Taxing Energy[1]

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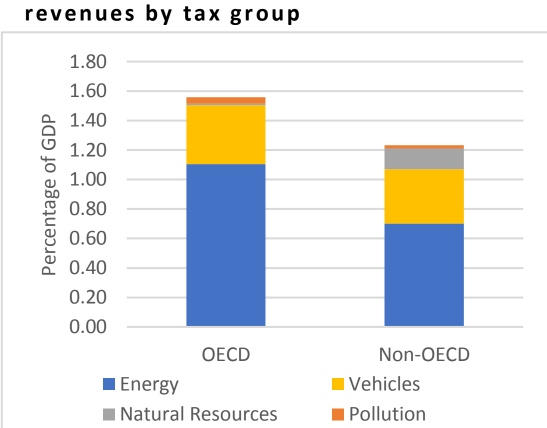
1. Introduction

Energy makes possible the investments and innovation that generate jobs, inclusive growth and shared prosperity for entire economies. Fossil fuels are the main source of energy across the globe and thus the energy sector is a major contributor to climate change, responsible for two-thirds of greenhouse gas (GHG) emissions. Currently, the sector is witnessing a major transformation, with renewable energy playing an increasingly vital role in helping countries develop modern and resilient energy systems. Given the global imperative to address climate change, there is a need to both broaden the base of existing energy taxes to cover all fossil fuel use and to rationalize energy tax rates to fully internalize those fuels' environmental costs. There is also often scope for significant fiscal savings (and environmental protection) from eliminating pre-tax subsidies and tax expenditures that promote fossil fuel consumption.

This note provides guidance on how to assess a country's current level of energy taxation and formulate a policy framework for its rationalization and expansion. Section 2 provides an overview of global energy taxes, including a description of the various instruments used, their revenue raising capabilities, and how external costs are included in their formulation. Section 3 discusses policy considerations for achieving an efficient level of energy taxes such as the choice of tax base and rates, revenue potentials, and other major policy concerns. Section 4 summarizes key policy advice and Annex I provides a distributional analysis of energy taxes.

2. Overview

FIGURE 1: Environmental tax revenues by tax group



Source: OECD Pine Database

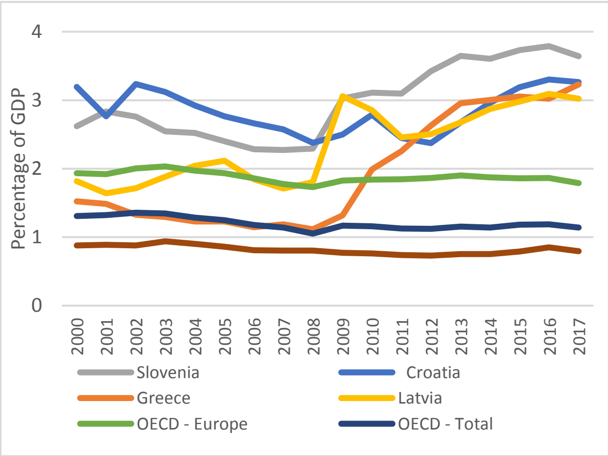
Energy taxes, which comprise fuel excise taxes as well as carbon and electricity consumption taxes[2], are the largest source of environmental tax revenue worldwide. Among OECD countries, energy taxes on average account for 72% of total environmental revenues. By contrast, among non-OECD countries, some of which generate significant revenue from natural resource taxes, energy taxes account for an average of 52 percent of environmental tax revenues (Figure 1). The share of energy taxes in environmental revenues is also more variable in the developing world. Among OECD countries, the share of energy taxes ranges from about 50 percent for countries such as Iceland and New Zealand to more than 90% for countries such as Poland

[1] This paper is part of a World Bank project, led by Miria Pigato (Lead economist) on 'Securing a Sustainable Recovery: A Guide to Green Taxes and Spending'', under the supervision of Chiara Bronchi (practice manager) and Marcello Estevao (Global Director) in the Macroeconomics, Trade and Investment Global Practice of the World Bank. The project includes seven technical Notes in response to a growing demand from client countries for insights on green spending polices and tax instruments to help support a sustainable recovery from the Covid-19 induced recession. Financial support from the Just-in Time COVID 19 Support Window for DPFs is gratefully acknowledged.

[2] For an in-depth review of energy taxes, see OECD (2019).

and Luxembourg. Among developing countries, however, this share ranges from close to 100 percent for countries such as Nicaragua and Madagascar to less than 20 percent for countries such as Kazakhstan and Brazil.

