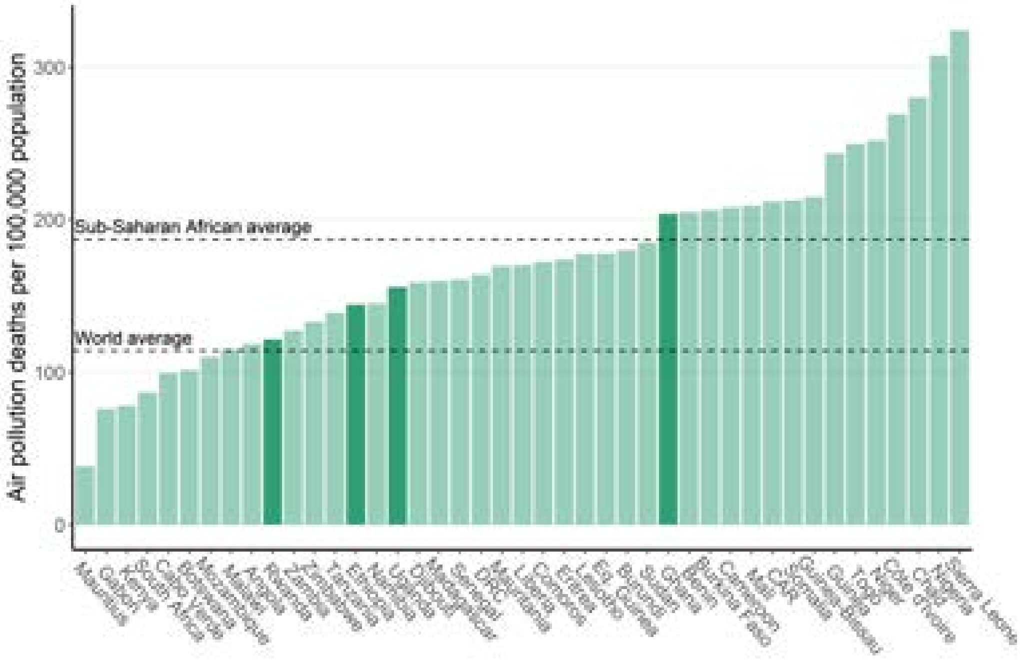
Air pollution causes more deaths on average (187 per 100,000 people) in SSA than the world average (114), as shown in Figure 3.4.

Though other factors, such as solid fuel burning and dust storms also contribute to the high levels of air pollution, the fact that air pollution is worse in SSA, with its much lower levels of motorisation than the world average, suggests that the quality and distribution of vehicles as well as the quantity of vehicles is an important consideration for policy.

Road fatalities

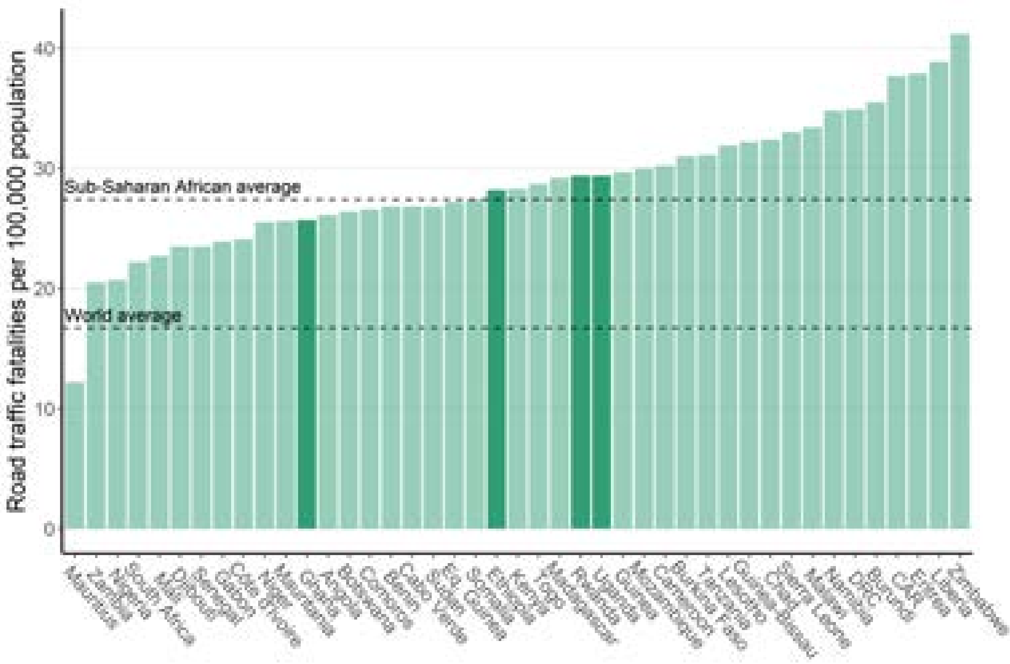
Road deaths show a similar picture. As Figure 3.5 shows, on average SSA countries have more road deaths (28 per 100,000) than the world average (16 per 100,000) and Africa has the highest rate of road deaths in the world. In addition to the loss of life, the healthcare costs and productivity losses associated with road traffic accidents are estimated to amount to 3% of GDP in Africa (WHO, 2021).

Figure 3.4. Air pollution deaths per 100,000 people in sub-Saharan Africa, 2016



Source: World Health Organisation.

Figure 3.5. Road traffic fatalities per 100,000 in sub-Saharan Africa, 2019



Source: World Health Organisation.

Congestion

Although congestion is one of the most important externalities associated with motoring, there are no readily available cross-country or time-series data. However, evidence from several cities suggests that congestion poses a big economic problem in SSA. Baertsch (2020) estimates that in Kampala (Uganda), the cost of congestion (in terms of lost working hours and reduced productivity) is equivalent to 4% of Kampala's GDP. In neighbouring Kenya, the Nairobi Metropolitan Area Transport Authority estimates that the cost of congestion is equivalent to 5% of Nairobi's GDP (Ombok, 2019; Kenya National Bureau of Statistics[12]), and Dixon et al. (2018) gave Nairobi the lowest score in Deloitte's worldwide congestion index. The Danne Institute for Research (2021) estimates that congestion in Lagos (Nigeria) costs 7% of the city's GDP.[13] For comparison, the cost of congestion is generally lower in higher-income countries. According to Inrix (2019), the costs of congestion in terms of lost productivity in London is only equivalent to 1% of citywide GDP.

CO_2 emissions

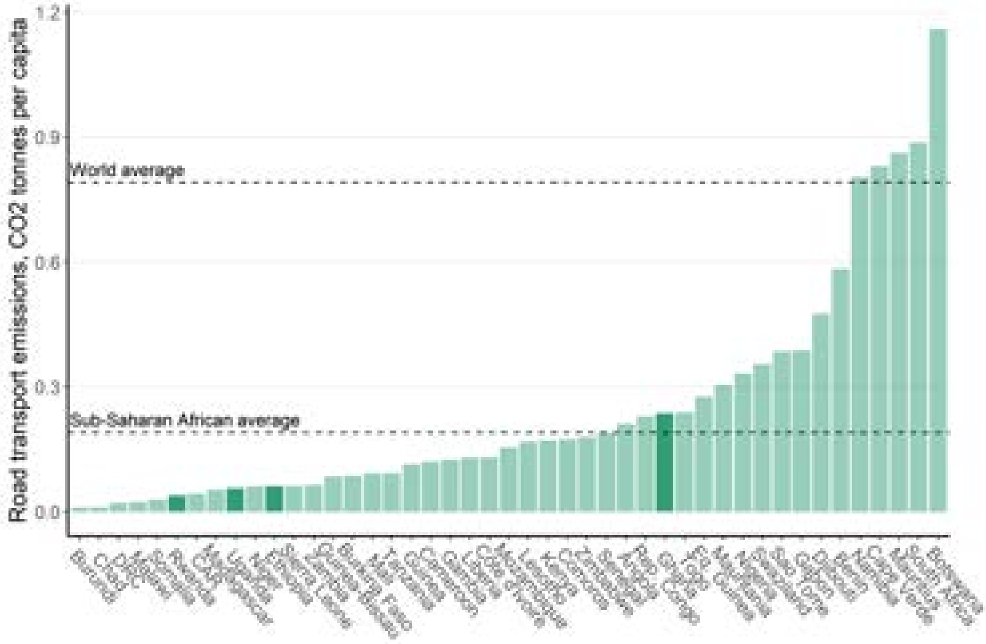
As discussed in Chapter 2 (and illustrated in Table 2.2), greenhouse gas emissions are a relatively small component of the externalities associated with vehicle use. Moreover, as Figure 3.6 shows, while there is significant variation across countries, the average CO_2 emissions in SSA (0.19t per capita) are much lower than the world average (0.79t per capita). The highest-income countries with the highest rates of car ownership (South Africa, Botswana and Namibia) generally have emissions similar to the world average, whereas poorer nations in Eastern Africa generally have the fewest vehicles and have CO_2 emissions below 100kg (0.1t) per person.

However, as a global externality, the contribution to climate change of marginal CO_2 emissions in SSA is the same as the contribution made by marginal emissions elsewhere, and it is marginal emissions which are targeted by taxation. Furthermore, as Figure 3.7 shows, CO_2 emissions in SSA have been increasing rapidly: up 74% in the last 30 years. Transport, including motor vehicles, is an important contributor to these increasing emissions and in 2018 accounted for 21% of the total in the region.

[12] The cost of congestion is estimated to be $1 billion, and Nairobi's GDP in 2019 is estimated to be $21 billion.

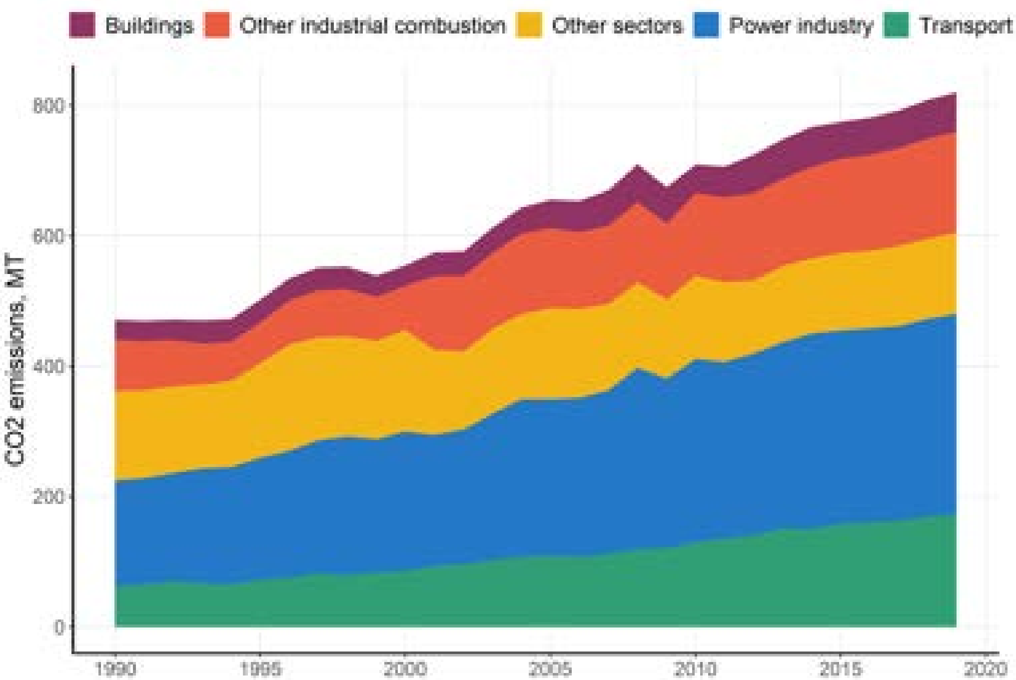
[13] Danne Institute for Research (2021) states Lagos's GDP to be 136 billion USD and the cost of congestion to be 3.8 trillion Naira. The exchange rate used is 411 Naira to USD.

Figure 3.6. CO_2 emissions from road transportation (tonnes per capita) in sub-Saharan Africa, 2019



Source: European Commission (EDGAR).

Figure 3.7. CO_2 emissions from fossil fuel burning by source (megatonnes), sub-Saharan Africa, 1990–2019



Source: European Commission (EDGAR). ‘Transport’ combines road transport with other forms of transport, excluding international shipping and aviation.

The majority of African countries have also signed up to emissions reduction targets under the Paris climate agreement, and will have to take steps to curb emissions growth in the coming years to meet this agreement.

3.3 Summary

While the number of motor vehicles in SSA is increasing, the number of motor vehicles per person is still, on average, very low. However, vehicle quality is also poor, and vehicles are heavily concentrated in the largest urban areas (in contrast to high-income countries, where vehicle ownership is often lower in major urban areas). These factors contribute to major cities in the region suffering from severe and costly congestion problems, and countries as a whole seeing higher rates of death from air pollution and road fatalities than the world average. Greenhouse gas emissions are low, but are rising fast and threaten climate targets.

Given these problems, it is clear that motoring taxes have an important role to play in SSA – although how to address the primarily urban problems without impacting rural mobility is a key challenge.

More generally, domestic revenue mobilisation remains an important policy priority in the region. SSA countries raise only 18% of GDP in revenues on average, substantially lower than the world average of 28%. Ethiopia, Ghana and Uganda even lag behind the low regional average (IMF, 2021). In these countries, recent rapid growth has not been accompanied by growth in revenues relative to output. This is referred to as having low 'tax buoyancy'. Governments are therefore looking for ways to expand domestic revenues, but are limited by several structural factors, such as narrow tax bases, low tax administration capacity, economic informality and non-compliance. Increasing tax rates and expanding the tax base can often mean placing greater burdens on a relatively small group of taxpayers and / or on small businesses or poorer households (Moore, Prichard and Fjeldstad, 2018). As well as addressing environmental concerns, motoring taxes may therefore represent an opportunity to strengthen domestic revenue mobilisation in both an efficient and progressive manner over the coming years. But what is the current state of motoring taxes in SSA?

4. Motor taxes in sub-Saharan Africa

This chapter describes the motoring taxes currently in place in SSA. It also compares them with those in place in a selection of middle- and high-income countries. It is important to note that in doing so we are not implying that motoring taxes in SSA should be the same as in middle- and high-income countries. As discussed earlier, lower incomes in SSA suggest that the monetary cost of some externalities will be lower than in higher-income countries, for a given level of the externality. This would imply that motoring taxes should be lower. Moreover, there may be greater social benefits to motorisation in SSA than in other contexts, given low aggregate levels of vehicle use. Working in the other direction, levels of pollution, road fatalities and congestion are often higher in SSA than in developed countries, and the weaker income tax system means that motoring taxes are more important for redistribution, all of which would imply relatively higher levels of motoring taxes.

