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The environmental tax and subsidy reform in Mexico

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THE ENVIRONMENTAL TAX AND SUBSIDY REFORM IN MEXICO

Box 1. SUMMARY

While price regulation caused fossil fuels in the Mexican energy markets to be sold at subsidised rates until mid-2014, recent reforms first reduced subsidies and then increased taxes on the main transport fuels. Mexico also introduced a carbon tax that applies to most fossil fuels, but at modest rates. This paper analyses the Mexican environmental tax reform, considering a broad set of dimensions of policy reform and highlighting trade-offs among them. The Mexican reforms significantly improve the extent to which the external costs of energy use are reflected in prices and increase government revenues, both welcome developments from an environmental and public finance perspective. The gradual transition towards higher taxes had initially increased the political acceptability of the policies, but, as price deregulation progresses further, more attention may need to be devoted to analysing and addressing the policies' distributive effects. Other policy changes that are currently discussed, such as moves towards carbon trading, could make it worthwhile to consider additional trade-offs among the framework dimensions. These changes may increase complexity and they could also result in higher administrative and compliance costs, reduce the environmental effectiveness of the policy and lead to lower revenues. More generally, the Mexican moves from fuel subsidies to carbon prices represent a considerable policy effort, insights from which could be relevant for a wider set of countries. The analysis also highlights that ease of administration and collection are an important property of carbon taxes, which appears highly desirable, especially in emerging market contexts.

LA RÉFORME DE LA FISCALITÉ ET DES SUBVENTIONS RELATIVES À L'ENVIRONNEMENT AU MEXIQUE

Box 2. BREF RÉSUMÉ

En raison de la réglementation des prix, les combustibles fossiles ont été vendus à des prix subventionnés sur les marchés mexicains de l'énergie jusqu'à la mi-2014. Sous l'effet de récentes réformes, ces subventions ont d'abord baissé, puis les taxes sur les principaux carburants pour les transports ont augmenté. Le Mexique a en outre instauré une taxe carbone qui s'applique à la plupart des combustibles fossiles, mais à des taux modérés. On peut lire dans le présent document une présentation de la réforme de la fiscalité environnementale engagée, qui couvre un large éventail de dimensions de cette réforme et met en évidence les arbitrages qui ont dû être effectués entre ses différentes dimensions. Grâce à cette réforme, les coûts externes de la consommation d'énergie sont nettement plus répercutés sur les prix et augmentent d'autant les recettes publiques – deux évolutions positives tant du point de vue environnemental que de celui des finances publiques. Si la nature très progressive de la hausse des taxes a, dans un premier temps, accru l'acceptabilité de ces politiques publiques, il peut être nécessaire à mesure que la déréglementation des prix s'amplifie encore, d'accorder une plus grande attention à l'analyse et à la prise en compte de leurs effets redistributifs. Au vu des autres évolutions des politiques publiques qui font actuellement l'objet de débats, comme la mise en place d'un système d'échange de permis d'émission de carbone, il pourrait être judicieux de s'intéresser à certains arbitrages supplémentaires entre les différentes dimensions du dispositif. Ces évolutions peuvent avoir pour effet de compliquer la situation et entraîner de surcroît une augmentation des coûts administratifs et de mise en conformité, réduire l'efficacité environnementale de cette politique et peser sur les recettes publiques. De manière plus générale, la réduction des subventions aux énergies fossiles, suivie de la mise en place d'un système de tarification du carbone au Mexique, représentent un effort considérable pour les pouvoirs publics, dont les enseignements pourraient être utiles à un plus grand nombre de pays. Ce document souligne en outre que la facilité d'administration et de recouvrement est une caractéristique importante des taxes carbonées – et des plus intéressante, en particulier pour les pays émergents.

ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

Governments around the world are facing mounting environmental challenges: at a global (e.g. climate change), but also at local level (e.g. air and water pollution, waste management). Environmentally related taxes, which encourage polluters to take account of the consequences of their behaviour to society at large, are a cost-effective policy to address these concerns. They also raise government revenue, often a welcome property, but policy design is in many cases shaped by a range of different considerations, too.

In a bold policy effort, Mexico recently moved away from subsidies to transport fuels, increased tax rates on these fuels and introduced a carbon tax. Together, these changes represent an environmental tax reform, understood here as a set of changes in tax rules, of which one of the primary goals is to improve environmental outcomes. Though motivations beyond environmental policy have played a role in Mexico, parts of the reform were explicitly motivated by environmental concerns, justifying this interpretation. The Mexican reforms are an interesting case study, since they took place in a country with a decade-long history of fuel subsidies, and strong reliance on income from oil exports. Implementing an environmental tax reform in this context involves a considerable policy effort with potentially wide-ranging environmental and climate benefits. Lessons from this experience might be of interest for other countries, especially for emerging economies, and particularly in view of the recently increased efforts to reduce global greenhouse gas emissions in the context of the global negotiations to combat climate change.

The Mexican reforms are analysed using a broad set of criteria that consider the main practical dimensions of environmental policy design: environmental effectiveness, equity and distributional impacts, broader tax system impacts, macroeconomic effects, compliance and administration, policy process and consistency. No hierarchy or weighting of criteria is proposed; instead, assessment under the framework is meant to better inform decisions around policy design, and make trade-offs among different objectives and constraints explicit.

In Mexico, abolishing transport fuel subsidies and increasing taxes on transport fuels to much higher levels means that the prices of transport fuels now reflect the external cost of fuel use more closely. Beyond transport, the new carbon tax covers a much larger share of emissions with a price, but the rates are very low and do not consistently reflect the carbon content of the underlying fuels. In particular, of all rates above zero, coal is taxed at the lowest rate despite the high external cost associated with its use, and natural gas – the use of which is expected to increase in the coming years – is zero-rated. In that sense, the cost of carbon emissions differs across economic sectors, reducing environmental effectiveness. It appears that compromises were made on this dimension to satisfy stakeholder demands.