FIGURE 2. Energy tax revenue as a share of GDP



Source: Coady et al. (2019)

As a share of GDP, energy tax yields tend to be significantly lower in developing economies (Figure 2). Among OECD countries, energy taxes raise an average of 1.1% of GDP, and over the past decade a few European countries have raised their yield to more than 3% of GDP. By contrast, among non-OECD countries energy taxes raise an average of 0.7% of GDP.[3] This lower yield partially reflects lower overall levels of taxation in developing countries.[4] However, it also reflects lower levels of private automobile ownership as well as policymakers' concerns about the effect of fuel taxes on economic activity and the poor.[5]

Tax instruments and revenues

Energy taxes are levied on a variety of fuels as well as electricity consumption. The most common form of energy tax is a specific charge per fuel unit: e.g., litre of gasoline or diesel, ton or kg of coal, or cubic meter of natural gas. However, a few countries use ad valorem charges based on the market value or sales price of fuels. Revenues from specific taxes fluctuate much less that ad valorem tax revenues since petroleum market prices are volatile.

Carbon taxes are also usually levied as specific excises on fossil fuels, based on the average GHG emissions from combustion of each fuel source. For example, a carbon tax of $US 40/ton of GHG emissions would apply roughly a $0.08 per cubic meter excise on natural gas, a $0.10 per litre excise on motor fuels, and a $89 per metric ton excise on coal (Table 1).

TABLE 1. Carbon emissions by fuel source

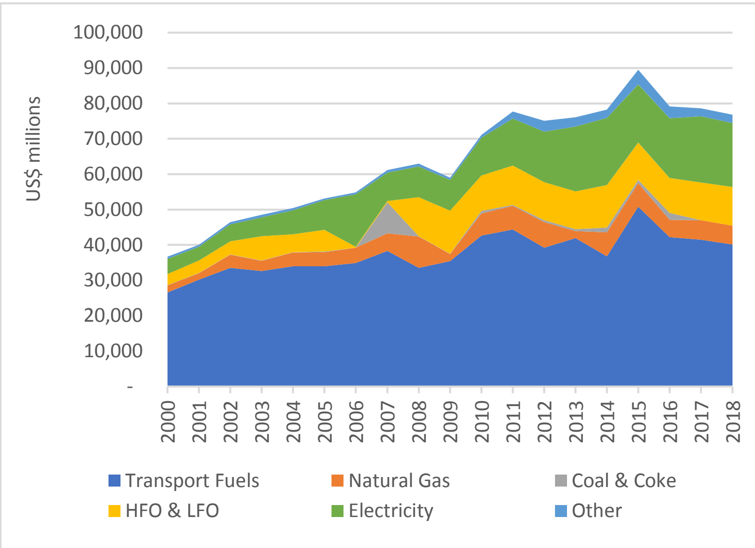
Fuel	Metric	Carbon emissions per metric unit	Carbon tax
		Kg CO2 equivalent	*US$40 per metric ton of CO2 equivalent*
Natural Gas	Cubic meter	1.9	$0.08
Motor gasoline	litre	2.3	$0.09
Motor diesel	litre	2.7	$0.11
Coal	metric	2,224.5	$88.98

Source: US Environmental Protection Agency.

3 These observations are based on a subset of 74 non-OECD countries covered in the OECD environmental database.
4 In 2018, the average ratio of tax revenue to GDP was 34% among OECD countries vs. 20% among non-OECD economies.
5 See below discussion on the regressivity of fuel taxes.

Electricity taxes are levied per kilowatt hour consumed, regardless of the power source (fossil fuel, nuclear or renewables). They are most widely used in Europe, where the European Union requires it. These taxes discourage energy use in general but do not distinguish among energy sources.

FIGURE 3. Energy Tax Revenues by Tax Base



Source: OECD PINE Database

The most important source of energy tax revenues in both OECD and non-OECD countries is transport fuels—gasoline and diesel—which together account for more than 50 percent of energy tax revenues (Figure 3). This share has declined from more than 70 percent over the past 20 years, however, as taxes on other energy sources increase—particularly electricity taxes, but also taxes on natural gas, heavy fuel oil (HFO) and light fuel oil (LFO). Coal and coke remain severely undertaxed, given their large pollutive effects.