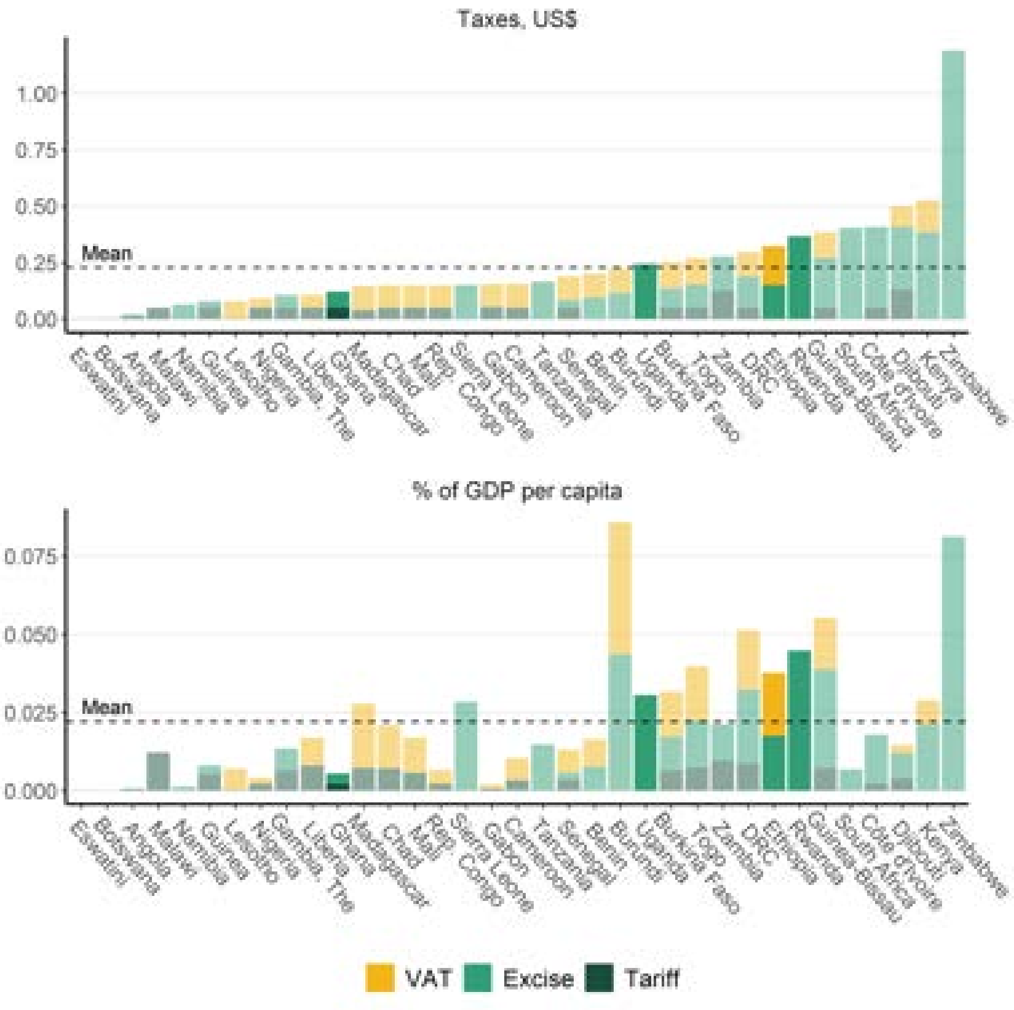
We do not attempt to quantify how these factors should be traded off when comparing tax rates between countries. However, tax rates are presented in both absolute USD values and as a percentage of GDP per capita, to account for the fact that income levels are a factor in the monetary cost of externalities.

4.1 Taxes on fuel

Taxes on fuel include customs duty, excise duty and VAT. Figure 4.1 presents the official level of taxation imposed on one litre of imported gasoline, with a pre-tax price of $0.50, for SSA countries for which data are available. For each group of countries, the top panel shows nominal taxes in US dollars, while the bottom panel shows taxes as a percentage of GDP per capita. For all countries, it is assumed that the fuel is imported from a country where there is no trade deal (i.e. trading under WTO 'Most-Favoured Nation' terms). This is an important assumption as a number of countries in the region impose significant customs duties on fuel (while such duties are negligible in the comparison countries, with the exception of India).

In nominal terms, the average official tax on a litre of imported gasoline in the region is $0.24, compared with $0.82 per litre in the middle- and high-income countries the OECD provides data for (see Appendix Figure A2.1). Relative to GDP per capita, taxes are higher in SSA, averaging 0.022% of GDP per capita per litre, compared with 0.003% in middle- and high-income countries.

Figure 4.1. Official taxes due on a litre of imported gasoline, sub-Saharan Africa



Note: Data are for last year available.

Source: WTO [tariff]; KMPG / EY [VAT]; authors' research [excise; see Appendix Table A3.1 for a full list of sources].

Behind the regional average, there is wide variation across countries. At the higher end, several countries, including Zimbabwe, Kenya, Djibouti, Côte d'Ivoire and South Africa, impose taxes of 40 cents or more. At the lower end, fuel taxes are below 10 cents in Eswatini, Botswana, Angola, Malawi, Namibia, Guinea, Lesotho and Nigeria. This suggests that there might be space for countries that impose negligible or very low fuel taxes to converge their rates to higher levels. This is particularly true for countries that have rates that are very low even in relative terms, including some of the relatively more affluent countries such as Botswana and Namibia.

It is also worth noting that two factors mean that the effective tax rates applied in practice can vary significantly from these official rates. First, in many countries, there are many exemptions and substantial under-collection of fuel taxes. Second is that most African nations intervene in the market to stabilise the price of fuel: of the 10 largest economies in SSA, only Uganda has a fully liberalised fuel market.[14] Fuel price stabilisation aims to protect consumers from swings in oil prices. For oil-producing countries, stabilisation can help to smooth government revenues. Even in oil-importing countries, fuel price stabilisation reduces the exposure of the population to fluctuations in the world market price. The danger – both in oil-producing countries and in oil-importing ones – is that there is less political pressure to raise prices above market prices when market prices are low, whilst there is strong political pressure to subsidise prices when market prices are high. Bagattini (2011) finds that successful stabilisation funds tend to be in countries with effective governance and with less political polarisation, which is not often the case for SSA countries.

As discussed in detail in Box 4.1, Ethiopia is an example where both under-collection and price stabilisation are important issues that mean that official tax rates do not line up with actual collections.

[14] https://www.iea.org/reports/energy-prices-2020.

Box 4.1. Under-collection of fuel taxes and price stabilisation: Ethiopia

Table 4.1 shows the official rates of tax applied to imported gasoline and diesel in Ethiopia. However, in addition, fuel is subject to implicit taxes and subsidies arising from a fuel price stabilisation scheme that aims to insulate households and businesses from fluctuations due to changes in exchange rates and global oil prices.

Table 4.1. Official tax rates on gasoline and diesel in Ethiopia

Tax	Gasoline (petrol)	Diesel
Customs duty	0%	0%
Excise duty	30%	0%
VAT	15%	15%
Surtax	0%	0%
Road maintenance fuel levy (RMFL)	0.095 ETB / litre	0.08 ETB / litre

Note: Customs duty is imposed on the pre-tax (CIF) price, excise duty is imposed on the post-customs-duty price, VAT is imposed on the post-excise-duty price, and surtax is imposed on the post-VAT price.

Although termed a ‘stabilisation’ policy, the programme often results in large subsidies, which are not offset by additional taxes in other periods. Table 4.2 shows that in March 2021, the value of the subsidy from the fuel price stabilisation fund was very high, at 23–25% of the pre-tax price of the fuel. In addition, the Ethiopian Petroleum Supply Enterprise (EPSE), which manages fuel taxes, charges lower rates of excise duty and VAT than are legislated for: excise of 9% rather than 30% is charged on gasoline, and VAT of 5% rather than 15% is charged on both gasoline and diesel. Alongside price stabilisation, this under-charging of taxes means that the net effect of all the taxes and subsidies was a 2.31 ETB subsidy per litre of gasoline (9% of the pre-tax value) and a 4.46 ETB subsidy per litre of diesel (17% of the pre-tax value) as of March.

Table 4.2. Actual taxes levied on a litre of imported gasoline / diesel in Ethiopia, March 2021

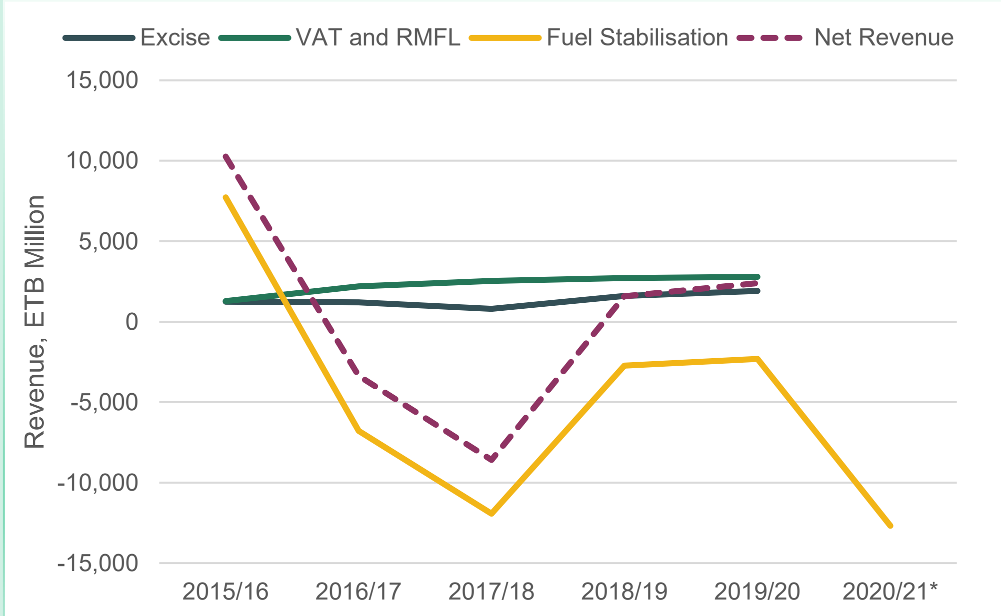
	Gasoline (petrol), ETB *(effective tax rate in parentheses)*	**Diesel, ETB** *(effective tax rate in parentheses)*
Pre-tax price (CIF value)	**26.31**	**25.82**
Excise duty	2.40 *(9.1%)*	0.00 *(0.0%)*
VAT	1.56 *(5.4%)*	1.28 *(5.0%)*
Road maintenance fuel levy (RMFL)	0.095 *(0.4%)*	0.080 *(0.30%)*
Fuel price stabilisation fund	–6.61 *(–25.1%)*	–6.06 *(–23.5%)*
Other fees	0.245 *(0.9%)*	0.238 *(0.9%)*
Post-tax price	**24.00**	**21.36**
Net tax	–2.31 *(–8.8%)*	–4.46 *(–17.3%)*

Note: ‘Other fees’ refers to municipality tax and the margin taken by the Ethiopian Petroleum Supply Enterprise. The effective tax rate is calculated as the tax / subsidy as a proportion of the pre-tax price, with the exception of the effective tax rate for VAT, which is calculated as the tax as a proportion of the post-excise-duty price (which is the relevant base for VAT). The post-tax price refers to the price at which the EPSE sells to local distributors, and will be lower than the price at the pump due to distributors’ and retailers’ margins.

Source: Ethiopian Petroleum Supply Enterprise.

Figure 4.2 breaks down fuel revenues by type, between 2015–16 and 2019–20, and also shows price stabilisation costs between 2015–16 and 2020–21. Net revenues from the fuel price stabilisation fund are much more volatile than revenues from excise and VAT / RMFL. In 2015–16, the fund raised 7.7 billion ETB, which was used to offset previous deficits, but from 2016–17 it consistently made losses, reaching a projected 12.7 billion ETB in 2020–21. If other tax revenues are assumed to be stable in 2020–21, this would mean that subsidising fuel is projected to cost the government 8 billion ETB in 2020–21, equivalent to 3% of general government revenue.[15]

Figure 4.2. Fuel tax revenues / losses, Ethiopia



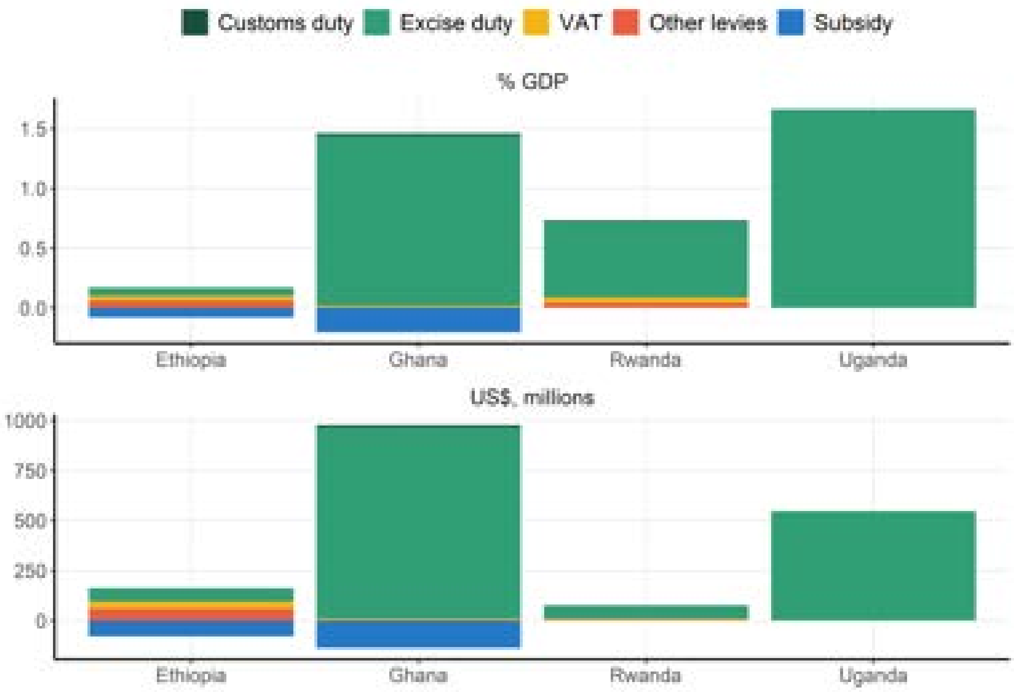
Note: VAT and RMFL are reported together as the Ethiopian Road Fund does not provide disaggregated figures. The annual revenue of the fuel price stabilisation fund is calculated as the yearly change in total balance. *Forecast for 2020–21.

Source: Data provided by the Ethiopian Customs Commission [excise]; Ethiopian Road Fund [VAT and RMFL]; Ethiopian Petroleum Supply Enterprise [fuel price stabilisation].

Figure 4.3 presents revenue from fuel taxes (and losses from subsidies) in 2019, for Ethiopia, Ghana, Rwanda and Uganda, broken down into components. Taxes on fuel in that year were a substantial revenue-raiser for Ghana, Rwanda and Uganda, although data on the fuel price stabilisation gain / loss are not available for Rwanda. Despite low vehicle ownership (see Figure 3.1) and an average level of official fuel tax rates (Figure 4.1), Uganda collected the highest share of GDP in fuel tax revenue at 1.67%, which may relate to the use of taxed fuel in generators used to generate power (e.g. for mining operations). Ethiopia collected the lowest share of revenue from fuel taxes, at 0.2% of GDP, and as discussed in Box 4.1, net revenues in 2020 and 2021 are likely to be negative due to an increase in fuel subsidies.

[15] Total general government tax revenue in 2019–20 was 268 billion ETB (Harris and Seid, 2021).