Up to January 2017, the staged transition towards higher energy prices facilitated the political acceptability of the reforms and decreased their immediate distributional effects. In the particular case of transport fuels, where prices are the subject of close public and political scrutiny, the low oil price provided an opportunity to smooth the initial impact of price increases in the domestic market. However, recent crude oil price rises and worsening exchange rates led to a much tougher policy environment. Although the transport fuel price reforms appear progressive overall, higher fuel prices and their indirect effects can pose energy affordability problems for poorer households. Nevertheless, OECD analysis for twenty countries (predominantly European, not including Mexico) has shown that redistributing up to a third of revenues is sufficient to address energy affordability risk. In the case of the carbon tax, low initial rates might set the stage for future gradual increases. However, any future changes will also need to take account of the effects of the tax on the distribution of income and on energy affordability. In these circumstances, any future adjustments to the carbon price may need to be accompanied by targeted flanking measures to protect those at the lower end of the income distribution.

The new and increased taxes are already raising substantial additional revenues, slowly shifting general government income away from its reliance on oil exports. The Mexican taxes on energy, and in particular the carbon tax, may have the potential to raise much larger amounts of revenue if rates were increased, and the tax base enlarged in the future. In the Mexican debate, a major argument in favour of introducing a carbon tax, and not an emissions trading system, was its relative ease of administration and collection. To ensure that carbon pricing lives up to its potential, both in terms of reducing emissions and raising revenue, it could be important to retain these two characteristics, especially when considering recent moves towards carbon trading and increased recognition of international carbon offsets.

1. Introduction

Increasing carbon prices and phasing out fossil fuel subsidies helps combat climate change and contributes to other policy objectives, including reducing air pollution and raising public revenue. While Northern-European countries pioneered the introduction of carbon taxes in the 1990s, the locus of policy change has shifted more recently. For example, China (several subnational systems, since 2014), Korea (since 2015), Canada (several subnational systems, to be extended to all provinces until 2018) and Chile (planned from 2017) have introduced or legislated carbon taxes or emissions trading systems. Mexico, too, has implemented a significant environmental tax reform, and reform efforts are on-going. While price regulation caused fossil fuels in the Mexican energy markets to be sold at subsidised rates until mid-2014, the reforms first reduced fossil fuel subsidies and then led to net taxes. Prices of transport fuels are to be fully deregulated by 2018, with prices set to float freely from 2017 in regions in which the local markets are deemed to be sufficiently competitive. Mexico also introduced a carbon tax that applies to most fossil fuels used in Mexico, albeit at currently modest rates.

Environmentally related taxes are one of the most cost-effective tools to shape environmental policy outcomes (see e.g. OECD, 2013a). However, besides cost-effectiveness, a multitude of aspects are relevant in the design and implementation of environmental tax policy. A nuanced approach to the appraisal of environmental tax policies is therefore needed to ensure that they retain their cost-effectiveness, while being practicable and consistent with other government priorities. This paper applies a framework developed by the OECD that attempts to capture important dimensions of the design of environmental tax policies: environmental effectiveness, equity and distributional impacts, broader tax system impacts, macroeconomic effects, compliance and administration, as well as policy process and consistency. No hierarchy or weighting of criteria is proposed; instead, assessment under the framework is meant to help in making trade-offs among different policy objectives and constraints explicit. While a preliminary requirement for policy evaluation is that the policy is described in sufficient detail to allow assessment along the criteria presented, the emphasis on individual dimensions may differ depending on the case studied. The framework is summarised in the Box “Dimensions for the appraisal of dimensions for environmental tax reforms” .

This paper analyses the recent Mexican environmental tax reform, with a focus on the reform of the excise tax on transport fuels and the introduction of a carbon tax.¹ Though motivations other than improvements in environmental outcomes have been driving some of the policy changes, parts of the reform were explicitly justified with environmental motivations, such as achieving a decrease in air pollution, and complying with Mexico’s commitments in the international climate change negotiations. Together, these changes represent an environmental tax reform. The Mexican reforms are an interesting case study, since the reforms took place in a country with a decade-long history of fossil-fuel subsidies. Mexico is also a large oil exporter, with a traditionally strong reliance on income from oil sales for the government budget (through the national oil company), and a strong sense that the proceeds from resources should be shared among the population. Moving from fuel subsidies to carbon pricing, and following through with the reforms, thus involves a large policy effort. Insights from this process could be relevant for a wider set of countries, in particular with a view to the recently increasing collective efforts to reduce global greenhouse-gas emissions reflected in the Paris agreement and as its result, but also in the context of the global agreement on Sustainable Development Goals, to be reached by 2030.

The paper proceeds as follows: Section 2 briefly summarises the past and current structure of the excise tax on transport fuels and the new carbon tax, followed by an assessment of policy changes in Section 3. Section 4 briefly considers some of the discussed changes to the current policy design, and the

¹ The Mexican government is also in the process of reducing subsidies to electricity prices for the residential and agricultural sectors, but analysis of these reforms is beyond the scope of this paper.

conclusion offers a few observations on the trade-offs between the framework dimensions in the Mexican context.

Box 3. Dimensions for the appraisal of environmental tax policy and reform

Pricing environmental externalities via taxes, charges, or tradable emissions permits is one of the most cost-effective and efficient ways to encourage energy producers and users to factor the environmental impacts of their behaviour into production and consumption choices. While the improvement of environmental outcomes is often a primary objective for introducing environmental- or energy-tax changes [, reforms can have a range of intended or unintended flow-on effects. Tax policymakers and tax administrators strongly emphasise the practical importance of a number of economic, administrative and political dimensions of tax policy and tax administration, which can be as important as economic efficiency in shaping policy outcomes. In practice, a nuanced approach to the appraisal of environmental tax policies is needed to ensure that carbon pricing policies retain their cost-effectiveness, while also being practicable and consistent with other government priorities.