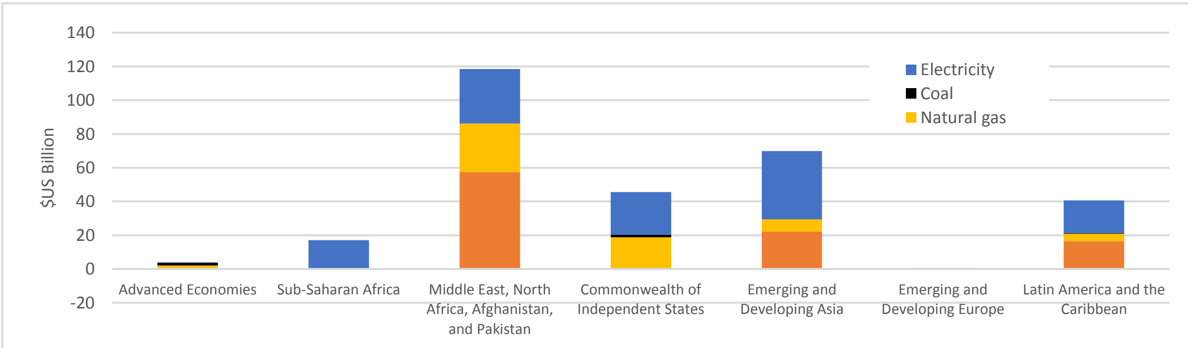
Externalities and Efficiency

Fossil fuel combustion produces two kinds of environmental externalities: carbon emissions, which cause global warming, and local air pollution, which damages human health as well as the ecosystem (e.g., through acid rain). Consumption of road transport fuels is also externalities, including congestion, accidents, and infrastructure damage.[6] Markets tend to produce inefficient outcomes for activities with negative externalities, such as fossil fuel consumption, because the social cost of those activities exceeds their private cost. Raising their cost by imposing a tax commensurate with their negative externalities corrects this inefficiency. Failure to fully tax fossil fuels in line with the social cost they impose can therefore be viewed as a form of subsidy.

Coady et al. (2019) estimate effective fuel subsidies for 191 countries (Figures 5 and 6). Under their rubric, subsidies comprise both "pre-tax" subsidies from selling fuel or electricity below cost and "post-tax" subsidies from taxing fuel by less than the full social cost of carbon emissions, local air pollution and vehicular externalities.

[6] While vehicular externalities are most appropriately addressed through vehicle taxes—e.g., vehicle excises and license and circulation charges—in their absence the externalities may also be addressed through fuel taxes.

FIGURE 4. Pre-tax energy subsidies by region

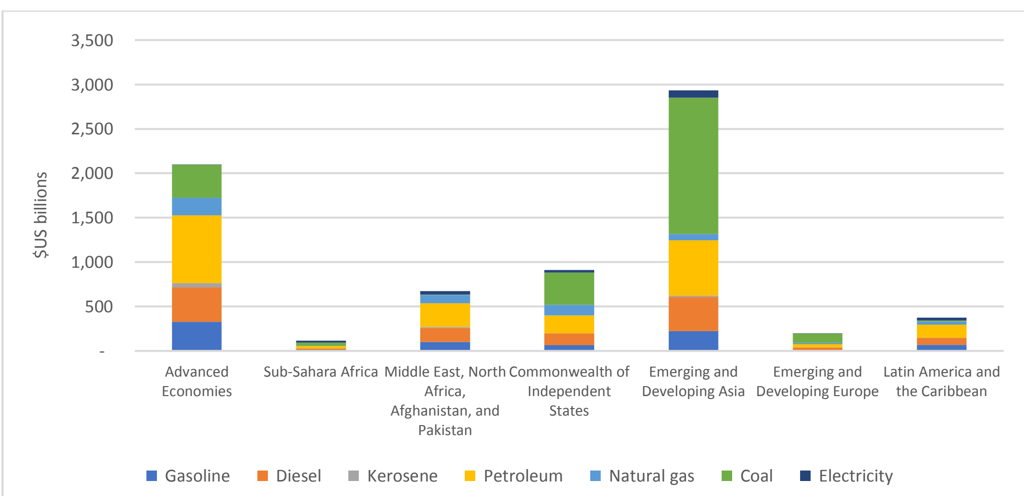


Source: Coady et al. (2019)

In 2017, global pre-tax subsidies totalled $296 billion, or about 0.4 percent of global GDP, having fallen by roughly half, since the beginning of that decade. Some 40 percent of these subsidies arise in the Middle East/North Africa region, and another 24 percent are from developing Asia. Almost half of pre-tax subsidies (46 percent) are from pricing electricity below cost. One third derive from under-pricing motor fuel, and another 21 percent from natural gas.

Global post-tax subsidies—the amount by which fuels were undertaxed, relative to their efficient price—were much larger at $5.2 trillion, or 6.5 percent of global GDP. The largest source of post-tax subsidies was developing Asia, which accounted for 44 percent, followed by developed countries with another 26 percent. Coal is the source of almost half (46 percent) of global post-tax subsidies, or $2.4 trillion. Motor fuels account for about another 40 percent of post-tax subsidies, and natural gas 10 percent.

FIGURE 5. Post-tax energy subsidies



Source: Coady et al. (2019)

3. Considerations for designing an effective system of energy taxes

This section provides information on how to evaluate a country's existing energy taxes and gauge their potential for increased revenue. Links to relevant datasets and diagnostic tools are provided. Additionally, major policy concerns are discussed.