Figure 4.3. Revenue from fuel taxes, selected African countries, 2019



Note: Revenues / losses from fuel price stabilisation are included for Ethiopia and Ghana, but are not available for Rwanda. Value for Uganda is for 2018. Values refer to HS code 2710.

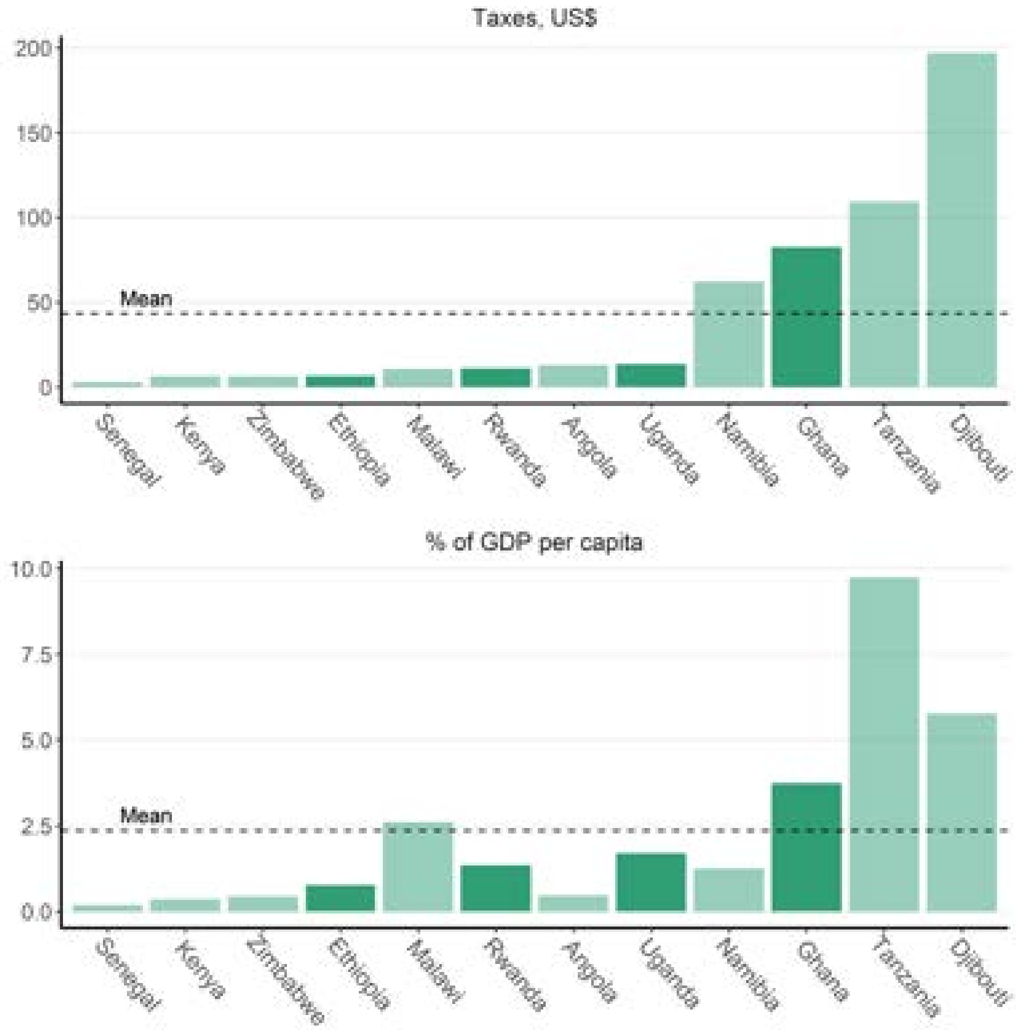
Source: Ethiopian Ministry of Revenue; Ghana Revenue Authority; Rwanda Revenue Authority; Uganda Revenue Authority.

4.2 Taxes on vehicle ownership

Ownership taxes are charged on a periodic basis (typically annually) and may be referred to as licence fees or registration fees. They are also often collected by a department other than the main revenue authority, and are sometimes collected at a regional or local level. This makes finding information on them more difficult than for other motoring taxes.

Figure 4.4 presents taxes and fees on vehicle ownership, for a five-year-old gasoline-powered car with an engine capacity of 1,600cc, in SSA countries where data are available. Appendix Figure A2.2 shows the equivalent for a selection of middle- and high-income countries for which the ACEA provides data.

Figure 4.4. Taxes on vehicle ownership, for a five-year-old gasoline-powered vehicle with a 1,600cc engine, selected African countries



Note: Data are for last year available.

Source: Authors' research. See Appendix Table A3.1 for a full list of sources.

The average annual tax across the 12 countries in our sample is $43 per year, which is about a fifth of what comparison countries in the ACEA data levy on average ($197). However, in eight of the countries, the taxes are minimal – less than $15 per year, while in Djibouti they are close to the level in developed countries (at $196). Relative to GDP per capita, ownership taxes are higher than in developed countries, averaging 2.4% compared with 0.7%. In all countries except for Kenya (where the ownership tax is technically a vehicle licence renewal fee), the tax varies either by engine size or by maximum number of passengers.

4.3 Taxes on vehicle import and purchase

The final main type of motoring tax is the taxes levied on the import of motor vehicles, typically consisting of import duties, excise duties and VAT.[16]

Figure 4.5 presents the total tax for an imported car, assuming that the car is less than five years old,[17] has an engine capacity of 1,600cc, runs on gasoline and has a pre-tax cost of 5,000 US dollars in SSA. Appendix Figure A2.3 does the same for a selection of middle- and high-income countries.[18] Compared with fuel and ownership taxes, customs duties play a greater role in the taxation of vehicles in the region.

Taxes on vehicle imports are higher, even in nominal terms, in sub-Saharan Africa ($3,843) than in middle- and high-income countries ($2,338). Excluding Ethiopia as an outlier, the sub-Saharan African average is $3,032. These taxes represent a very large burden in relative terms, on average 406% of GDP per capita (307% excluding Ethiopia), compared with just 12% in middle- and high-income countries. Given that trade deals covering vehicles are more common amongst middle- and high-income countries, our analysis likely overstates total taxes on vehicles in these countries, and underestimates the difference between them and SSA.

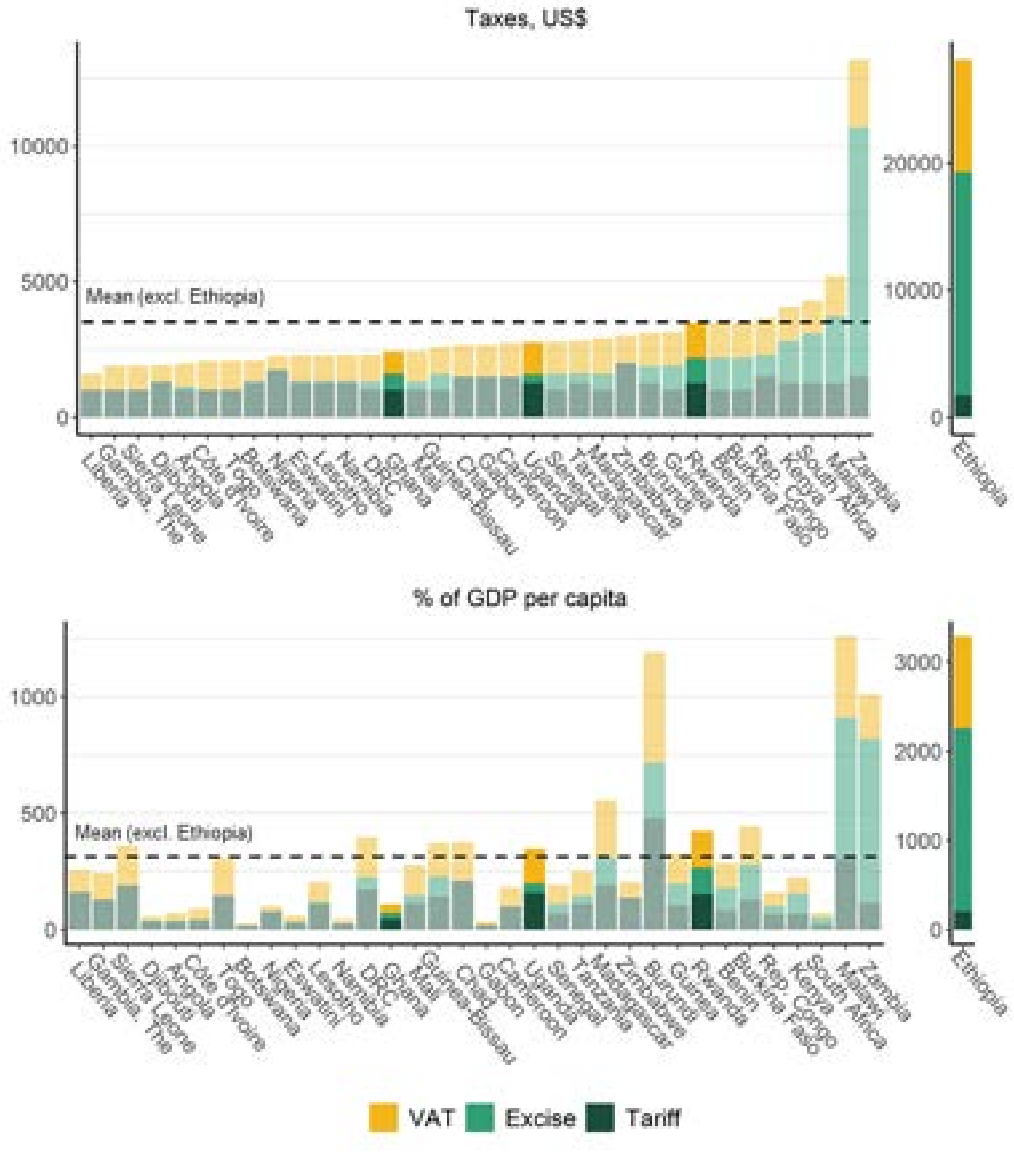
Figure 4.6 presents revenues from vehicle import taxes in Ethiopia, Ghana, Rwanda and Uganda, showing that they account for 0.45–0.60% of GDP in these four countries.

[16] In this section, the terms vehicle import taxes and vehicle purchase taxes are used interchangeably, as no sub-Saharan African country has a substantial vehicle manufacturing base with the exception of South Africa.

[17] Specifically, the vehicle is assumed to be 4.9 years old.

[18] Specifically, for the 10 largest EU countries by GDP where data are available, as well as the major markets of Japan, the US, the UK, China, Korea, Turkey and Russia.

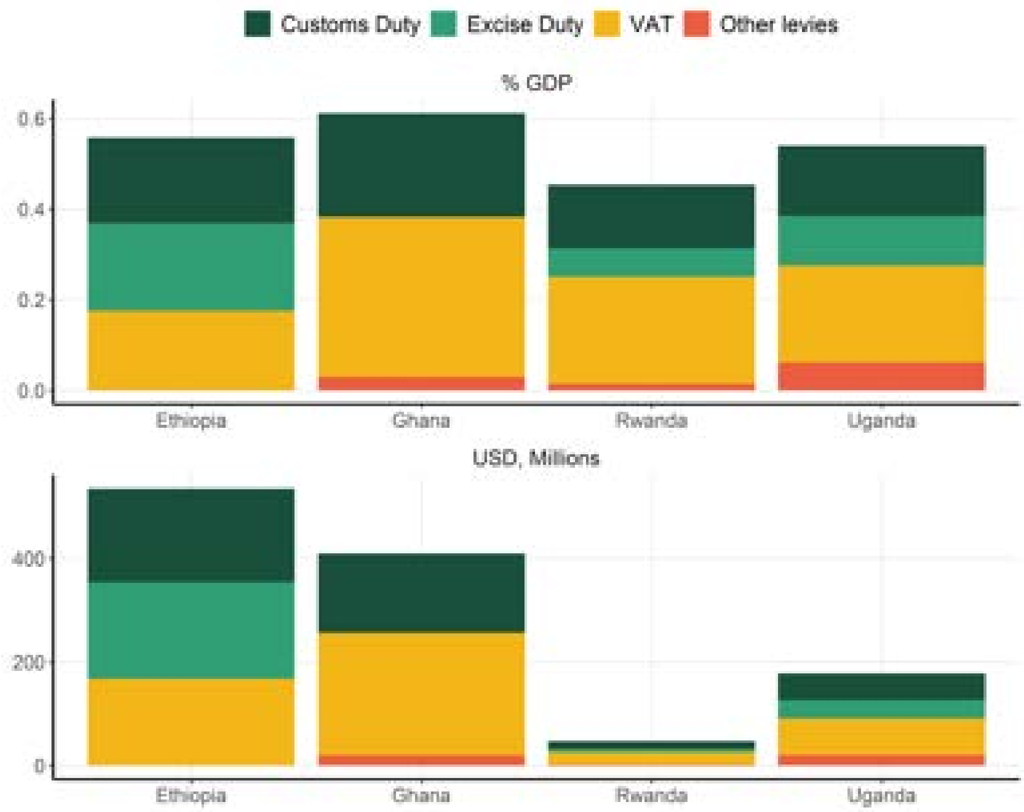
Figure 4.5. Taxes on vehicle purchase, for a used imported gasoline-powered vehicle less than five years old with a 1,600cc engine and a pre-tax price of US$5,000, sub-Saharan Africa



Note: Ethiopia is presented on a separate axis due to large differences in scale. Data are for last year available.

Source: WTO [tariff]; KPMG / EY [VAT]; authors’ research [excise; see Appendix Table A3.1 for a full list of sources].

Figure 4.6. Revenue from vehicle import taxes, 2019, selected African countries



Note: Value for Uganda is for 2018.

Source: Ethiopian Ministry of Revenue; Ghana Revenue Authority; Rwanda Revenue Authority; Uganda Revenue Authority.

An important consideration discussed in Chapter 2 is that taxes on the import and purchase of vehicles cannot directly account for externalities from car use and variation in those externalities by time and place of use. What is possible in principle and often done in practice is to vary import and purchase taxes by either emissions or proxies for emissions (engine size and age). Table 4.3 shows that a significant number of countries in SSA have import taxes that vary in this way – although South Africa is the only one to base its excise tax on the emissions of the engine, rather than engine size, charging an excise rate of $7.80 per g/km of CO_2 emissions that exceed 95g/km.[19] Many SSA countries do not account for such

[19] https://www.sars.gov.za/wp-content/uploads/Legal/SCEA1964/LAPD-LPrim-Tariff-2012-11-Schedule-No-1-Part-3D.pdf.