A framework for assessing environmental tax policies and reforms, understood as a change, or a set of changes in tax rules, of which one of the primary goals is to improve environmental outcomes compared with the *status quo*, should address the main dimensions of such a reform:

- *Environmental effectiveness*: How will the policy affect environmental outcomes and how will the change be measured?
- *Equity and distributional impacts*: How will price changes resulting from the policy affect different groups of households and firms?
- *Broader tax system impacts*: How will the policy and accompanying measures affect the effectiveness and efficiency with which government revenue is raised?
- *Macroeconomic effects*: What are the effects of the policy on growth, efficiency and competitiveness?
- *Compliance and administration*: How will the policy be administered and what compliance costs will it impose.
- *Policy process*: How do the procedural requirements and the policy process in general affect the policy design, introduction and transition to it?
- *Consistency*: Is the policy consistent with other domestic and international policies, targets and commitments?

If possible, the effects of the policy on the framework dimensions should be evaluated in the short term, but also over a longer time frame.

The list of questions emphasises that policies potentially have a wide range of impacts, all of which can be relevant to decision-makers, and that the weights given to these potential impacts can vary over time or place. No hierarchy or weighting of criteria is proposed: instead, trade-offs among different policy objectives and policy constraints exist, and the assessment under such a framework can help making these trade-offs explicit. This assessment could facilitate discussion on the policy design choices to be made.

2. Background and overview of the recent policy changes

This section provides a quick overview of the recent reforms and the structure of energy taxation in Mexico, as background to the analysis of the environmental tax reforms in Section 3. Two taxes apply to

fuel use in Mexico – the excise tax on transport fuels (with two components) and the carbon tax.² While the excise tax on transport fuels applies to premium gasoline, regular gasoline and diesel for transport use, the carbon tax base is much broader and it applies to gasoline, diesel, fuel oil, kerosene, LPG and coal for use by households, industry and electricity generation (Table 1).

Table 1. The structure of the Mexican energy taxes differ by sector

Name	Tax base	Introduced in	Mechanism
Specific excise tax on transport fuels	Premium & regular gasoline, diesel for transport use	2008	Part I: Fixed rates (<i>ad quantum</i>), rate is added to final price, incl. VAT Revenue earmarked for Mexican states and municipalities
		1980 Last reformed in 2016	Part II: Before January 2016: Determined by the Ministry of Finance on a monthly basis. Since January 2016: Fixed rates (<i>ad quantum</i>)
Carbon tax	Gasoline, diesel, fuel oil, kerosene, LPG, coal, other fossil fuels	2014	Fixed rates (<i>ad quantum</i>)

The rates of the specific excise tax on premium gasoline, regular gasoline and diesel consist of two components. The first component of the fuel tax (“Part I”, in legislative terms) is added to the final retail price of fuels after VAT, with the highest rates applying to premium gasoline, followed by regular gasoline and the lowest rate for diesel. The revenues of this tax are earmarked for the Mexican states and municipalities. Applying taxes after VAT is unusual, and decreases the amount of revenue collected from VAT. However, since the design of this part of the tax has not been affected by the recent reforms, it is not considered further in this paper.

The second component of the fuel tax (“Part II”, in legislative terms – “fuel tax”, from here) was strongly affected by the recent reforms. Until January 2016, this tax component was used to dampen domestic price fluctuations of gasoline and diesel in Mexico, and negative rates resulted in large fuel subsidies over several years. Total fossil fuel subsidies in Mexico stood in the magnitude of 1.95% of GDP in 2011, of which 1.01% were for gasoline and diesel alone, 0.32% of GDP were for LPG and 0.61% for electricity (Energy Secretary, 2016). Broadly, the subsidies for gasoline and diesel were the result of an interplay between the level of the domestic regulated retail price and production costs (itself related to fuel prices in the US Gulf Coast), with both of these elements entirely regulated by the government.³ From

² As of mid-2017, no other specific taxes apply to fuel use in Mexico. Both rates are part of the framework provided by the “Special Tax on Production and Services” (“IEPS”, by its Spanish acronym), which levies rates on a broad range of products (including tobacco, telecommunications, alcoholic beverages, gaming, soda drinks and some high-calorie foods). Since 2014, this excise tax also levies a rate on the use of pesticides, which is not discussed further here.

³ More specifically, the fuel tax rates were determined by the Ministry of Finance on a monthly basis. When domestic prices (including the fuel tax but before transport costs, other margins and tax components) were set below production cost (fixed by the government, among others depending on the fuel prices in the US Gulf Coast), a subsidy was given to fuel producers (until recently, only Pemex). When domestic prices were set above production cost, the fuel tax rates and the resulting tax liability for fuel producers was positive (OECD, 2013).

January 2016, the fuel tax has been applied at fixed rates, more akin to excise taxes in other OECD countries, and the fuel tax design remained unchanged in 2017.

Some rules apply to smooth the transition towards full deregulation of prices. In 2016, fuel prices were not allowed to fluctuate outside of a price band, which was fixed by the Ministry of Finance at +/- 3% of the December 2015 prices. However, on 1 January 2017, the regulation allowed the maximum price for gasoline to rise by as much as 20%. Moreover, from 2017, maximum fuel prices are updated more frequently than before; and they are fixed on a daily basis from February. Fixing maximum prices opens the – so far hypothetical – possibility for subsidies to return until full price deregulation.

To keep prices within the band, a complementary rate can apply to the fuel tax. In particular, when the sum of the individual price components exceeds the maximum price determined by the Ministry of Finance, the tax rates are decreased. If the sum of the individual price components is lower than the minimum price, this additional levy is added to the price (Mexican Government, 2015b). From January 2017, one year ahead of schedule, fuel prices have been deregulated in regions for which retail fuel sales are assessed as “sufficiently competitive” by the Energy Regulatory Commission (CRE) and the Federal Competition Commission (Cofece). In other regions, where the market is assessed as still too concentrated to allow for full liberalisation, maximum prices continue to be fixed by the Ministry of Finance, but deregulation is scheduled to be completed by the end of 2017.