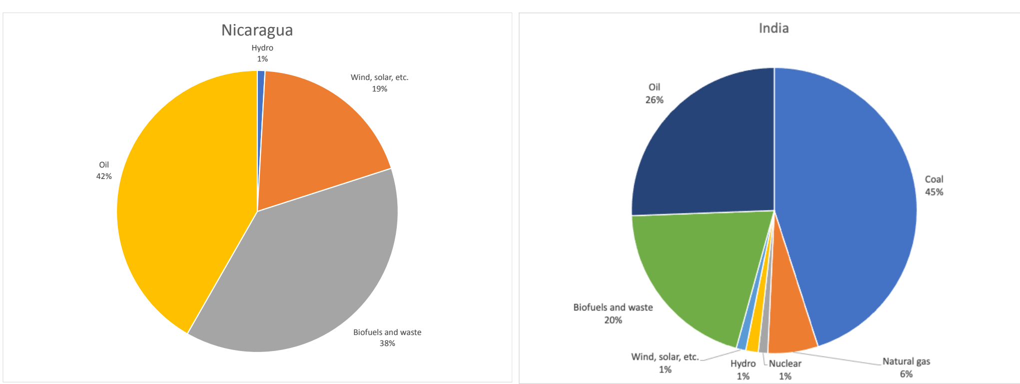
An efficient energy tax "internalizes" the environmental costs of fuel consumption by shifting them from society at large back onto the fuel user. The efficient fuel excise should thus be set equal to the marginal social cost of fuel consumption, which include GHG emissions and local air pollution. Since these externalities depend on the amount of fuel consumed, the appropriate energy tax is a specific excise levied per physical unit of fuel.

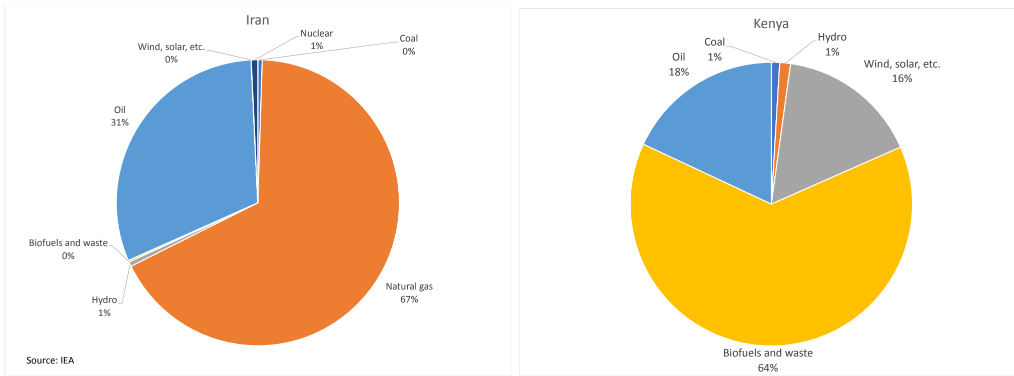
As tax instruments, fuel excises have two very desirable properties: They are efficient revenue instruments because they not only internalize social costs, but their base is also relatively inelastic. Since fuels are typically a necessity with few good substitutes, fuel demand is relatively price-insensitive, at least in the near term. Over time, however, heavier taxation of fossil fuels should shift innovation and consumption toward renewable energy sources. Fuel taxes are also easy to administer: They are typically imposed on petroleum products at customs, as well as at the well head or refinery in countries with oil and gas sectors. This model can easily be extended to natural gas and coal.

Evaluating the tax base

The first step toward evaluating a country's energy taxes is understanding its energy matrix. While all countries rely on petroleum for transportation, sources for other types of energy vary widely. While some countries, such as India and Iran, rely heavily on fossil fuels for power generation, others such as Nicaragua and Kenya rely relatively more on renewables (Figure 7). Clearly, the revenue potential for efficiency-enhancing fuel taxes will be higher in countries that rely more heavily on fossil fuels. Two sources for data on country energy matrices are the U.S. Energy Information Administration (EIA) and the International Energy Agency (IEA). These data include annual consumption of different fuel types, which would serve as potential tax bases.

FIGURE 6. Energy consumption by source – 2018





Source: Coady et al. (2019)

Inventory of existing policies

The second key element in evaluating energy tax potential is an inventory of existing energy policies, including pre-tax subsidies, tax expenditures, and existing energy taxes.