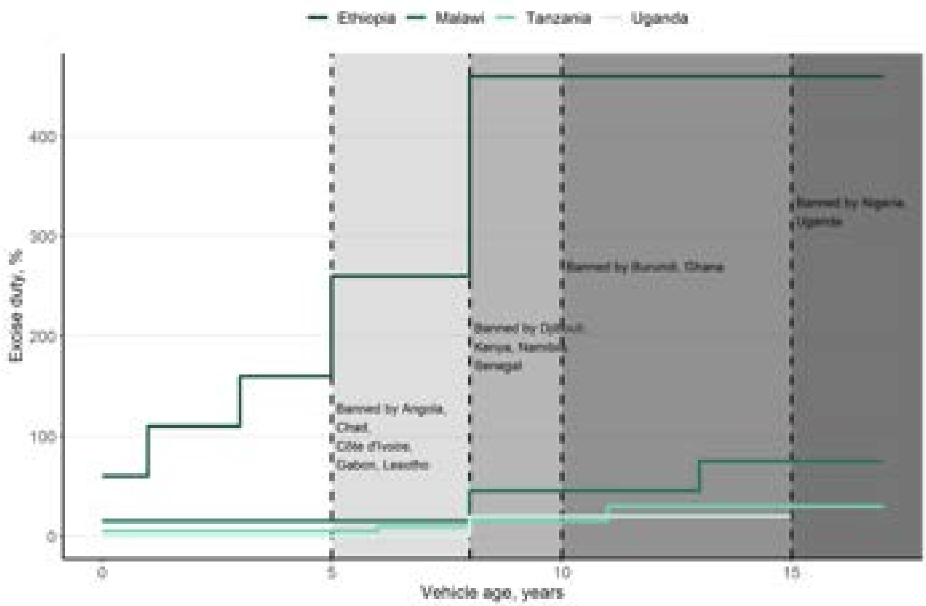
factors at all though. In contrast, all countries in our sample of middle- and upper-income countries vary vehicle taxes by engine size, and most vary taxes by CO_2 emissions.

In addition to variation of taxes by engine size and/or age, several countries impose additional regulatory hurdles to the import of cars. According to UNEP (2020), Ghana, Nigeria and Rwanda require all imported cars to meet Euro 3 / 4 emissions standards. Several SSA countries also have import bans on cars based on age (see Figure 4.7). Other practices (which are less common amongst African countries) include outright bans on second-hand cars, bans on diesel cars (as they contribute more to air pollution), a requirement for cars to pass a roadworthiness test and the requirement for cars to have a functioning catalytic converter (UNEP, 2020).

Table 4.3. SSA countries that vary vehicle excise taxes by emissions, engine size or age

	Excise tax increases with age	**Excise tax does not increase with age**
Excise tax increases with engine size or emissions	Ethiopia, Malawi, Tanzania	Angola, Burundi, Cameroon, Ghana, Guinea, Kenya, Rwanda, South Africa, Zambia
Excise tax does not increase with engine size or emissions	Uganda	Benin, Republic of the Congo, Democratic Republic of the Congo, Guinea-Bissau, Madagascar, Namibia, Nigeria, Senegal

Figure 4.7. Vehicle age, excise tax and import bans in sub-Saharan African countries



Note: Where relevant, for a passenger car with engine size 1,600cc.

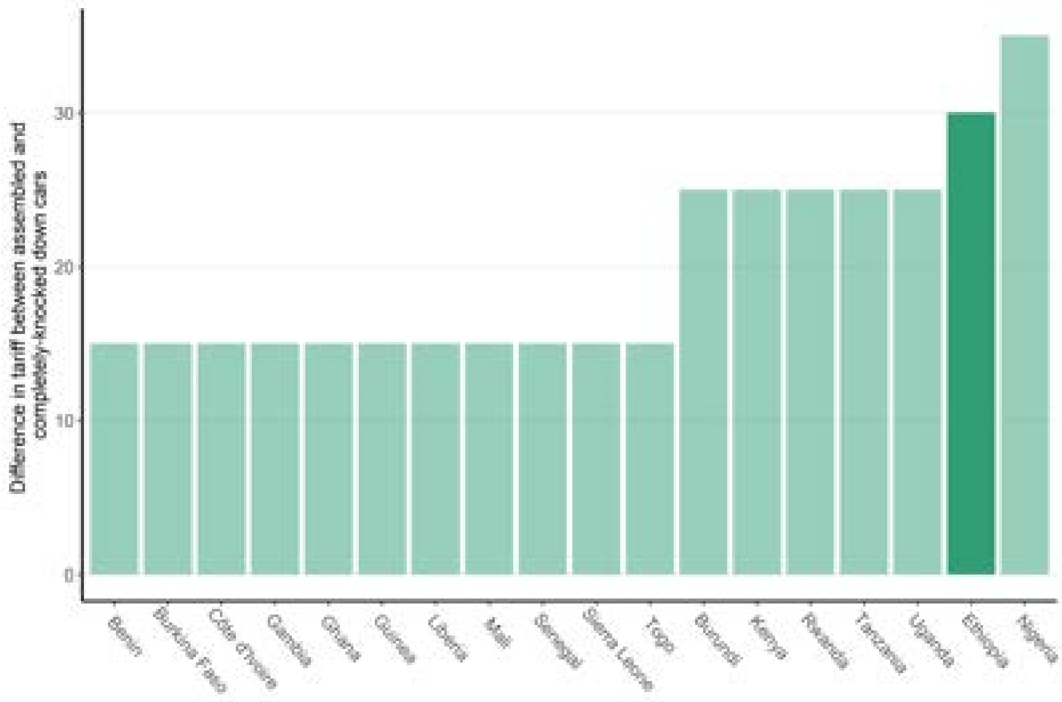
Source: UNEP [vehicle bans]; authors' research [excise tax rates; see Appendix Table A3.1 for a full list of sources].

Figure 4.7 also shows how the level of the excise tax varies by the age of the imported car, for Ethiopia, Malawi, Tanzania and Uganda (the only countries to vary excise taxes by age).[20] The shading shows the age at which countries ban the import of cars. For new cars, excise taxes are high in Ethiopia, but not completely out of step with other SSA countries. Ethiopia is unique in that, whilst other countries start to increase excise tariffs, or impose used cars bans, between 5 and 10 years old, Ethiopia dramatically increases taxation once a car is just 1 year old.

It is a common practice in SSA to offer tax breaks for vehicles assembled domestically, to protect and stimulate the domestic automotive industry. This typically means lower rates of customs for completely knocked-down (CKD) and semi-knocked-down (SKD) vehicles than for assembled cars. Figure 4.8 shows differences in customs duty between assembled and CKD cars. It only presents data on customs duty, as comparable data on excise taxes for CKD vehicles are not available.

[20] There is very little variation in customs taxes by age.

Figure 4.8. Difference in customs duty (excluding excise duty) between an assembled car and a completely knocked-down car, sub-Saharan African countries



Note: Data for HS code 870323 (vehicles with engine size between 1500cc and 3000cc), for countries that specify different tariffs for completely knocked-down and assembled vehicle sets.

Source: WTO.

4.4 Summary

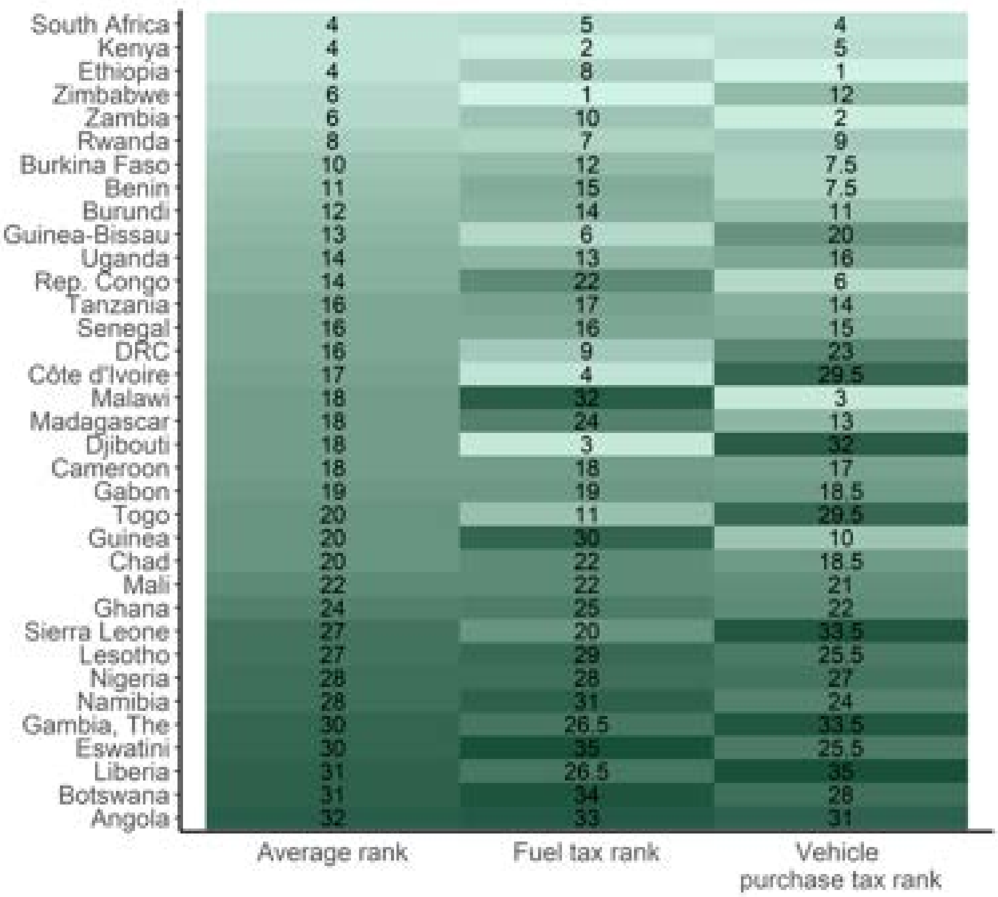
This review of existing motoring taxes in SSA has highlighted four key findings. First, taxes on fuel and vehicles are already a significant revenue-raiser in many countries in the region. For example, in Ethiopia, Ghana, Rwanda and Uganda, fuel and vehicle taxes raise between 0.8% and 2.1% of GDP. This is similar to levels for high-income countries (ACEA, 2021).

Second, SSA countries have, on average, official fuel tax rates that are lower than those in more developed countries in nominal terms but higher relative to per-capita GDP. In reality, effective fuel tax rates can be lower due to subsidies, price stabilisation and under-collection.

Third, the level of vehicle ownership taxes is on average one-quarter of developed comparison countries in nominal terms, but much higher as a percentage of GDP.

Fourth, import and purchase taxes on vehicles are the only tax category in which taxes are higher in sub-Saharan African than in middle- and high-income countries in both cash terms and relative to GDP per capita. The high level of these taxes is likely due to the ease of taxing imports and vehicles’ perceived status as luxury goods, as well as industrial policy concerns (as shown by the discount that completely knocked-down vehicle sets receive compared with assembled vehicles). Vehicle import / purchase taxes are generally based on the engine size and age of the vehicle in SSA, whereas middle- and high-income countries generally have more complex systems that take into account the CO_2 emissions of the vehicle, and sometimes Euro standards.

Figure 4.9. Sub-Saharan African countries’ relative ranking on fuel and vehicle purchase tax rates



Across all types of taxes, there are substantial differences within sub-Saharan African countries. Figure 4.9 shows the rankings of sub-Saharan African countries on fuel taxes and on vehicle purchase taxes,[21] as well as the average of the two ranks. For example, Malawi has the 3rd highest level of vehicle purchase tax but the 32nd highest level of fuel taxes, giving it an average rank of 18. Although motoring tax revenues in the countries we have data for are already fairly high, countries at the bottom end of the list, such as Angola, Botswana, Eswatini and Liberia, may wish to increase motoring taxes to increase revenues whilst also addressing environmental concerns.

[21] Vehicle ownership taxes are not included as information on them could not be found for all countries, and they are relatively low in most of the countries where they do exist.

5. Reform experiences in sub-Saharan Africa

Before discussing the potential for reform of SSA countries' existing motor taxes in more detail, it is worth reflecting on the process of motoring tax reform where it has been attempted in Africa already. In particular, it is important to recognise that motoring tax reforms can be controversial and politically difficult to implement. Citizens may see driving as necessary and be concerned about the impact of higher costs on their household budgets. They may expect the government to offset rising costs in some way, and even where this takes place, the link between mitigation measures and other increases in government spending (or reductions in borrowing) and higher taxes may not be perceived. In many countries, taxi and bus operators and the freight industry are politically powerful and may become a focal point for opposition.

To push forward with reform, it will be important to learn lessons from those countries where reform has been successfully implemented – and those where it has not. This chapter therefore describes the experience of a range of African countries as they reformed motoring taxes and subsidies, drawing out key lessons for successful reform. We focus in particular on the broader reform packages that motoring tax reforms were part of and the mitigating measures governments implemented to reduce the costs for low-income citizens.

5.1 Reforms to fuel pricing

As discussed in the last chapter, in recent decades many countries in sub-Saharan Africa have implemented fuel price stabilisation schemes that effectively subsidise rather than tax fuel consumption.[22] A number of these countries have reduced or abolished these subsidies, generally motivated by concerns about the health of the

[22] Some of these subsidies are for kerosene, a common cooking and heating oil used by low-income households, and not for motor gasoline.

public finances: fuel subsidies are expensive for the government and scaling them back can markedly reduce public spending and help balance the budget. In this section, we review the details of such fuel subsidy adjustments in Ghana, Mauritania, Namibia, Niger and Nigeria. Much of our discussion is based on case studies published by the International Monetary Fund (IMF, 2013).

Economically speaking, an equivalent-sized cut in fuel subsidy and increase in fuel taxation should have the same impact on fuel prices and hence households’ and businesses’ costs. However, such reforms may be perceived differently by the public – meaning that political reaction to reforms may differ. This is a caveat to keep in mind, although the reform events discussed here suggest that it is government-mandated increases in fuel prices (whether due to subsidy or tax reform) that are the focus for opposition.

Ghana

Ghana’s experience of reducing and abolishing fuel subsidies included several abandoned and partially reversed reforms over a period of more than a decade. Successful implementation of reform, even if only for a short time, has been associated with effective communication and linking reform to expansion of the welfare state.

In Ghana, a single state-owned company has a monopoly on the production and importing of refined oil products. In the late 1990s and early 2000s, the prices it charged fuel users were regulated and were not increased as world market prices rose, such that by 2001 accumulated losses at this company amounted to 7% of GDP. To address this, the government of Ghana attempted to almost double the regulated fuel price in 2001, but quickly abandoned this reform in the face of general inflationary pressures as a result of a depreciating currency. A near-doubling of fuel prices was then implemented in 2003, but widespread opposition and scheduled elections in 2004 led to the partial reversal of these increases, with fuel subsidies costing 2.2% of GDP in that year.

Following the elections, the Ghanaian government successfully implemented a 50% increase in fuel prices and introduced a public price-adjustment formula. This was administered by a new National Petroleum Agency, with a mandate to ensure cost recovery and taking its decisions at arm’s length from politicians. Importantly, the reforms were accompanied by a broad communication campaign and packaged with programmes designed to mitigate the impacts of rising fuel prices on low- and middle-income Ghanaians. These eliminated fees for primary and secondary schools; increased the availability of public transportation and put a ceiling on fares; invested in healthcare and electrification in rural and poor areas; and increased the minimum wage.

Even after this reform though, during periods of sharply rising fuel prices, and in advance of elections, the government of Ghana has moved away from cost recovery and reintroduced subsidies (such as during 2008, and 2011 and 2012). Since then, the government has tried to remove fuel subsidies again, but they have been periodically reintroduced. This suggests that even after 'successful' reform of fuel pricing, large price increases and the political cycle can put pressure on government to start subsidising fuel again.