In contrast with the fuel tax, which has existed since 1980, the carbon tax is a new policy instrument. A first proposal for a carbon tax was sent to the Mexican Congress in 2013, with tax rates proposed by the Mexican Ministry of Finance on an *ad quantum* basis per fuel. While the tax was initially proposed at a level that reflected the average price of carbon on relevant markets in Europe and the U.S, the rates were substantially revised before their implementation. In addition to levying substantially lower rates, the tax rates as implemented deviate from the idea of uniformity per unit of carbon emissions, and coal is now taxed at much lower rates than originally proposed. Similarly, while the carbon tax was proposed as levying positive rates on all fossil fuel use in Mexico, natural gas – understood by Congress to be the cleanest fossil fuel – is now zero-rated.⁴

The Mexican environmental tax reform forms part of a broader set of policy changes that have been implemented since 2012. Notably, the *General Law on Climate Change* of April 2012 paved the way for the fuel price reforms by mandating substantial emissions reductions (30% from business-as-usual by 2020, and 50% by 2050, from 2000 levels), and advancing market-based instruments to achieve reductions in a cost-efficient way.⁵ The fuel tax reforms, and the carbon tax introduction, were part of a broad tax reform, which improved the efficiency of the tax system and significantly increased tax revenues (OECD, 2017).

Another broad and on-going reform introduced competitive elements into energy markets and is likely to make oil exploration, production and retail markets more flexible in the future (OECD, 2017). The government motivated that reform by the need to address projected shortfalls in oil and oil product supply, increase the efficiency of the incumbent utilities, but also to make government spending more transparent (OECD, 2015a). While the state-owned oil company Pemex is still by far the dominant player in all segments of oil and gas markets, the government is running the first-ever auctions of oil exploration and

⁴ Kerosene was zero-rated as an aviation fuel due to international conventions for non-taxation of aviation fuels used in international flights. Since aviation fuel is the only use of kerosene in Mexico, in practice, no kerosene use is subject to the carbon tax although there is a rate for it.

⁵ Mexico’s intended nationally determined contribution (INDC), pledged prior to the United Nations Conference on climate change in December 2015, is broadly consistent with these targets though domestic climate policies may need to be strengthened to ensure they are met (Climate Action Tracker, 2015).

production blocks, and private players are entering fuel retail markets. The energy market reform, based on the 2014 Law on Hydrocarbons, also provided the legal grounds for the deregulation of oil product prices and thus for a broad reform of fuel subsidies.⁶

These reforms should be viewed against the broader macroeconomic backdrop, and the general structure of the Mexican public finances. In particular, the 2014 fall in oil prices, amplified by a decrease in crude-oil production, contributed to a significant drop in the value of Mexican oil exports. While this had large implications for the financial position of Pemex, the turbulences also channelled through to the government budget and made reforms of both energy markets and government income more urgent.

3. Evaluating criteria in the context of the Mexican environmental tax and subsidy reform

This section applies the framework outlined in Box 1 to the recent Mexican reforms. The six framework dimensions – environmental effectiveness, equity and distributional impacts, broader tax system impacts, macroeconomic effects, compliance and administration, and other procedural considerations – are discussed in turn.

3.1 Environmental effectiveness

Environmental effectiveness – often one of the prime motivations for implementing or changing environmental tax policies – refers to the extent to which an environmental tax policy or policy reform is suited to improving environmental outcomes. The environmental effects of the Mexican reform must be viewed in the context of two distinct elements of the reform: the gradual abolishment of price regulation and fuel tax reform, and the carbon tax introduction. While it is still too early to assess the effect of the reforms on emissions, it is possible to gauge their likely effectiveness in improving environmental outcomes by analysing the policy design.

The gradual abolishment of price regulation means that the pricing of transport fuels increasingly reflects production costs, until full abolishment of price regulation. Going beyond subsidy removal, the gradual increase in the rates of the fuel tax since mid-2014 – helped by the decrease in crude-oil prices – was rounded off with the nominal fixing of the tax rates for 2016 and possibly at new rates in forthcoming budgets. Together, these changes translate into substantial increases in the retail prices of transport fuels, with the fuel tax accounting for a growing proportion of gasoline and diesel retail prices.

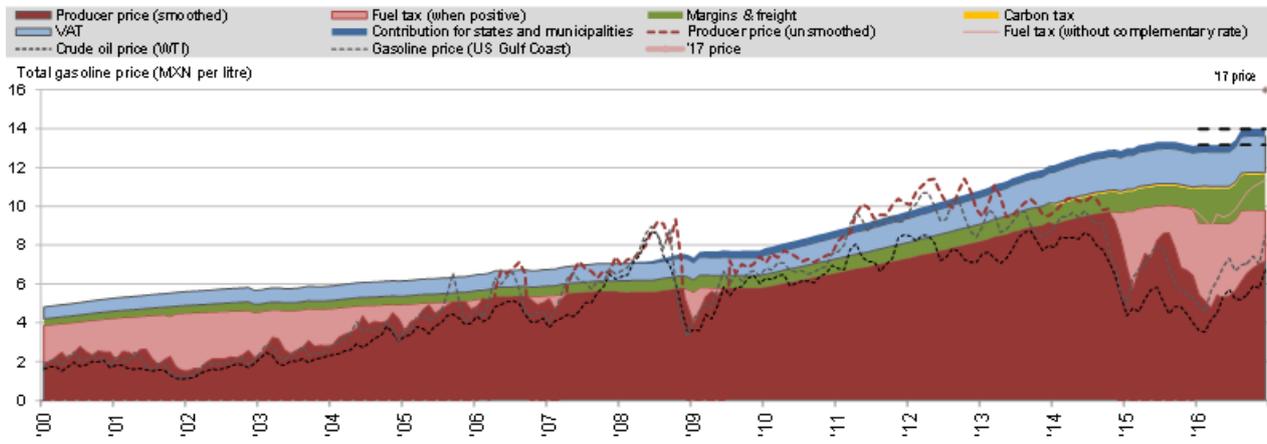
The development of the total gasoline price and its components over time is shown in Figure 1. This figure disaggregates the price of regular gasoline, which is taken as a representative transport fuel as it accounts for 80% of gasoline consumption. The fluctuation of the fuel tax rate is visible in light red when its values are positive. When the fuel tax is negative, its rates are plotted as the positive difference between the unsmoothed and the smoothed producer price. Fuels were taxed at mostly positive rates from 2000 to 2005, but the producer price of regular gasoline was subsidised through negative rates between 2005 and mid-2014, when the international oil price was high. With international oil prices falling almost continuously between mid-2014 and the start of 2016, fuel tax rates have again been set at positive levels since September 2014.⁷