Pre-tax subsidies can take a variety of forms, such as fuel price stabilization funds[7] or provision of electricity at below-market rates.[8] Coady et al. (2019) provides estimates of pre-tax subsidies in 191 countries in 2017. Ideally, most fossil fuel subsidies should be eliminated as a first step toward rationalizing energy policy.[9] While this may not always be feasible, it is nonetheless important to understand the extent and effects of any existing fuel subsidies when designing tax policy for the sector.

The finance ministry should provide comprehensive information on existing fiscal instruments, including both tax laws and revenue data. The laws provide information not only on rates, but also on bases, including tax expenditures.[10] If the country has a recent tax expenditure report, that should also be provided; however, depending on how the country measures the "baseline" tax regime, fuel tax expenditures may or may not be included.

Measuring and eliminating existing tax expenditures that encourage fossil fuel consumption is a key component of energy tax reform. Energy tax expenditures can arise under both direct (income) and indirect (goods and services) taxes, but indirect tax expenditures are often more costly in revenue terms. Prominent examples of indirect energy tax expenditures include exempting fuel or electricity from the value added tax (VAT) and exempting motor fuels used in certain applications (e.g., boating, aviation, farming, or electricity generation) from excise taxes.[11] Given the typical size of energy tax bases and VAT rates, these exemptions can forego a significant amount of revenue. Broadening the VAT base to include all fuels and electricity is a priority reform, along with eliminating motor fuel excise exemptions for agriculture, boating and aviation. Taxing international maritime and aviation fuel use requires international coordination, but fuel for domestic boating and aviation can be taxed by national governments (though few do.)

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7 Fuel price stabilization funds are used to smooth volatile world prices of petroleum products: When prices are low, a tax is charged, and when prices are high those revenues are used to reduce prices below market.

8 For below-cost pricing to persist, the government must cover the chronic losses of power companies.

9 Some types of pre-tax fuel subsidies, such as fuel price stabilization funds (with hard budget constraints), are a reasonable policy instrument to insure the population against fuel price swings.

10 A tax expenditure is a reduced (or zero) effective tax rate on a particular good or activity that would normally be taxed at a higher rate under the "standard" tax code.

11 Standard VAT treatment of a good or service that is subject to an excise is to apply the VAT to the excise-inclusive goods price. For an imported good, the standard treatment is to apply first the tariff, then the excise, then the VAT.

Direct energy tax expenditures include special tax breaks for oil and gas or power companies (e.g., tax holidays, reduced tax rates, accelerated depreciation/expensing). They also include provisions that encourage fuel consumption, such as exempting company car benefits from income taxation. Eliminating tax expenditures is a priority policy measure in reforming post-tax energy subsidies.

Calculating Efficient Rates and Revenues

Actual levels of fuel taxation should be compared with a target level that internalizes environmental costs. The IMF/World Bank Carbon Pricing Assessment Tool (CPAT) can be used to assess the appropriate corrective excise rates. Fuel taxes should be calibrated to internalize carbon and air pollution costs. They may also be calibrated to offset the cost of vehicular externalities, if those are not charged for using other fiscal instruments (e.g., vehicle taxes). The tool can be updated to reflect current energy use and tax rates, and the social price of carbon can also be adjusted.[12]

The country's excise tax rates should be compared with those of surrounding countries. Charging substantially higher excise tax rates than other countries with a common border can encourage cross-border shopping and/or smuggling. This constraint is clearly more important for continental countries than for islands (although some islands do experience fuel smuggling). Regional coordination of excise tax rates and bases, such as in the European Union or the Southern Africa Development Community (SADC), can help stem competitive pressures on fuel tax rates.

Once efficient fuel tax rates have been derived, the revenue yield of levying those taxes can be estimated, using the consumption data from the IEA/EIA and the appropriate price elasticities of demand. Labandeira et al. (2017), performing a meta-analysis of more than 428 papers estimating the price elasticities of different energy products such as gasoline and electricity, find remarkable consistency across products and countries: The short-term price elasticity of energy demand is about -0.2, and the long-term elasticity is about -0.5. IMF (2019a) uses an elasticity of -0.5 across all countries and products[13] and finds the potential revenue from efficient fuel taxation is US$2.8 trillion, or about 3.8 percent of global GDP.

Table 2 shows a sample calculation of the revenue gain from imposing a US$40/ton of CO_2 equivalent carbon tax. The formulas for calculation of each step are shown at the head of each column. Since consumption tax—VAT or a general sales tax—are imposed on top of excises, the total revenue gain exceeds that of the carbon tax alone.