Key lessons

- The government needs to communicate to citizens why fuel prices are increasing and what is being done to ease the impact of the price increase.
- Mitigating measures that are transparent and reach low-income citizens quickly need to be in place at the same time as fuel prices increase.
- Even with mitigating measures and an initially successful reform, governments may find it hard to commit to tracking market prices if they rise substantially or in advance of elections. It may help to plan measures (e.g. automatically triggered transfers that reflect changes in the cost of living) in advance that can be used to compensate for increases in the cost of living in lieu of reintroducing fuel price subsidies.

Mauritania

Following the discovery of oil in 2006, the government of Mauritania significantly increased public spending, including on food and fuel subsidies (as well as public sector wages). The expected increase in revenues did not materialise, however, and the cost of the subsidies increased as global food and fuel prices increased. Given these costs and recognition that the fuel subsidies in particular benefited wealthier households and widened income inequality, the government attempted to reduce the subsidies in 2008. However, the resulting price increases led to protests, and contributed to political instability, and ultimately a military coup. After the coup, the subsidies were reinstated and fuel price increases reversed.

In 2011, a new government again reduced fuel subsidies and instituted a formula-based approach to fuel pricing, replacing the previous discretionary approach. Technical assistance with this reform was provided by the IMF, and the government increased subsidies for food in order to ameliorate the impact of higher fuel prices for poorer households.

After successfully increasing fuel prices to world market levels by Summer 2012, subsequent price increases were not fully passed through to retail prices, meaning a reintroduction of subsidies. The government still maintains a system where rising international prices are not automatically passed through to the population, which leads to a fluctuation in budget revenues but protects the population from rapid fluctuations in the international market. Recently, domestic fuel prices have been set around the world average, eliminating subsidies (IMF, 2018).

Key lessons

- Reform programmes may be more successful if implemented gradually. Rapid implementation of price-changing policies, especially without communication or mitigation measures, can generate strong opposition.
- In the face of volatile international prices, governments may consider price-smoothing as a tool, both to maintain political support and to protect the population from excess risks.
- However, this approach can be risky: initial price-smoothing policies can end up being permanent subsidies if they respond asymmetrically to world price increases and decreases, as has happened in Ethiopia's fuel price stabilisation programme.
- Engaging donor and development partners in the design and implementation of the reform can help politically as well.

Namibia

Namibia reformed fuel pricing during the 2000s to reduce public spending on subsidies and make pricing more efficient. The government set up a new pricing mechanism that allows public spending to remain relatively balanced while limiting pass-through at times of particularly large international price increases. The pricing formula is such that the government energy fund balance is always within a predetermined range, but the fund can absorb some price shocks, protecting the population. The government has generally, though not always, been able to stick to the formula.

Namibia implemented this reform based on extensive public consultation and only gradually removed subsidies. Moreover, the government implemented several mitigating measures to address the impact of rising fuel prices on low-income Namibians. It instituted a zero-rate VAT for selected food products, rebates for food imports, and direct food distribution to the poorest. In rural areas, the government continues to subsidise pump prices and the transportation costs of fuel distributors.

Key lessons

- Gradual price adjustments are likely to be more acceptable to the population than large price shocks. This applies to both the initial introduction and the later operation of a programme.
- Mitigating measures can help make price increases more acceptable to the population, though some measures (such as differential VAT rates) are more politically popular than economically sound.
- Differentiation by geography, industry or product may also be required for political success, even if it runs counter to economic principles.

Niger

Niger instituted a fuel pricing formula with technical assistance from the IMF in the early 2000s that would allow for pass-through of international price changes. It was based on an automatic mechanism that would adjust prices if international price changes were above a threshold, while for smaller changes the government would absorb price changes through decreased or increased taxes. However, during the middle of the decade, increasing international fuel prices meant that the government felt unable to stick to the formula, and subsidies were introduced to keep pump prices fixed. This then led to fiscal losses for the government.

The government started phasing out subsidies in 2010, recognising both the fiscal pressure and the regressive nature of the subsidy. The government tried to make the public aware of the need for the price increases through making subsidy spending explicit in the budget, and it invested extensively in public consensus building around the best ways to implement the reform. An important caveat about the fuel price reform in Niger is that domestic fuel production started at the same time, which introduced additional political economy considerations – for example, the population was less willing to accept a price increase when domestic production might be expected to lead to a price decrease.

The government mitigated the impacts of the reform by subsidising public transportation. It also used savings on subsidies to increase social spending by 19% and to recruit 4,000 new teachers. Though not direct mitigating measures, these highlight that savings on subsidies (or additional revenues from taxes) can be put to use effectively and may make citizens internalise the advantages of increased prices.

Key lessons

- Raising public awareness, building consensus and managing expectations are key to successful reforms.
- Understanding how a policy interacts with the wider economic situation is important to anticipate the public’s reaction to a proposed policy.
- Making explicit what reduced subsidy spending or increased tax spending will be used for can reassure people about a policy that requires them to pay more.

Nigeria

Nigeria administratively sets maximum prices for gasoline (as well as kerosene). It is in a special position since it is one of the leading oil-exporting countries in the world, yet it also imports refined fuel. Because the government has historically artificially depressed fuel prices, the creation and utilisation of refinery capacity has been disincentivised.

In 2011–12, the government set out to increase gasoline prices to a cost recovery level, which would have entailed a 117% price increase. The government spent months campaigning to convince the population that this was economically necessary and useful. It explained that the subsidies were costly, diverted money from important spending priorities, resulted in corruption and were regressive. It promised to spend the savings on important social programmes (public transit, health services, public works, vocational training) and left the price of kerosene (used by lower-income household for cooking) unchanged. Yet the price increase led to intense protests and unrest and the government scaled down the price increase to 49%.

Key lessons

- Not all government campaigns are well received by the population. The Nigerian campaign may have been too short and is alleged to have lacked an element of consultation and consensus building (IMF, 2013).
- The public may also have been sceptical that the government would spend the savings in the way that it promised, or alternatively may not have valued these spending priorities sufficiently.
- A broader contextual issue that arose in Nigeria is the lack of trust in the government, which needs to be evaluated in each country.

5.2 Other tax and subsidy policies

Some low-income countries, including countries in Africa, have implemented explicit new motoring taxes or new regulations. We discuss the cases of the motoring tax in Malawi, the import ban on cars older than 15 years and tax on the import of other used cars in Uganda, and the Mauritius 'feebate' scheme. In the first three cases, the environmental, emissions-reducing impact of the taxes was more important than their ability to raise revenue for the government. In Mauritius, the feebate scheme actually reduced net revenues.

Malawi: carbon tax on motorists

In November 2019, Malawi introduced an annual tax on motorists. The tax is based on engine size (as a proxy for carbon emissions) and aims to both reduce emissions and raise government revenues. The tax applies to local- and foreign-registered motor vehicles. For locally registered vehicles, the tax is collected annually at the time of renewing vehicle certificates of fitness, while for foreign-registered motor vehicles it is collected at the port of entry. The applicable tax rate varies between $5.50 and $21 per year depending on the engine capacity. Exemptions are granted to all government-owned vehicles, including ambulances.[23] The government will use the tax revenue to finance various projects aimed at combating environmental degradation and fighting for environmental protections.

[23] https://news.bloombergtax.com/daily-tax-report/malawi-introduces-annual-carbon-tax-for-vehicles-from-monday?context=article-related.

Despite initial public opposition to the carbon tax on the ground that the tax should have been applied to all fuel users instead of only targeting motorists, the government has managed to effectively implement the tax throughout the country (Symon, 2019). The tax is included in the 2019/20 budget statement.[24]

Key lessons

- Appropriate communication can help overcome initial opposition to reforms if the government is both persistent and willing to communicate openly.
- The tax requires the payment of relatively small sums and therefore raises small amounts of revenue. However, starting out small may be a way to make a new tax type more accepted by the population.

Uganda: import ban on old vehicles

In September 2018, the Ugandan government passed a law prohibiting the import of second-hand cars older than 15 years (Traffic and Road Safety Act 2018). The import ban on old vehicles was introduced on road safety and environmental grounds as well as to encourage local car assembly businesses. Initially, the government proposed a total ban on vehicles older than 8 years, but this proposal elicited opposition and the government instead proposed banning imports of vehicles older than 15 years.[25] Some newer vehicles are also heavily taxed. Motor vehicles (excluding goods transport vehicles) between the ages of 5 and 8 years are subject to a 35% environmental levy (on the CIF value of the vehicle). Motor vehicles that are older than 8 years and were imported before the Traffic and Road Safety Act of 2018 are subject to a 50% environmental levy. And motor vehicles over the age of 5 years that are principally designed to carry goods are subject to a 20% environmental levy. According to the Ugandan Revenue Authority, the law has led to falls in imports of used vehicles and in customs duties on used vehicles, despite higher taxes on vehicles between 8 and 15 years old.[26]

[24] https://www.cabri-sbo.org/uploads/bia/Malawi_2020_Approval_External_BudgetSpeech_MinFin_COMESASADC_English.pdf.

[25] https://www.parliament.go.ug/news/1514/importation-old-cars-banned.

[26] https://www.monitor.co.ug/uganda/business/commodities/used-vehicle-imports-drop-1872242.

The public had mixed reactions to the import ban.[27] Local car assembly businesses welcomed the ban as they perceived it to encourage local production and boost investment. Local imported car dealers, on the other hand, opposed the ban, arguing that it could lead to substantial job losses as well as make cars unaffordable for Ugandans.

Key lessons

- Bans on the import of older cars are quite unpopular since many people cannot afford newer cars. This suggests that bans without mitigating measures may not work.
- Outright bans instead of appropriate taxes may not be optimal: they do not lead to an internalisation of the environmental and congestion externalities but instead force people to make suboptimal decisions if they cannot access any vehicles. They may also lead to a fall in tax revenue.

Mauritius: ‘feebate’ vehicle tax scheme based on CO_2 emission

Mauritius was the first developing country to introduce a ‘feebate’ tax system on motorists based on CO_2 emission. The tax was introduced in 2011 to promote the use of energy-efficient motor vehicles. Accordingly, a CO_2 emission rebate is granted for those vehicles with a CO_2 emission below 150g/km (to be deducted from the excise duty for vehicles). A tax is imposed for vehicles above the threshold of 150g/km CO_2 emission.[28]

The feebate system has encouraged the importing of fuel-efficient vehicles, and the number of hybrid cars being imported to Mauritius doubled each year between 2010 and 2013. The average fuel efficiency of the vehicle fleet in the country improved from 7 litres per 100km (which corresponds to CO_2 emission of 186g/km) in 2005 to an average of 6.6 litres per 100km (a reduction in CO_2 emission of 169g/km) in 2013.[29]

[27] https://www.dw.com/en/tax-hikes-for-secondhand-cars-in-uganda/a-43438412.

[28] The CO_2 emission threshold level was 158g/km in 2011 when it was first introduced. But the government lowered the threshold to 150g/km in 2013.

[29] http://www.ppmc-transport.org/fuel-economy-in-mauritius/; https://www.unep.org/news-and-stories/blogpost/mauritius-shares-their-experience-promoting-cleaner-and-more-fuel.

Initially, the scheme was revenue neutral. However, over time it has generated a net loss for the government. Between 2012 and 2015, the scheme cost the government around Rs 1.12 billion (30 million USD). In July 2016, the Minister of Finance and Economic Development announced the suspension of the CO_2 levy/rebate scheme in the 2016/17 Budget. A number of operational issues affected the proper functioning of the CO_2 levy/rebate scheme on motor cars, including different standards for the measurement of CO_2 emission and unreliable CO_2 values for the computation of the amount of levy or rebate (Jugnauth, 2017).

Key lessons

- While it is possible to introduce an emission-based tax/subsidy system in a developing country, there are both technological challenges (related to accurate and consistent measurement) and design issues (related to revenue neutrality).

6. Discussion and conclusion

The use of motor vehicles brings significant private benefits to individuals and businesses, and arguably has important social returns too. However, depending on the type of vehicle used and the time and place that it is driven, motoring also generates significant social costs, including congestion, local and global pollution, and accidents. The government has an important role to play in managing these costs alongside the potential benefits, and taxation can be a powerful and efficient way of doing so. More generally, taxes levied on motor vehicles and fuels can be a useful way to raise tax revenue in addition to broader-based taxes – particularly in low-income countries such as many of those in sub-Saharan Africa. This is because taxes on fuel and vehicles are harder to evade, more progressive and less likely to distort behaviour than other targeted taxes.

For countries in sub-Saharan Africa, motoring taxes are already an important source of revenue. Among the SSA countries covered in this report, overall taxes on fuel and vehicle purchases raise a similar share of GDP to that observed in high-income countries – despite low levels of motorisation. This partly reflects higher taxes relative to GDP per capita, even if in absolute terms fuel taxes are typically much lower. However, these revenues are often not well configured towards managing the social costs of motoring. There is a strong reliance on taxes on vehicle imports, which do not price the marginal social cost of vehicle usage, let alone account for the fact that this marginal social cost is substantially higher in certain places (e.g. major cities) and at certain times of day (e.g. peak commuting times). Fuel taxes are better targeted at vehicle usage but still typically fail to account for variability in social costs due to time or place of vehicle usage.

These social costs of motoring are large and growing in SSA as the number of vehicles increases with development. Both air pollution and road accidents already cause more deaths per capita than the world average, and existing city-specific estimates of the cost of congestion are extremely high. The size of these growing costs and the current configuration of motoring taxes suggest that there is ample opportunity for reforms that improve how they are managed across the region. As well as helping to better manage the costs of motoring, there may also be scope for additional revenue-raising, particularly in countries where existing taxes are relatively low, such as Angola, Nigeria and Liberia. Such revenue-raising provides an opportunity to make progress on development goals that often hinge on domestic revenue mobilisation, or to improve fiscal sustainability in some cases.

While specific reform recommendations cannot be broadly applied in a cross-country report such as this, our review of existing policies highlights a few key policy options that could be considered:

- **Increasing the effective tax rate on fuel.** This might involve increasing *de jure* tax rates when these are low (e.g. Eswatini, Botswana, Angola) or addressing under-charging and under-collection, including through fuel price stabilisation schemes that have become long-term subsidies (e.g. Ethiopia). Though these reforms would be progressive, previous fuel pricing reforms highlight the importance of effective communications campaigns and mitigation measures for low- and middle-income households that are explicitly linked to the fuel price changes.
- **Introducing or increasing taxes on vehicle ownership.** The majority of sub-Saharan African countries do not have vehicle ownership taxes, and those that do generally set them at a low level. Vehicle use, and the problems associated with it, are highly concentrated in cities, so higher taxes on vehicles based in cities could address urban problems without hindering rural mobility and development. Ownership taxes could also vary according to the emissions of vehicles. Lower rates or exemptions could be applied to taxis, buses and commercial vehicles, with less risk of fraud than for fuel taxes.
- **Implementing parking charges and other congestion management schemes.** Congestion charges implemented in some cities in developed countries are effective in dealing with congestion, but complicated and costly to implement, so are probably of most relevance to the largest cities only. The implementation of charges for parking would involve a lot of labour but not necessarily expensive investment in technology and may be more practical for smaller cities.
- **Governments with very high motor vehicle import taxes could consider redesigning these taxes.** If taxes on vehicle ownership and fuel taxes are raised, there may be scope for reducing the taxes on vehicle purchase, facilitating the replacement of older lower-quality vehicles. Even if vehicle

import tax levels were set to raise the same revenues overall, governments could improve their design by basing them on CO_2 and particulate emissions (e.g. using Euro standards), rather than engine size or vehicle age as is generally the case currently.