⁶ For an extensive discussion of the fossil fuel subsidy reform process, and in particular of the electricity subsidy reform, see IEA (2016).

⁷ From its introduction in 2016, the figure also shows the price band within which gasoline prices have been allowed to move.

Figure 1. The recent reforms resulted in large fuel price and tax increases

Composition of regular gasoline prices on the Mexican market from January 2000 to December 2016



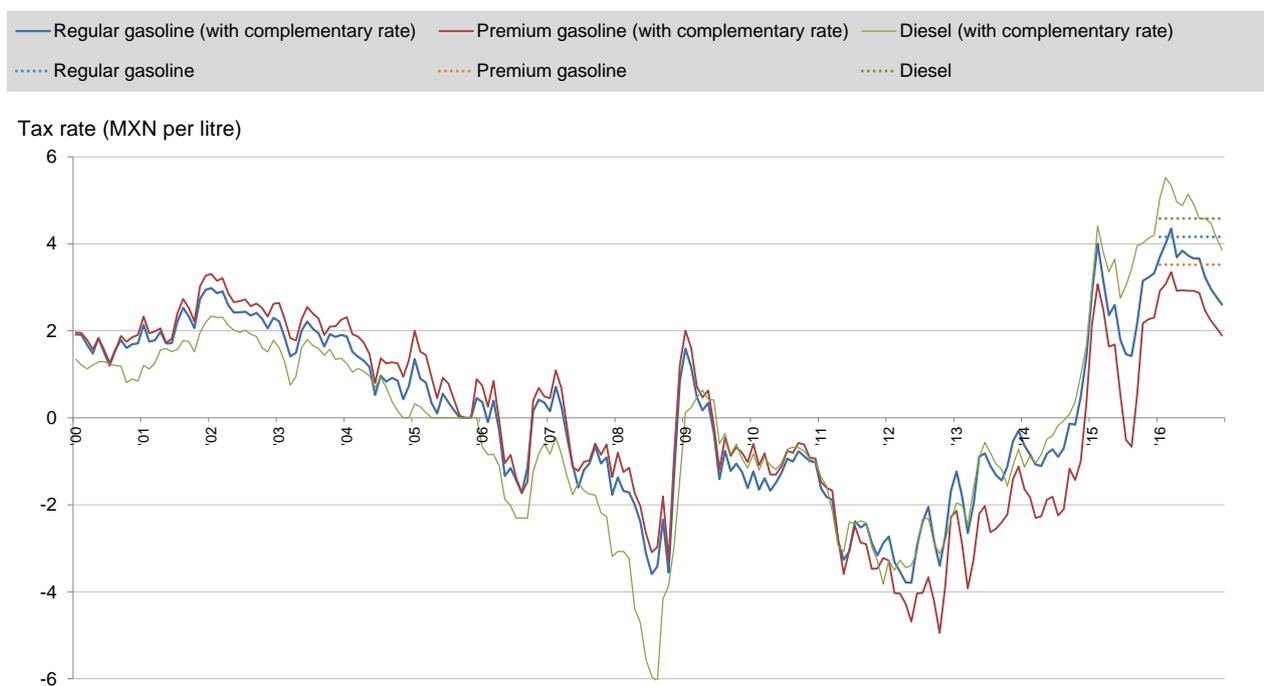
Source: Author's calculations based on data from the Mexican System of Energy Information (2016). US gasoline prices at the Gulf coast and the WTI oil price are from EIA (2016) and are shown for reference. Note: As a result of oil price and exchange rate fluctuations, the price of regular gasoline increased to MXN 15.99 per litre (14.1% compared to the prices observed in December 2016) in January 2017. This new maximum price is plotted, too, though delays in data availability do not permit further disaggregation of the gasoline price after December 2016.

The impacts of the fuel price and tax reforms are reflected in the development of the total gasoline price and its components (Figure 1). The gasoline price has gradually increased after 2000, but it was allowed to increase at a faster pace from 2010 onwards, at rates around 1% per month. In mid-2015, prices reached a plateau, followed by further increases in 2016, in parallel with the market price of crude oil. Since mid-2014, with increasing liberalisation of the market, the producer price has followed the development of the crude oil price much more closely than before. The price smoothing through the complementary rate is visible, too, as the difference between the light red line and the solid light red area. In the case of regular gasoline, the fuel tax rates were smoothed to ensure that prices remain within the price band.

While the movement in the rates among the three main transport fuels was broadly similar across fuels over time, their magnitude differs among the different fuel types (Figure 2). For example, over the years, the subsidy to premium gasoline was larger than the subsidy to regular gasoline and diesel in absolute terms. Figure 2 also shows the tax rate smoothing that has been occurring since 2016, to keep rates within the price band, in the transition towards fully liberalised prices. While the two types of gasoline benefitted from subsidies to keep prices below the price ceiling, the tax rate smoothing resulted in higher tax rates for diesel, compared to the rates given in the law.