TABLE 2. Sample calculation of revenue change from imposition of carbon tax

Fuel	Unit	Carbon tax	Consumer Price/Unit	Pre-Tax	Tax rate consumption	Price increase	Percentage price change	Elasticity	Post-tax consumption	Total revenue gain
		A	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**
		US$40 per ton of CO equivalent	US$		Millions of units	A*(1+D)	(B+E)/B-1		C*(1+F*G)	E*H
Natural Gas	cubic meter	$0.08	$0.10	100	10%	$0.08	85%	-0.20	83	$7
Motor gasoline	litre	$0.09	$1.00	100,000,000	10%	$0.10	10%	-0.20	97,959,483	$9,994,401
Motor diesel	litre	$0.11	$1.00	100,000,000	10%	$0.12	12%	-0.20	97,627,286	$11,582,083
Coal (mixed)	metric ton	$88.98	$30.00	100,000,000	10%	$97.88	326%	-0.20	34,748,480	$3,401,086,720

Source: Staff calculations

[12] The default carbon price is US$40/metric ton of C02 equivalent, which the IMF finds would meet most countries' Paris commitments.

[13] However, a slightly higher elasticity of -0.7 is assumed for the power sector.

The WB/IMF model highlights the importance for both climate change and human health of taxing all fossil fuels in proportion to their environmental damage. Worldwide, many countries tax gasoline and diesel, imposing effective carbon tax rates of as much as $125 per ton of CO_2 equivalent.[14] By contrast, coal and natural gas, which contribute 57 percent of fuel externalities worldwide, are often taxed at low or zero rates. Taxing fossil fuels other than road transport fuels can also raise substantial revenue: For example, an efficient tax on coal in China would raise about 5 of GDP of GDP, and an efficient tax on natural gas in Iran would raise almost 4 percent of GDP.

Major policy concerns

The two major policy concerns regarding fossil fuel taxation are regressivity and competitiveness. Since fuel is a necessity both for households and businesses, taxing it burdens both consumption and production. Numerous studies show that energy—both direct household fuel consumption and energy-intensive goods--constitutes a larger budget share for lower-income households than for upper-income households. Fuel taxes therefore tend to be regressive, insofar as their income share decreases as household income increases. Box 1 discusses how to measure the distributional impact of fuel taxes.

BOX 1. Recent energy tax reforms in developing countries

Over the past decade, numerous developing countries have undertaken energy sector reforms, often with support from the World Bank and International Monetary Fund (IMF). For example:

- Egypt: Prior to reform, this North African oil-producing country heavily subsidized domestic fuel consumption, with transport fuel prices well below the international market and electricity cost recovery of only 30%. Fuel subsidies at the start of the reform constituted 7% of GDP and 22% of the national budget. Beginning in 2014, Egypt began phasing out subsidies with support from the World Bank and IMF, and by 2019 fuel prices were raised and indexed to world market levels. The fiscal savings from the energy subsidy reforms were also redirected towards social spending, in particular health and education (Wheeler et al. 2020). At the same time, the government froze the prices of certain fuels and food staples and expanded the food subsidy system in order to reduce the effects of energy price reform on consumers, particularly the poor (International Institute for Sustainable Development, 2014). Since 2014, investment has constantly increased, along with expenditures on food subsidies and the cash transfer program. The cash transfer program appears to have been more effective than the food subsidy system at mitigating the consumption losses of poor households due to rising energy prices (Breisinger et al. 2018).
- Haiti: This Caribbean fuel-importing country fixed fuel prices in nominal domestic currency terms, triggering an increase in subsidies whenever world prices increase, or the exchange rate deteriorates. Prior to reform, subsidies had risen to more than 2 percent of GDP and were highly regressive: The top income quintile receiving 93% of the benefit. Nonetheless, fuel prices had a large impact on the poor, especially through the price of public transportation. When subsidies were cut in 2014, fuel prices rose 7 percent. Popular protests broke out, causing the government to backtrack on the reform and consider subsidies for public transportation. The Haitian experience highlights the importance of insulating low-income households from higher fuel prices and accompanying energy price reform with a public information campaign.
- Malaysia: Prior to reform, fuel subsidies in this Southeast Asian oil-exporting country were more than 4% of GDP and 10% of the government budget. Below-market oil prices led to outgoing fuel smuggling. The reform initiated in 2010 phased out transport fuel subsidies over 4 years and electricity subsidies over a decade, and it was accompanied by an expansion of cash transfers to the poor and infrastructure investment. Half of the fiscal savings from energy price reforms was dedicated to direct cash assistance for low-income groups, and the other half was used to finance development projects. In 2016, a total of US$1.5 billion was allocated to these cash transfers, benefitting 7.3 million recipients. The cash transfers were found to have effectively helped low-income households maintain consumption levels despite an increase in the cost of living due to the energy price reforms (Loo & Harun 2020). The reform's success highlights the importance of raising energy prices gradually and protecting low-income households.

[14] IMF (2019b) and OECD (2020).