Reforms such as these would help to better manage the motorisation of SSA countries in the coming decades. Existing tax policies do not seem well designed for this purpose but may reflect other policy objectives, such as a desire to promote the development of a domestic motor vehicle industry, though the effectiveness of such policies is questionable. Existing policies may also reflect constraints: reforms such as the ones above are likely to be politically challenging, and in some cases administratively difficult too. But experience from previous reforms in the region highlights that reform efforts are likely to be more successful when carefully planned and communicated, and when implemented gradually and alongside mitigating measures. Learning the lessons from these reform periods will be crucial for policymakers in the region aiming to reform their motoring taxes so as to ensure they are designed to tackle the substantial externalities generated by vehicle usage. The payoff is a transport system that better balances the economic benefits of mobility with the social costs of pollution, congestion and accidents.

References

Adam, S. and Stroud, R. (2019), ‘A road map for motoring taxation’, in C. Emmerson, C. Farquharson and P. Johnson (eds), *The IFS Green Budget: October 2019*, https://ifs.org.uk/publications/14407.

Atkinson, A. B. and Stiglitz, J. E. (1976), ‘The design of tax structure: direct versus indirect taxation’, *Journal of Public Economics*, 6, 55–75, https://doi.org/10.1016/0047-2727(76),90041-4.

Baertsch, L. (2020), ‘Quantifying the economic benefits of public transportation in Kampala’, International Growth Centre, Policy Brief UGA-19148, https://www.theigc.org/wp-content/uploads/2020/10/Baertsch-2020-policy-brief-19148.pdf.

Bagattini, G. Y. (2011), ‘The political economy of stabilisation funds: measuring their success in resource-dependent countries’, Institute of Development Studies (IDS), Working Paper 356, https://doi.org/10.1111/j.2040-0209.2011.00356_2.x.

Bessone, P., Rao, G., Schilbach, F., Schofield, H. and Toma, M. (2020), ‘The economic consequences of increasing sleep among the urban poor’, National Bureau of Economic Research (NBER), Working Paper 26746, https://www.nber.org/papers/w26746.

Cabrera-Arnau, C., Prieto Curiel, R. and Bishop, S. R. (2020), ‘Uncovering the behaviour of road accidents in urban areas’, *Royal Society Open Science*, 7(4), 191739, https://doi.org/10.1098/rsos.191739.

Coady, D., Flamini, V. and Sears, L. (2015), ‘The unequal benefits of fuel subsidies revisited: evidence for developing countries’, International Monetary Fund (IMF), Working Paper 250, https://doi.org/10.5089/9781513501390.001.

Danne Institute for Research. (2020), ‘What Traffic Congestion Costs Lagos Commuters’. https://danneinstitute.org/publications/what-traffic-congestion-costs-lagos-commuters/.

Danne Institute for Research. (2021), ‘Economic Costs of Traffic Congestion in Lagos’. https://danneinstitute.org/publications/always-go-with-a-smile-4/.

Davis, L. W. (2008), 'The effect of driving restrictions on air quality in Mexico City', *Journal of Political Economy*, 116, 38–81, https://doi.org/10.1086/529398.

Dixon, S., Irshad, H., Pankratz, D. M. and Bornstein, J. (2018), 'The Deloitte City Mobility Index', https://www2.deloitte.com/content/dam/Deloitte/za/Documents/Consumer_Industrial_Products/ZA_Deloitte_Global_Mobility_Index_October_2018.pdf.

Essel, D. (2016), 'Vehicle population and growth rate', Ghanaian Ministry of Transport, https://wedocs.unep.org/bitstream/handle/20.500.11822/21481/Vehicle%20Popultaion%20and%20Growth%20Rate%2C%20Daniel%20Essel%2C%20Ministry%20of%20Transport%20Ghana.pdf?sequence=1&isAllowed=y.

Greene, D. L., Liu, J., Khattak, A. J., Wali, B., Hopson, J. L. and Goeltz, R. (2017), 'How does on-road fuel economy vary with vehicle cumulative mileage and daily use?', *Transportation Research Part D: Transport and Environment*, 55, 142–61, https://doi.org/10.1016/j.trd.2017.06.004.

Hanna, R., Kreindler, G. and Olken, B. A. (2017), 'Citywide effects of high-occupancy vehicle restrictions: evidence from "three-in-one" in Jakarta', *Science*, 357(6346), 89–93. https://doi.org/10.1126/science.aan2747.

Harris, T. and Seid, E. (2021), '2019/20 survey of the Ethiopian tax system'. Institute for Fiscal Studies, https://doi.org/10.1920/re.ifs.2021.0187.

Harrison, A. and Rodríguez-Clare, A. (2010), 'Trade, foreign investment, and industrial policy for developing countries', in D. Rodrik and M. Rosenzweig (eds), *Handbook of Development Economics*, volume 5, Elsevier.

Huntington, H. G., Barrios, J. J. and Arora, V. (2019), 'Review of key international demand elasticities for major industrializing economies', *Energy Policy*, 133, 110878, https://doi.org/10.1016/j.enpol.2019.110878.

Inrix (2019), 'INRIX Global 2019 Traffic Scorecard', https://inrix.com/press-releases/2019-traffic-scorecard-uk/.

IMF (2013), 'Case Studies on Energy Subsidy Reform: Lessons and Implications', International Monetary Fund, https://www.imf.org/external/np/pp/eng/2013/012813a.pdf.

IMF (2018), *IMF Country Report No. 18/365*, International Monetary Fund, https://www.imf.org/en/Publications/CR/Issues/2018/12/13/Islamic-Republic-of-Mauritania-Second-Review-Under-the-Extended-Credit-Facility-Arrangement-46465.

IMF (2021), *Regional Economic Outlook for Sub-Saharan Africa*, International Monetary Fund, https://www.imf.org/en/Publications/REO/SSA/Issues/2021/04/15/regional-economic-outlook-for-sub-saharan-africa-april-2021.

ITDP (2021), 'Demand responsive parking in African cities', Institute for Transportation and Development Policy, https://africa.itdp.org/demand-responsive-parking-in-african-cities/.

Jugnauth, P. (2017), 'A New Era of Development: Budget Speech 2016/17', Mauritius Ministry of Finance and Economic Development, https://mof.govmu.org/Documents/Documents/Budget%202016-2017/Budget2016-17/budgetspeech2016-17.pdf.

Karagulian, F., Belis, C. A., Dora, C. F. C., Prüss-Ustün, A. M., Bonjour, S., Adair-Rohani, H. and Amann, M. (2015), 'Contributions to cities' ambient particulate matter (PM): a systematic review of local source contributions at global level', *Atmospheric Environment*, 120, 475–83, https://doi.org/10.1016/j.atmosenv.2015.08.087.

Kojima, M. (2016), *Fossil Fuel Subsidy and Pricing Policies: Recent Developing Country Experience*, World Bank, https://doi.org/10.1596/1813-9450-7531.

Kreindler, G. (2016), 'Driving Delhi? Behavioural responses to driving restrictions', International Growth Centre (IGC), Working Paper C-35330-INC-1, available at: https://www.ssrn.com/abstract=2966797.

Liu, A. A. (2013), 'Tax evasion and optimal environmental taxes', *Journal of Environmental Economics and Management*, 66, 656–70, https://doi.org/10.1016/j.jeem.2013.06.004.

Mirrlees, J., Adam, S., Besley, T., Blundell, R., Bond, S., Chote, R., Gammie, M., Johnson, P., Myles, G. and Poterba, J., (2011), *Tax by Design: The Mirrlees Review*, Oxford University Press for the Institute for Fiscal Studies.

Moore, M., Prichard, W. and Fjeldstad, O. (2018), *Taxing Africa: Coercion, Reform and Development*, Zed Books.

Nieuwenhuis, P. (2017), ‘Fact Check: are diesel cars really more polluting than petrol cars?’, *The Conversation*, http://theconversation.com/fact-check-are-diesel-cars-really-more-polluting-than-petrol-cars-76241.

Nigerian National Bureau of Statistics (2018), ‘Road transport data (Q4 2018)’, https://www.nigerianstat.gov.ng/pdfuploads/Road_Transport_Data_-_Q4_2018.pdf.

Ombok, E. (2019), ‘Traffic jams in Kenya’s capital bleed $1 billion from economy’, Bloomberg, https://www.bloomberg.com/news/articles/2019-09-24/traffic-jams-in-kenya-s-capital-bleed-1-billion-from-economy.

Rizzi, L. I. and De La Maza, C. (2017), ‘The external costs of private versus public road transport in the Metropolitan Area of Santiago, Chile’, *Transportation Research Part A: Policy and Practice*, 98, 123–40, https://doi.org/10.1016/j.tra.2017.02.002.

Rodrik, D. (2008), ‘Normalizing industrial policy’, Commission on Growth and Development, Working Paper 3, https://documents.worldbank.org/en/publication/documents-reports/documentdetail/524281468326684286/normalizing-industrial-policy.

Sen, A. K., Tiwari, G. and Upadhyay, V. (2010), ‘Estimating marginal external costs of transport in Delhi’, *Transport Policy*, 17, 27–37, https://doi.org/10.1016/j.tranpol.2009.09.003.

Smith, S. (2006), ‘Taxes on road transport in Southern African countries’, in S. Cnossen (ed.), *Excise Tax Policy and Administration in Southern African Countries*, University of South Africa.

Symon, Y. (2019), ‘MRA justifies carbon tax’, *The Times Group Malawi*, 2 December, https://times.mw/mra-justifies-carbon-tax/.

Transport and Environment (2020), ‘How clean are electric cars? T&E’s analysis of electric car lifecycle CO_2 emissions’, https://www.transportenvironment.org/sites/te/files/downloads/T%26E%E2%80%99s%20EV%20life%20cycle%20analysis%20LCA.pdf.

UNEP (2020), ‘Used Vehicles and the Environment’. United Nations Environment Programme, https://www.unep.org/resources/report/global-trade-used-vehicles-report.

Van Amelsfort, D. and Swedish, V. (2015), *Introduction to Congestion Charging: A Guide for Practitioners in Developing Countries*, Asian Development Bank, https://www.adb.org/publications/introduction-congestion-charging-guide-practitioners-developing-cities.

Warwick, K. (2013), 'Beyond industrial policy: emerging issues and new trends', OECD Science, Technology and Industry Policy Paper 2, http://dx.doi.org/10.1787/5k4869clw0xp-en.

WHO (2013), 'Health effects of particulate matter', World Health Organisation, https://www.euro.who.int/__data/assets/pdf_file/0006/189051/Health-effects-of-particulate-matter-final-Eng.pdf.

WHO (2018), 'Global Status Report on Road Safety 2018', World Health Organisation, https://www.who.int/publications/i/item/9789241565684.

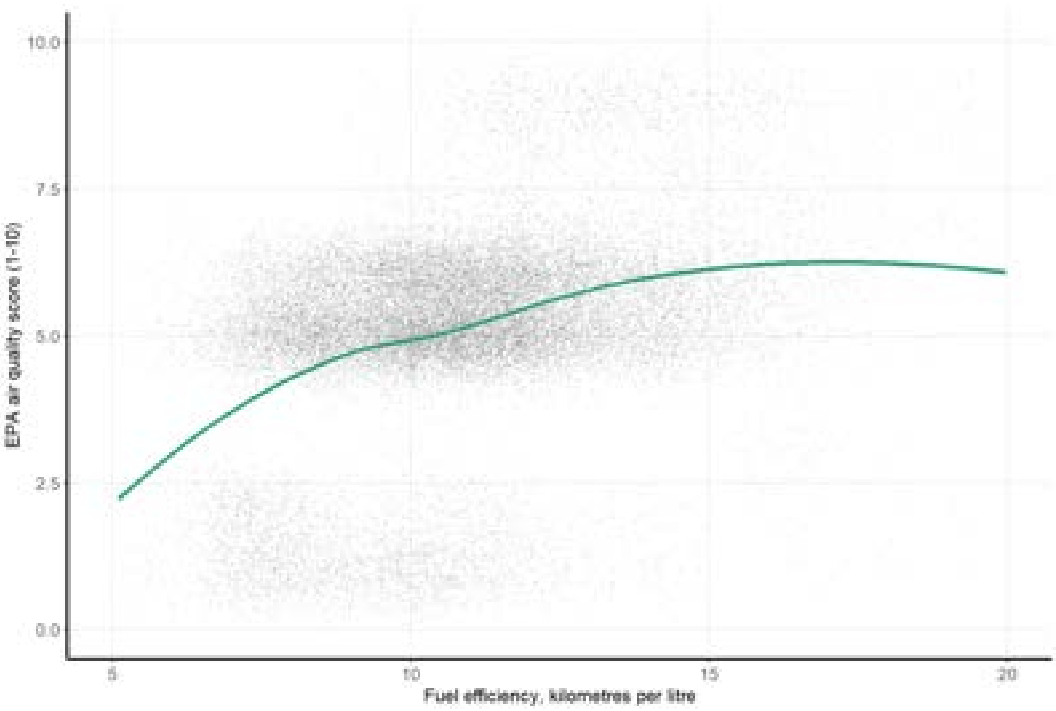
WHO (2021), 'Road traffic injuries', https://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries.

Appendices

Appendix 1. Fuel efficiency, emissions and vehicle age

Figure A1.1 presents the relationship between a vehicle's fuel efficiency and the EPA's assessment of that vehicle's air quality. Cars with better fuel efficiency generally have fewer particulate emissions, but this relationship is not perfect.

Figure A1.1. Vehicle fuel efficiency and contribution to air pollution for all cars sold in the US, 2002–17

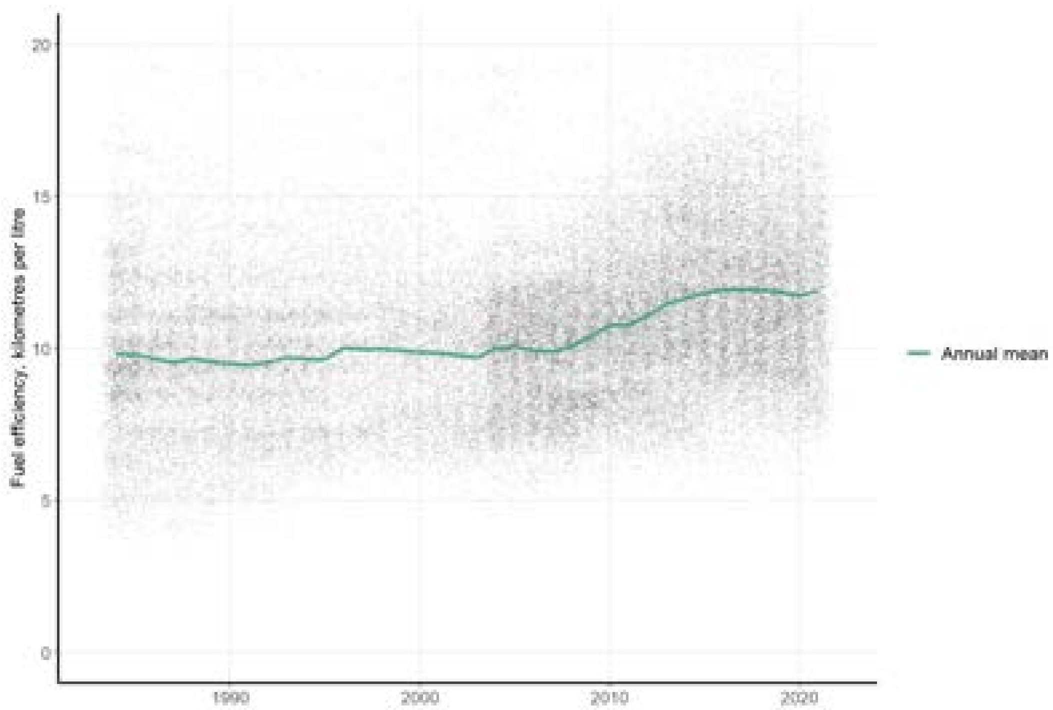


Note: Fuel efficiency is measured by the kilometres per litre from driving on a highway. The air quality score is a composite measure based on particulate and other emissions – for more details, see the EPA's website: https://www.epa.gov/greenvehicles/smog-rating. A higher score indicates that the car is less polluting. The dots represent individual vehicle models, with a darker shade indicating a higher concentration of vehicle models.