Figure 2. Tax rates have increased markedly for the three main transport fuels

The Mexican fuel tax rates from January 2000 to December 2016, with and without tax rate smoothing



Source: Author's calculations based on Mexican System of Energy Information (2016) and Mexican Government (2015a).

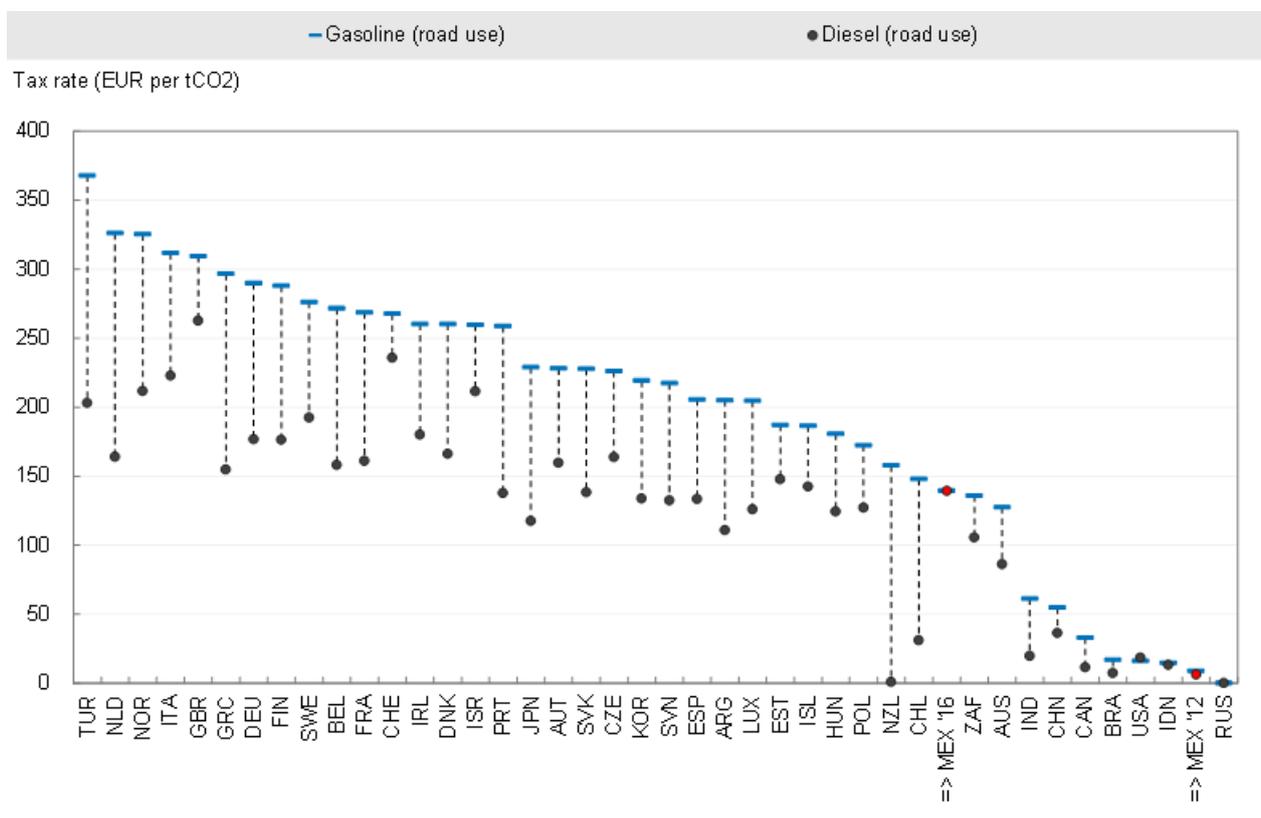
The tax reforms significantly change Mexico's position when comparing the fuel tax rates with other OECD and G20 economies (Figure 3). Total taxes on road transport fuels remain low compared to those in most OECD countries, but they are now more closely aligned with, or higher than, those in other non-European OECD countries. As plotted in Figure 3, when converted into tax rates per tonne of carbon, both gasoline and diesel are priced at just below EUR 140 per tCO₂. Notably, Mexico is one of the very few countries to have entirely abolished the gap between the tax rates on diesel and gasoline in terms of the carbon content of the underlying fuels. It is, however, worth mentioning that further differentiation in the tax rates on diesel is needed if the tax rates are to also account for the higher emissions of air pollutants per litre, when compared to gasoline (Harding, 2015).

Together, these moves towards prices that are more reflective of production and social costs improve the price signal of gasoline and diesel from an environmental point of view, since they give energy users an incentive to use fuels more efficiently, or substitute towards cleaner fuels. High taxation of transport fuels is in particular justified where the costs from congestion, air pollution and accidents are large, as is the case in several large urban areas in Mexico (Munoz-Pina et al., 2016).

Over time, enhancing the predictability of the price signal, by fixing the fuel tax rates, is likely to induce investments in more fuel-efficient vehicles and in new clean technology, public transport, or incentivise the development of cleaner transport fuels, which may lead to further emissions reductions in turn. Higher transport fuel prices may also induce a gradual shift in modes of transportation, away from private vehicles, which in Mexico are in their majority relatively sizeable, old and inefficient (Sterner and Lozada, 2012), towards collective transportation modes. While budgetary considerations may have been driving these reforms, the transport fuel subsidy and tax reforms are likely to improve environmental outcomes nonetheless.

Figure 3. The reforms significantly improve how road fuel taxation in Mexico compares with other countries

Taxation of gasoline and diesel for road use in OECD and selected partner economies, on a carbon content basis



Notes: While the tax rates for Mexico are shown for 1 April 2012 and 1 January 2016, the tax rates of all other countries are shown for 1 April 2012.