Country experiences with energy reform (Annex 1) show that significant energy price reforms should not be introduced all at once; they must be phased in over a sufficient period to allow households and businesses to adjust. Commitments for emissions reductions under the Paris Agreement may, however, limit the length of any phase-in. It is also critical to accompany fuel price reform with public information campaigns to reduce consumer resistance to higher fuel prices. Regressivity can be addressed by using part of the revenue from increased fuel taxes to compensate low-income households for their loss of purchasing power.[15] This will be easiest if there is an existing framework for household transfers.

As source-based taxes on an important production input, fuel taxes also raise concerns about international competitiveness. Although fuel taxes, by internalizing an externality, *increase* production efficiency from a general welfare perspective, they may nevertheless render energy-intensive domestic products more expensive than competing products from countries that do not levy corrective fuel taxes. One method of ameliorating this effect is "border adjustment," which entails refunding energy taxes on exports to countries without an adequate level of energy taxes and imposing the tax on the (imputed) energy content of energy-intensive imports. Border adjustment can significantly increase the administrative costs of imposing higher fuel taxes. Another means of addressing the competitiveness issue is through multilateral coordination of energy taxes—for example, the Paris process.

A justification for increasing fuel excises that authorities may find persuasive is restoring their real value to historical levels. Specific excises, which imposed a fixed cost per unit of fuel consumed, are seldom indexed to inflation, so their real value tends to erode over time. If their rate has not been recently adjusted, their real value is often substantially below its level at the time of their introduction or last adjustment. Raising the real value of fuel excises in line with any cumulative increase in the consumer price index can result in substantial positive adjustments, which the authorities may find acceptable given that those real levels were imposed at an earlier date. Annual adjustments for inflation should ideally be encoded in all fuel excise statutes.

4. Summary of Technical Assistance Procedures

Based on the preceding analysis, technical assistance on energy tax reform should incorporate the following steps:

- Evaluate the country's energy use profile.
- Conduct a thorough inventory of existing energy policies, including government subsidies and tax expenditures.[16]
- Calculate efficient fuel taxes by quantifying the global and local environmental costs of fuel consumption.
- Conduct distributional analysis to quantify the benefits of any existing fuel subsidies and the costs of increased fuel prices.
- Phase out any existing fuel subsidies and tax expenditures to give industries and households time to adjust.[17]
- Once fuel and electricity prices reflect world market prices, phase in higher fuel taxes to reflect full environmental damages.

[15] See Pigato 2019 for more details on revenue recycling.

[16] In addition, energy sector reform should be grounded in the political realities of each country. In particular, there may be institutional pathways for achieving better energy sector outcomes; for example, see https://openknowledge.worldbank.org/bitstream/handle/10986/28853/WPS8235.pdf?sequence=5 and https://openknowledge.worldbank.org/handle/10986/32335.

[17] The efficiency of energy price reforms depends on the availability of low-carbon substitutions; if there are no alternatives to high-carbon technologies or products, incentives will be less effective in influencing production and consumption choices. In this case, additional policies may be needed as part of short- and medium-term green energy reform strategies, such as public investments in electrification, low-carbon transport, R&D for low-carbon technologies, etc.

- Increase transfers to poor households to protect them from higher fuel prices.
- Conduct a high-profile public information campaign to inform businesses and households of the need for environmental reforms.

Annex. Distributional Analysis

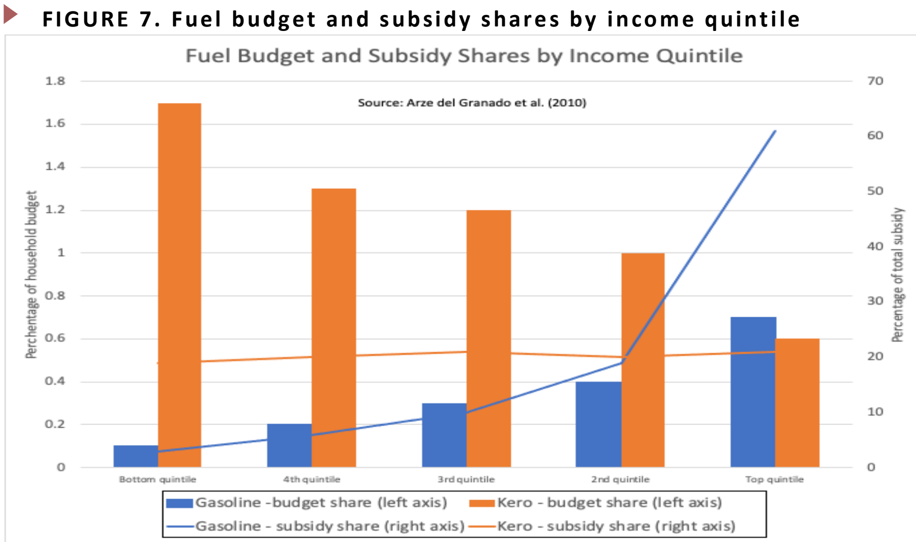
Raising energy prices is usually politically difficult due to effects on industry and lower-income households. Sound distributional analysis of these effects is therefore important to understanding the potential impact of higher fuel prices and designing policies that will protect vulnerable groups. Complete distributional analysis of fuel prices requires two inputs from the national statistical agency: input-output (or sources-and-uses) tables and a household consumption survey. Depending on the availability and level of detail of these databases, different levels of analysis will be possible.