Source: US Environmental Protection Agency, via www.fueleconomy.gov.

Figures A1.2 and A1.3 show the relationship between vehicle age and fuel efficiency, and between vehicle age and the EPA's air quality score, for all cars sold in the US in those years. As both figures show, older vehicles tend to be less fuel efficient and have lower air quality scores than vehicles produced more recently, but this relationship is not perfect – many cars from the 1990s and early 2000s are more fuel efficient and have higher air quality scores than some vehicles produced today.

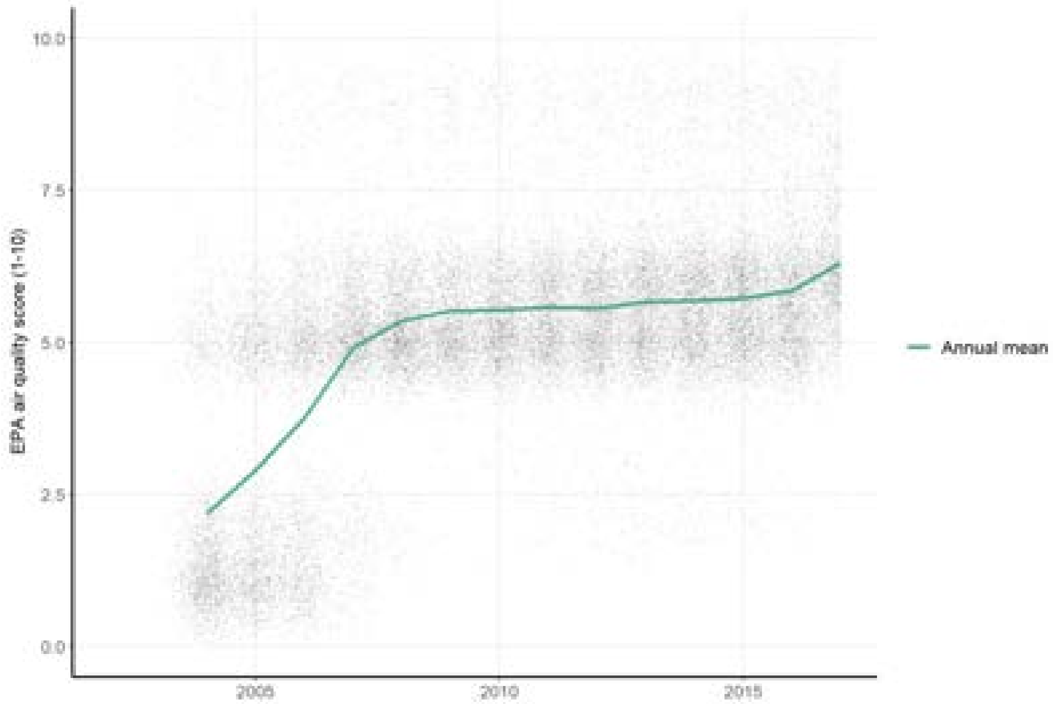
Figure A1.2. Fuel efficiency of vehicles sold in the US by year of production



Note: Fuel efficiency is measured by the kilometres per litre from driving on a highway. The dots represent individual vehicle models, with a darker shade indicating a higher concentration of vehicle models at that fuel efficiency.

Source: US Environmental Protection Agency, via www.fueleconomy.gov.

Figure A1.3. Air quality score of vehicles sold in the US by year of production

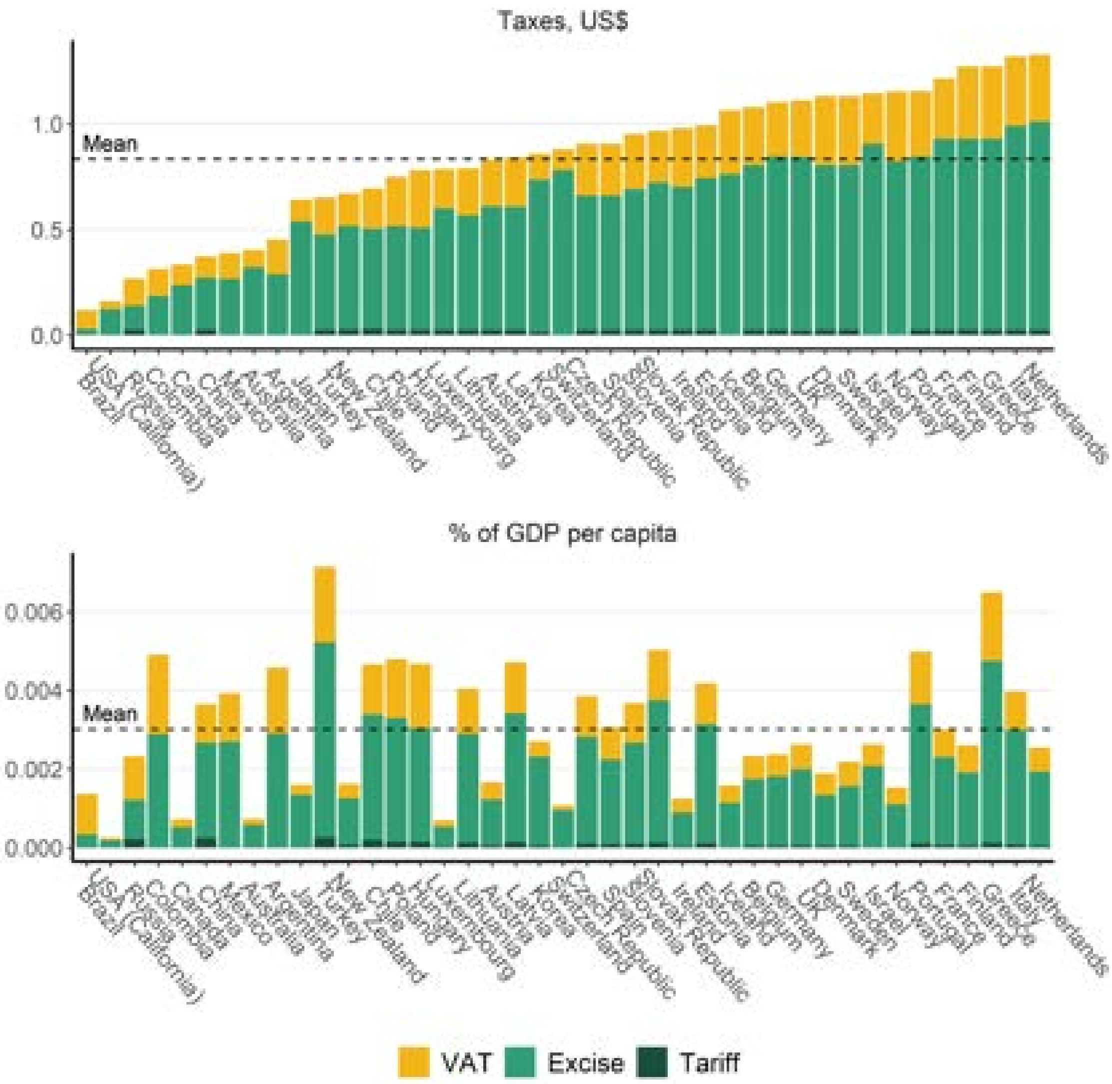


Note: The air quality score is a composite measure based on particulate and other emissions – for more details, see the EPA's website: https://www.epa.gov/greenvehicles/smog-rating. A higher score indicates that the car is less polluting. The dots represent individual vehicle models, with a darker shade indicating a higher concentration of vehicle models at that air quality score.

Source: US Environmental Protection Agency, via www.fueleconomy.gov.

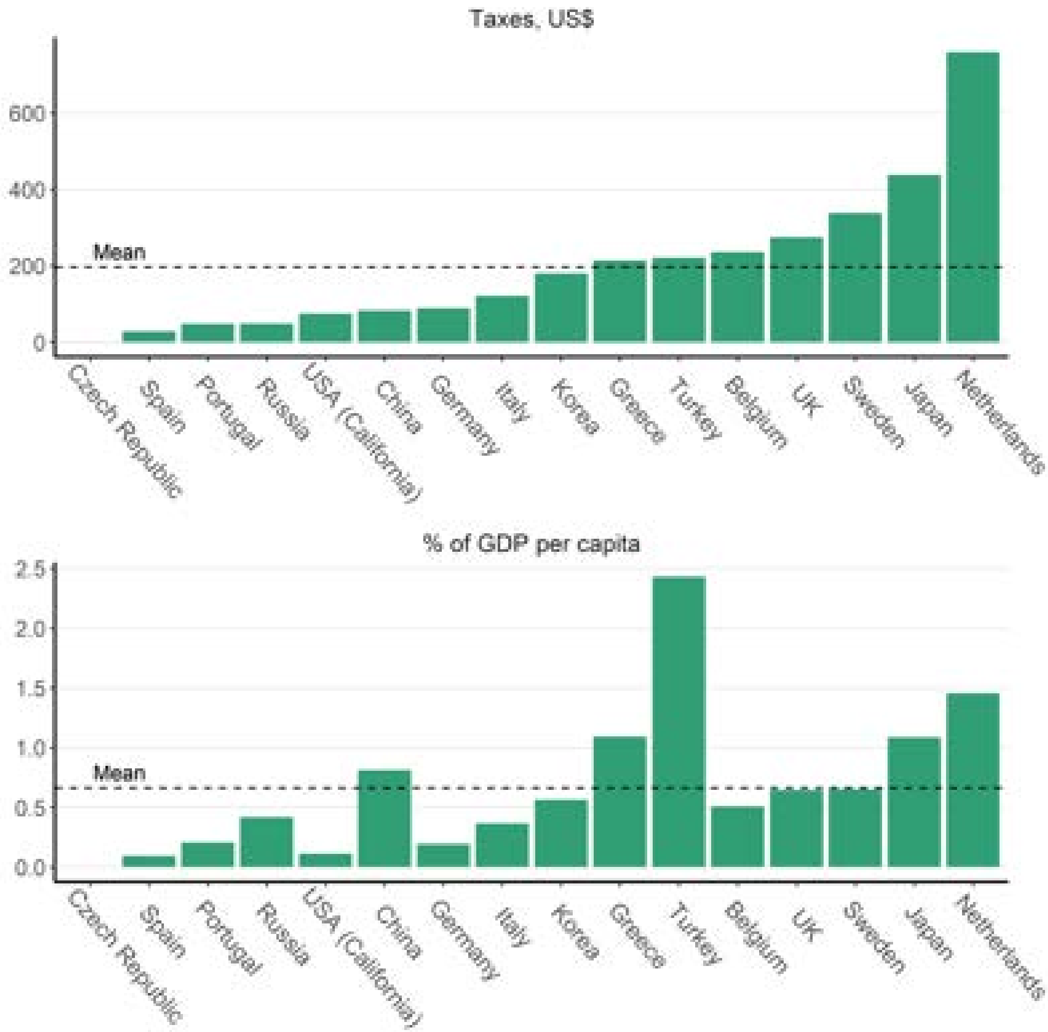
Appendix 2. Motoring taxes in middle- and high-income comparison countries

Figure A2.1. Official taxes due on a litre of imported gasoline, middle- and high-income countries



Source: WTO [tariff]; KMPG / EY [VAT]; OECD [excise].

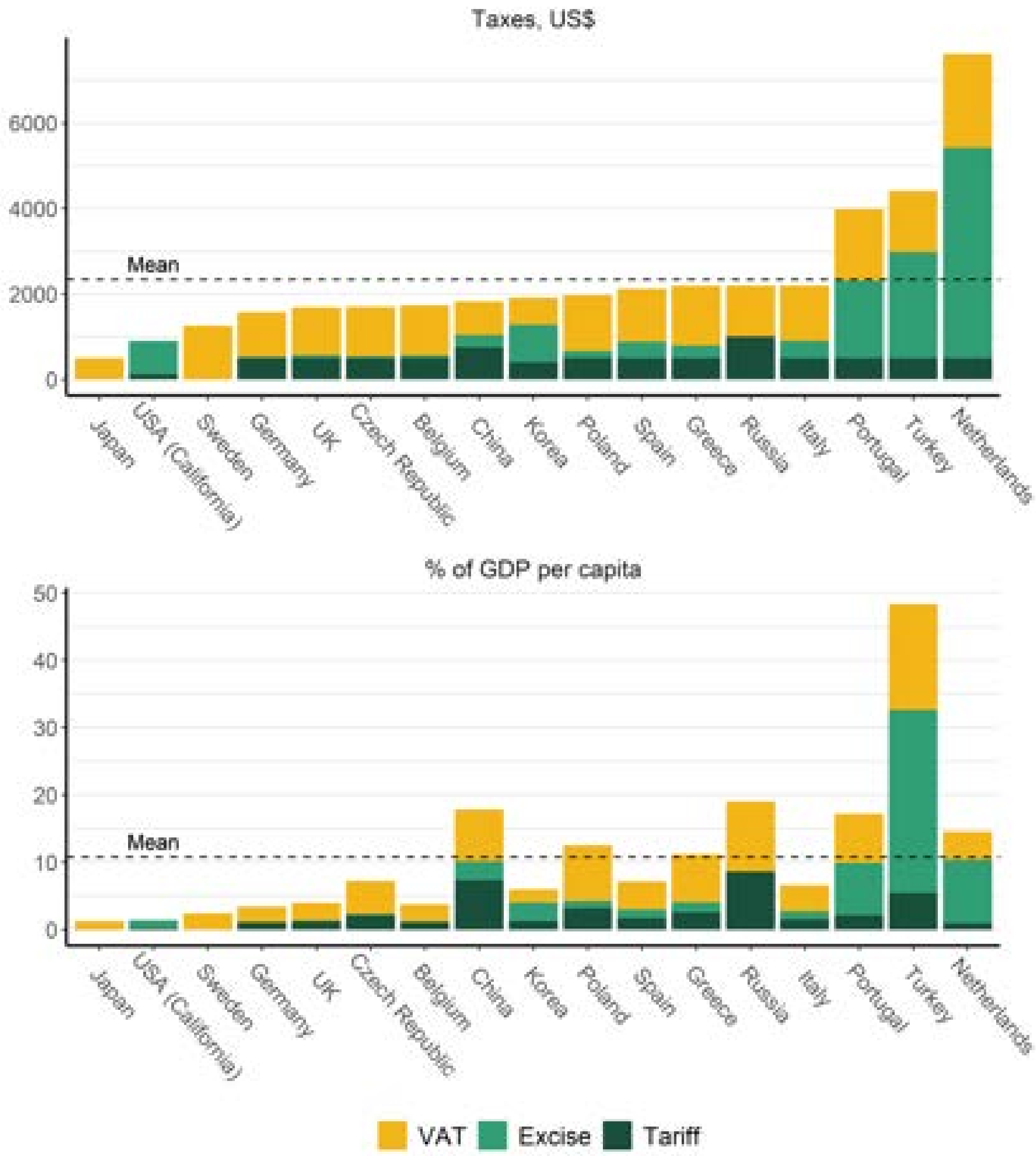
Figure A2.2. Taxes on vehicle ownership, for a five-year-old gasoline-powered car with a 1,600cc engine, middle- and high-income countries, 2020



Note: Countries include the 10 largest EU countries by GDP for which data were available, and other countries that the ACEA provides data for.