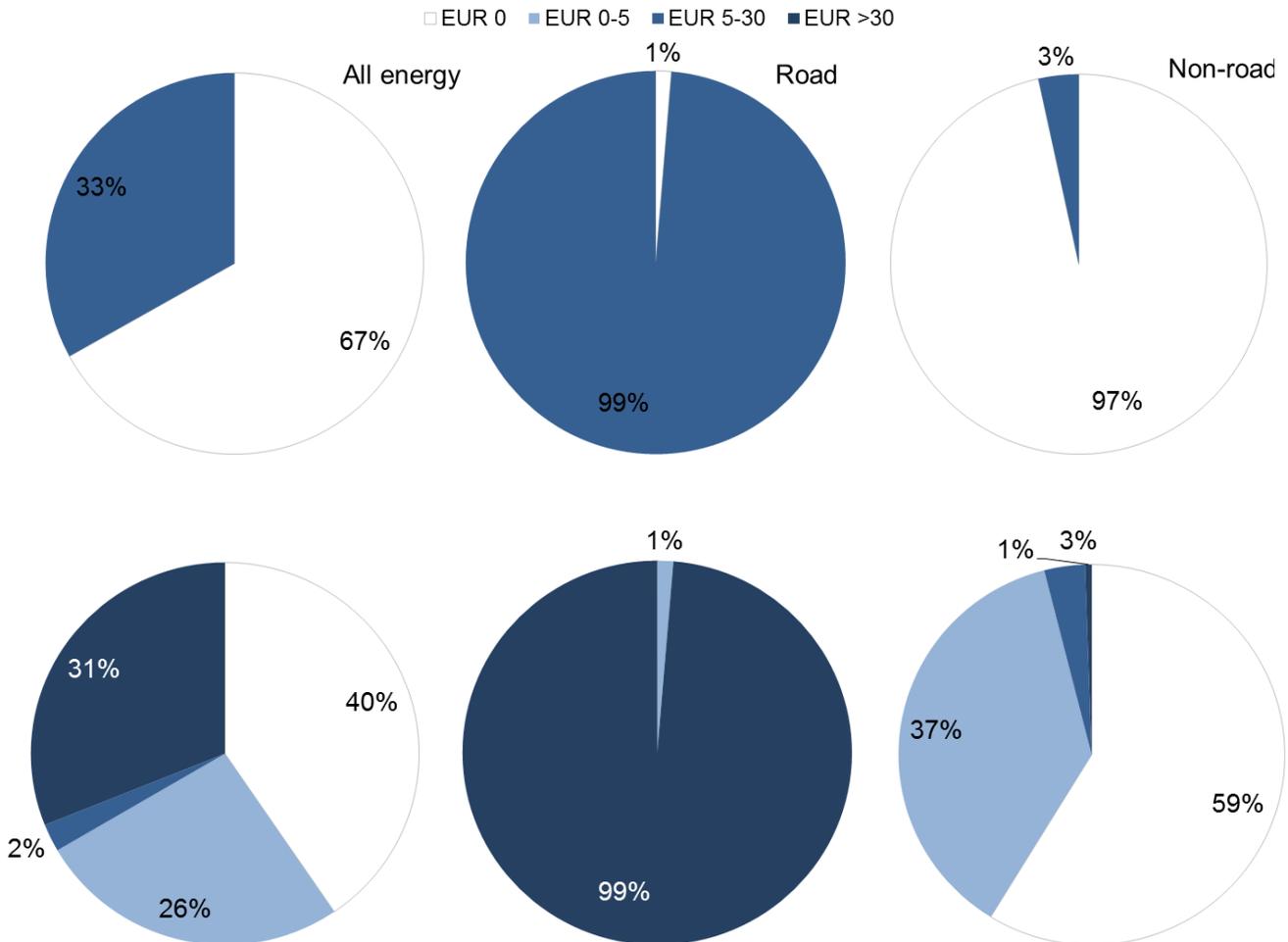
Source: Author's calculations based on OECD (2013b and 2015b).⁸

The higher relative level of taxation on fuels and carbon emissions affects roughly a third of energy use and carbon emissions from energy use in Mexico. The reforms significantly increased the share of emissions priced at levels above EUR 30 per tCO₂ (Figure 4). Outside of road transport, the carbon tax is the only tax that applies to fuel use, and it prices emissions at relatively low rates. Although a positive price signal on a share of carbon emissions that goes beyond the transport sector is an important step in the right direction, these tax rates are too low to ensure that energy users take account of the external cost of energy use to society. While a lower-end estimate of the climate cost of carbon alone is EUR 30 per tCO₂ (see OECD, 2016 and references provided therein), the Mexican carbon tax effectively prices carbon emissions from energy used for heating and process purposes at only MXN 22.24 per tCO₂ (EUR 1.08 per tCO₂ using the 2016 average EUR-MXN exchange rate) on a weighted-average basis across all fuels. The effective tax rate on carbon emissions is even lower in the electricity sector, where the tax prices carbon emissions from electricity generation at just MXN 15.43 per tCO₂ (EUR 0.75 per tCO₂). The relatively modest carbon price signal resulting from the carbon tax can be identified in Figure 4, in the non-road sectors, but also in Figure 1, which shows that the carbon tax accounts for less than 1% of the final retail price of regular gasoline.

⁸ The method used to calculate effective tax rates in this paper follows that used in the OECD's *Taxing Energy Use* publications (OECD, 2013b and 2015b). The calculation of effective tax rates also takes account the carbon emissions of untaxed fuels.

Figure 4. The reforms increase the share of emissions covered by a carbon price, but at low rates

Percentage of carbon emissions priced at different levels before and after the energy tax reforms (2012, upper panel and 2016, lower panel)



Note: Taxes considered include the fuel tax and the carbon tax.