At a minimum, detailed household consumption spending aggregated at the income decile or quintile level is necessary to measure the direct effect of fuel subsidies/taxes on household welfare. With this information, total fuel spending and average fuel budget share can be calculated for households in each quantile. The welfare impact of increasing a fuel's price depends on the household budget share of that fuel:

$$\frac{dY}{Y} = b_i \frac{dP_i}{P}$$

where Y is income, P_i is the price of good i, and b_i is the budget share of that good.[18] Thus, depending on the distribution of fuel consumption across income (or consumption) quantiles, a fuel tax increase may be more or less progressive. Evaluating fuel consumption patterns across a variety of developing economies, Arze del Granado et al. (2010) find that, while gasoline expenditure is skewed toward higher-income households, kerosene expenditure is skewed toward lower-income households (Figure 8). Imposing (or increasing) kerosene taxes is therefore likely to raise greater concerns about regressivity than increasing gasoline taxes.

FIGURE 7. Fuel budget and subsidy shares by income quintile



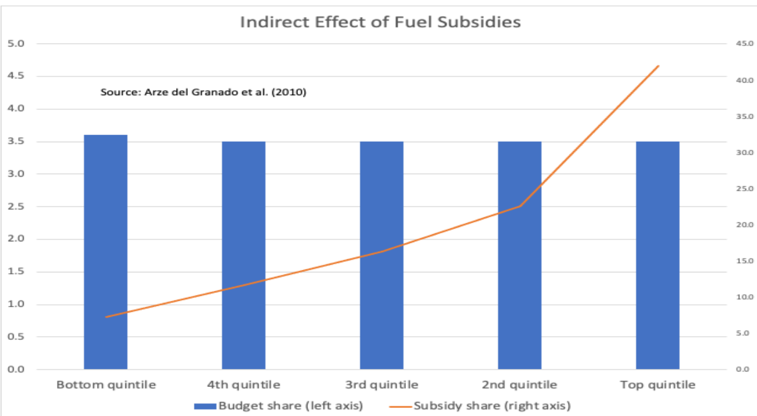
Source: IEA World Energy Balances 2020

18 From Fabrizio et al. (2016). This analysis does not account for potential cross-substitution across goods in response to price changes, and should therefore be interpreted at the short-run or upper bound welfare cost of fuel price increases.

The total cost of fuel subsidies (or under-taxation) depends not on budget share but on total expenditure by income quantile. Although the rich may spend a smaller share of their income on a particular fuel than lower-income households, they spend more overall, and may therefore reap most of the benefit from fuel subsidies. Due to variation in the total spending level by quantile, the distribution of fuel subsidies in Figure 8 is more progressive than the distribution of budget shares for both kerosene and gasoline. This illustrates the general proposition that, although raising fuel taxes may burden lower-income households disproportionately, upper-income households reap most of the benefit from under-taxing fuels. Raising fuel taxes and income households reap most of the benefit from under-taxing fuels. Raising fuel taxes and using a fraction of the revenue to compensate lower-income households is thus typically a progressive reform.

If sufficiently detailed input/output data are available, the indirect impact of fuel subsidies on other consumption goods can also be measured. First, I/O tables can be used to calculate the likely response of non-fuel goods and service prices to increased fuel prices,[19] and then the budget share and total expenditure impact of fuel taxes can be calculated as for direct fuel costs. Arze del Granado et al. (2010) find that indirect budget shares are essentially flat across quintiles (Figure 9), but again the majority of fuel subsidies benefit higher-income households due to their higher spending levels.

FIGURE 8. Indirect effect of fuel subsidies



Source: Arze del Granado et al. (2010)

Calculating the impact of changes in fuel prices on non-fuel outputs will also provide information on which industries are likely to be most affected by increased fuel taxation. This impact will be of greatest concern for industries that face international competition due to exports or competing imports. The price impact evaluation can help determine whether border adjustments – relieving higher fuel taxes on exports or imposing them on imports – will be a necessary component of the fuel subsidy reform.

Any major reform of energy taxation should also be accompanied by a thorough public education campaign explaining the necessity of higher fossil fuel prices considering their serious environmental costs.

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