Source: European Automobile Manufacturers' Association (ACEA).

Figure A2.3. Taxes on vehicle purchase, for a used imported gasoline-powered vehicle less than five years old, with a 1,600cc engine and a pre-tax price of US$5,000, worldwide



Source: WTO [tariff]; KPMG / EY [VAT]; ACEA [excise].

Appendix 3. Fuel and vehicle taxation in sub-Saharan African countries

Table A3.1. Rates and references for fuel taxes, taxes on vehicle purchase and taxes on vehicle ownership in sub-Saharan African countries

Country	Fuel customs duty (%)	Fuel excise duty (% or local currency / litre)	Is fuel VAT-exempt?	Vehicle customs duty (%) on a 4.9-year-old used vehicle	Vehicle excise duty (%) on a 4.9-year-old used vehicle	Vehicle ownership tax (local currency)	Sources
Angola	2	2%	Yes	30	2; varies by engine size	4,700; varies by engine size	Angolan law: http://www.parlamento.ao/documents/506145/0/08.+PROP.+LEI+IMPOSTO+SOBRE+OS+VE%C3%8DCULOS+MOTORIZADOS PwC: https://www.pwc.com/ao/en/services/tax/excise-duty.html
Benin	10	55 /ltr	No	20	20	N/A	WTO Trade Policy Review, 2017: https://www.wto.org/english/tratop_e/tpr_e/s362-01_e.pdf
Botswana	0	0.039 Rand + 0.12 P /ltr	Yes	25	1.4	N/A	WTO Trade Policy Review, 2015: https://docsonline.wto.org/dol2fe/Pages/FE_Search/FE_S_S009-DP.aspx?language=E&CatalogueIdList=226744,134794,97313,81745,14288,4

							8237&CurrentCatalogueIdIndex=0&FullTextHash=&HasEnglishRecord=True&HasFrenchRecord=True&HasSpanishRecord=True
Burkina Faso	10	50 /ltr	No	20	20	N/A	WTO Trade Policy Review, 2017: https://www.wto.org/english/tratop_e/tpr_e/s362-02_e.pdf
Burundi	0	210 /ltr	No	25	10; varies by engine size	N/A	WTO Trade Policy Review, 2019: https://www.wto.org/english/tratop_e/tpr_e/s384-01_e.pdf
Cameroon	10	0	No	30	0; varies by engine size and age	N/A	Ecomatin (local news), 2018: https://ecomatin.net/importations-le-plan-fiscal-pour-lutter-contre-les-vieilles-voitures/#:~:text=Selon%20le%20Guichet%20unique%20du,partir%20du%20port%20de%20Douala.&text=Pour%20les%20v%C3%A9hicules%20de%20tourisme,taux%20du%20droit%20d'accises KPMG, 2016: https://assets.kpmg/content/dam/kpmg/pdf/2016/03/africa-indirect-tax-country-guide.pdf
Chad	10	0	No	30	0	N/A	WTO Trade Policy Review, 2015, table 3.2: https://www.wto.org/english/tratop_e/tpr_e/s285-04_e.pdf KPMG, 2016: https://assets.kpmg/content/dam/kpmg/pdf/2016/03/africa-indirect-tax-country-guide.pdf
Côte d’Ivoire	10	210 /ltr	Reduced rate (9%)	20	0	N/A	Lloyds Bank Trade: https://www.lloydsbanktrade.com/en/market-potential/ivory-coast/taxes PwC: https://taxsummaries.pwc.com/ivory-coast/corporate/other-taxes DGI Côte d’Ivoire: https://www.dgi.gouv.ci/images/PDF/SYSTEME_FISCAL_2021.pdf

DRC	10	25%	No	20	5	N/A	DRC law, p8: https://www.droitcongolais.info/files/621.03.18-Code-des-accises.pdf
Djibouti	26	49.5 /ltr	No	26	0	35,000; varies by engine size	Oxford Business Group: https://oxfordbusinessgroup.com/overview/transition-time-comprehensive-guide-country%E2%80%99s-tax-laws
Eswatini	0	0.039 Rand /ltr	Yes	25	1.4	N/A	WTO Trade Policy Review, 2015: https://docsonline.wto.org/dol2fe/Pages/FE_Search/FE_S_S009-DP.aspx?language=E&CatalogueIdList=226744,134794,97313,81745,14288,48237&CurrentCatalogueIdIndex=0&FullTextHash=&HasEnglishRecord=True&HasFrenchRecord=True&HasSpanishRecord=True
Ethiopia	0	30%	No, but fuel does not incur surtax (of 10%)	30	260; varies by engine size and age	190; varies by number of passengers	Data provided by the Ethiopian Revenue and Customs Authority, Ethiopian Road Fund
Gabon	10	2.75 /ltr	No	30	0	N/A	World Bank, 2020: https://www.doingbusiness.org/content/dam/doingBusiness/country/g/gabon/GAB.pdf PwC: https://taxsummaries.pwc.com/gabon/corporate/other-taxes
Gambia	10	10%	Yes	20	0	N/A	WTO Trade Policy Review: https://www.wto.org/english/tratop_e/tpr_e/s365_e.pdf
Ghana	10	13%	Yes	20	10; varies by engine size	429.5; varies by engine size	Ghana Revenue Authority: https://gra.gov.gh/customs/vehicle-importation/ Ghanaweb: https://www.petrolworld.com/africa-middle-east/item/29308-ghana-parliament-passed-special-petroleum-tax-bill-2018

							Petrolworld, 2018: https://www.petrolworld.com/africa-middle-east/item/29308-ghana-parliament-passed-special-petroleum-tax-bill-2018
Guinea	10	5%	Yes	20	15; varies by engine size	N/A	World Bank, 2019: https://documents1.worldbank.org/curated/pt/472021561614678154/pdf/Guinea-Opportunities-for-Enhanced-Domestic-Revenue-Mobilization-Value-Added-Tax-and-Excise-Taxes.pdf
Guinea-Bissau	10	40%		20	10	N/A	WTO Trade Policy Review, 2017: https://www.wto.org/english/tratop_e/tpr_e/s362-04_e.pdf
Kenya	0	39.2 /ltr	No	25	25; varies by engine size	650 (licence renewal fee)	Kenya Revenue Authority: https://www.kra.go.ke/en/individual/calculate-tax/calculating-tax/car-import-duty; https://www.kra.go.ke/en/individual/importing/learn-about-importation/procedures-for-motor-vehicle The Star (local news), 2021: https://www.the-star.co.ke/business/kenya/2021-03-16-high-taxes-drive-up-kenyas-fuel-prices/ PwC, 2021: https://taxsummaries.pwc.com/kenya/corporate/other-taxes Reuters, 2018: https://www.reuters.com/article/kenya-economy/kenya-imposes-16-pct-vat-on-petroleum-products-defying-lawmakers-idUSL8N1VN09S
Lesotho	0	0.039 Rand /ltr	No	25	1.4	N/A	Lesotho Revenue Authority: http://www.lra.org.ls/tax-rates#:~:text=VALUE%20ADDED%20TAX%20(VAT)&text=0%25%20%2D%20Exports%20and%20basic%20commodities,15%25%20%2D%20Other%20goods%20and%20services WTO Trade Policy Review, 2015: https://docsonline.wto.org/dol2fe/Pages/FE_Search/FE_S_S009-

							DP.aspx?language=E&CatalogueIdList=226744,134794,97313,81745,14288,48237&CurrentCatalogueIdIndex=0&FullTextHash=&HasEnglishRecord=True&HasFrenchRecord=True&HasSpanishRecord=True
Liberia	10	0	No	20	0 (only for luxury cars > 600,000)	N/A	Liberia Revenue Authority: https://revenue.lra.gov.lr/08/REVENUE-CODE-REFORM-EXCISE-TAX-LAW-2018-CUSTOMS.pdf
Madagascar	7.6	0	No	20	10	N/A	WTO Trade Policy Review, 2015: https://www.wto.org/english/tratop_e/tpr_e/s318_e.pdf
Malawi	10	0	Yes	25	40; varies by engine size and age	8,000; varies by engine size	Malawi Revenue Authority: https://www.mra.mw/tax-update/calculation-of-duty-on-imported-saloons-and-station-wagons Times (local news), 2019: https://times.mw/mra-justifies-carbon-tax/
Namibia	0	0.93%	Yes	25	1.4; varies by engine size and price	900; varies by engine size	PwC, 2021: https://taxsummaries.pwc.com/republic-of-namibia/corporate/other-taxes
Nigeria	N/A	N/A	N/A	35	0	N/A	West Africa Automotive (local news), 2020: https://westafricaautomotive.com/car-import-levy-slashed-from-35-to-5/#:~:text=The%20federal%20government%20is%20implementing,presented%20to%20the%20national%20assembly Nigeria Customs: http://download.trade.gov.ng/tariff/chapters/Chapter_87.pdf?contentType=text%2Fhtml
Republic of the Congo	10	0	No	30	12.5	N/A	PwC, 2021: https://taxsummaries.pwc.com/republic-of-congo/corporate/other-taxes

Rwanda	0	183 /ltr	No	25	10; varies by engine size	10,000	PwC, 2021: https://taxsummaries.pwc.com/rwanda/corporate/other-taxes Rwanda Revenue Authority: https://www.rra.gov.rw/typo3conf/ext/complete/Resources/Public/download/pdf/vat_zero_rated_and_exempted_goods-2.pdf
Senegal	10	19.8 /ltr	Yes	20	10	1,600; varies by engine size	PwC, 2021: https://taxsummaries.pwc.com/senegal/corporate/other-taxes
Sierra Leone	0	30%	Yes	20	0	N/A	WTO Trade Policy Review, 2017: https://www.wto.org/english/tratop_e/tpr_e/s303_e.pdf
South Africa	0	5.84 /ltr	Yes	25	1.4; varies by engine size and carbon emissions	N/A	South Africa Revenue Service: https://www.sars.gov.za/wp-content/uploads/Legal/SCEA1964/LAPD-LPrim-Tariff-2012-04-Schedule-No-1-Part-1-Chapters-1-to-99.pdf; https://www.sars.gov.za/customs-and-excise/excise/ PwC, 2021: https://taxsummaries.pwc.com/south-africa/corporate/other-taxes
Tanzania	0	379 /ltr	No	25	5; varies by engine size and age	250,000; varies by engine size	Tanzania Revenue Authority: https://www.tra.go.tz/index.php/excise-duty PwC, 2021: https://taxsummaries.pwc.com/tanzania/corporate/other-taxes
Togo	10	60 /ltr	No	20	0	25,000	Deloitte, 2019: https://www2.deloitte.com/content/dam/Deloitte/za/Documents/tax/za_Africa_Key_Fiscal_Guide_2019.pdf Lloyds Bank Trade: https://www.lloydsbanktrade.com/en/market-potential/togo/taxes Office Togolais Des Recettes, 2020, p16:

							https://www.otr.tg/index.php/fr/impots/reglementations-fiscales/code-general-des-impots/199-le-guide-fiscal-otr-2020/file.html
Uganda	0	900 /ltr	Yes	25	0; varies by age	50,000; varies by engine size	Uganda Revenue Authority: https://www.ura.go.ug/Resources/webuploads/INLB/LICENSING.pdf PwC, 2021: https://taxsummaries.pwc.com/uganda/corporate/other-taxes
Zambia	25	1.97 /ltr	Yes	30	10; varies by age	N/A	Bloomberg: https://news.bloombergtax.com/daily-tax-report-international/zambia-tax-revenue-to-fall-3b-kwacha-on-removal-of-vat-on-fuel Zambian Customs and Excise Act: http://www.parliament.gov.zm/node/1291 Zambia Revenue Authority: https://www.zra.org.zm/wp-content/uploads/2020/03/2020-SPECIFIC-MOTOR-VEHICLE-DUTIES.pdf; https://www.zra.org.zm/wp-content/uploads/2020/01/Excise-Duty.pdf
Zimbabwe	0	1.19 (USD) /ltr	Yes	40	0	6.43 [USD]; varies by size	Mbare Times (local news): https://mbaretimes.com/2019/12/new-zinara-lice/ ZimFact: https://zimfact.org/fact-sheet-fuel-pricing-structure/#:~:text=Government%20taxes%20and%20levies%20make,litre%20to%20the%20total%20price WTO Trade Policy Review, 2020: https://www.wto.org/english/tratop_e/tpr_e/s398_e.pdf

Note: The source for all customs duty data is WTO Tariff Analysis Online: https://tao.wto.org/welcome.aspx?ReturnUrl=%2f%3fui%3d1&ui=1.
For all countries, the source of VAT exemptions is PwC’s worldwide tax summaries (https://taxsummaries.pwc.com/), EY’s worldwide indirect tax guide (https://www.ey.com/en_gl/tax-guides/worldwide-vat-gst-and-sales-tax-guide), Deloitte’s Africa tax guide (https://www2.deloitte.com/content/dam/Deloitte/za/Documents/tax/za_Africa_Key_Fiscal_Guide_2019.pdf) or KPMG’s indirect tax guide (https://home.kpmg/xx/en/home/insights/2016/07/regional-indirect-tax-country-guides.html).
N/A indicates data could not be found.
For fuel, the customs duty rate used is that for the six-digit HS code 271012 (petroleum oils and oils from bituminous minerals, not containing biodiesel, not crude, not waste oils; preparations n.e.c, containing by weight 70% or more of petroleum oils or oils from bituminous minerals; light oils and preparations). Subheadings below six digits are not harmonised across countries, but where possible we have used the value for the subheadings with the description ‘motor spirit’, ‘regular gasoline’ or any description that made it clear it was gasoline for vehicles. If there was no clear description, the average of all tariffs for the HS code 271012 was taken. The ‘Most Favoured Nation’ customs duty rate is used, which is the rate charged to any WTO member not subject to a trade agreement. In the case of multiple excise duties on fuel, the value for motor gasoline was taken, if available.
For taxes on vehicle purchase, the customs duty rate used is that for the six-digit HS code 870323 (vehicles with engine size between 1500cc and 3000cc). Subheadings below six digits are not harmonised across countries, but where possible we have used the value for the subheadings that indicated a used passenger car. If there was no clear description, the average of all tariffs for the HS code 870323 was taken. The ‘Most Favoured Nation’ customs duty rate is used, which is the rate charged to any WTO member not subject to a trade agreement.