Source: Author's calculations based on data from OECD (2016b) and Mexican Ministry of Finance (2015b).

The carbon tax rates do not consistently reflect the carbon content of individual fuels. While the *proposed* tax rates would have introduced a statutory carbon tax rate of MXN 70.68 per tCO₂ on all fuels, the carbon tax rates, as *enacted* by Congress (and unchanged since) are all lower than the rates in the original proposal, and they do not reflect the carbon content of the fuels (Table 2). For example, despite its high estimated social cost, the tax rates on coal are set at a much lower level than for other fuels. Importantly, natural gas, which accounts for around 45% of Mexican energy use and for roughly the same amount of CO₂ emissions from energy use in 2012, is subject to a zero tax rate, and there are currently no plans for change to this policy position in the near future.

Table 2. The carbon tax rates deviate from the idea of pricing carbon emissions at uniform rates

		Proposed		Enacted		
		MXN		MXN		Euro
		per unit	per tCO ₂	per unit	per tCO ₂	per tCO ₂
Natural Gas	m3	0.1194	55.20	0	0	0
Propane	litre	0.1050	65.29	0.0591	36.75	1.78
Butane		0.1286	79.97	0.0766	47.63	2.31
Gasoline		0.1621	70.49	0.1038	48.14	2.19
Kerosene		0.1871	73.11	0	0	0
Diesel		0.1917	72.02	0.1259	47.30	2.30
Fuel Oil		0.2074	70.59	0.1345	45.78	2.22
Petroleum Coke	kg	0.0189	6.06	0.0156	5.00	0.24
Coal Coke		0.0193	8.69	0.0368	16.57	0.80
Mineral Coal		0.0178	9.55	0.0275	14.75	0.72

Note: Carbon tax rates have remained broadly unchanged since their enactment, except for a yearly adjustment for inflation. *Source:* Author's calculations based on Mexican System of Energy Information (2016), conversion factors are those used in OECD (2013b).

In sum, broadening the policy-induced price signal to a larger share of energy use and emissions, also outside of the transport sector, as has been done by introducing the carbon tax in Mexico, is an important step towards providing better signals for cost-effective abatement. However, if the purpose of the carbon tax is to send a meaningful signal on the social cost of carbon emissions, and thus represent a credible component of the policy strategy for the mitigation of greenhouse gas (GHG) emissions in Mexico, the tax rates should be increased gradually. Furthermore, if users are to consistently take the carbon emissions associated with their energy use choices into account, it would be useful to set tax rates so as to reflect the underlying carbon content of the fuels. In addition, changes in fuel use resulting from the carbon tax might bring other benefits, in that they are often accompanied by reductions in the emission of other air pollutants and GHG emissions other than CO₂. As discussed in the next section, potential regressive effects of taxes can be addressed through targeted flanking policies.

3.2 Equity and distributional impacts

Depending on their relative consumption patterns and other socio-demographic characteristics, fuel price changes – whether resulting from a reform of fuel subsidies, changes in environmental taxes or non-policy induced fuel price changes – have different impacts on different households. In response, governments can and do implement targeted compensation measures to attenuate the impacts of fuel-price increases on low-income households. As these effects differ among fuels and their users, the discussion in this subsection differentiates between the effects of the subsidy and tax reform on transport fuels, and those of the carbon tax.

The direct effects of the tax reforms and subsidy removal for transport fuels in Mexico are likely to be strongly progressive. In general, lower-income households are less likely to have access to a motor vehicle, which implies that they often do not benefit from subsidies on transport fuels, and are less directly affected by price changes. While these effects differ across countries, they tend to be stronger, the more unequal the distribution of income is in a society (see, e.g., Sterner, 2012). Evidence suggests that these general arguments are in line with the situation in Mexico, where fossil fuel subsidies were estimated to be strongly regressive (for each peso assigned to the poorest two deciles of the population, MXN 19.5 were given to the richest two deciles) and just 50% of – relatively rich – households own a car (Mexican Secretary of Energy, 2016). In line with these insights, analyses of the distributional impacts of the fuel tax (before the tax increase) in Sterner and Lozada (2012) and Reynoso (2016) show that its direct effect on households is highly progressive.

Results may differ when looking at the indirect effects of the fuel tax on distributional outcomes, which tend to affect lower-income households more strongly (e.g. through effects on the prices of electricity or public transport). Sterner and Lozada (2012) and Reynoso (2016) show that lower-income households spend a larger share of their income on public transport, though the net effect of the fuel tax is found to be roughly neutral or only weakly regressive.⁹ However, even a progressive tax can pose affordability challenges for poorer households, if high absolute levels of expenditures on energy constrain households substantially in their consumption choices (Flues and Van Dender, 2017, forthcoming).

The reaction of the Mexican population to the price and tax reforms of transport fuels has become more pronounced as their impacts have become more visible in the domestic market. The price and tax reform of transport fuels in Mexico was implemented on a gradual basis and, until January 2017, the impacts of the price liberalisation and tax increases have been modest, due to falling oil prices in 2014 and 2015 (Figure 1). Due to ongoing price regulation prior to the reforms, the fall in oil prices was not immediately felt in the Mexican market and, as a result, the prices of transport fuels fell with increased deregulation, despite the price and tax increases. Taking advantage of the oil price slump to liberalise prices is likely to have strongly increased the political acceptability of the fuel-price reforms in their initial stages up until the end of 2016. In contrast, political unrest surfaced, when, due to worsening exchange rates and crude oil price fluctuations, continued price deregulation led to sudden fuel price increases in January 2017, of 14% to 20% for the three main transport fuels from one month to the next. Larger and sudden increases in the prices of gasoline in January 2017 contrasted with the gradual nature of previous price rises, increasing resistance against the reforms.

The distributional effects of increases in the prices of heating fuels in Mexico, which are affected through the new carbon tax, can be expected to differ from the distributional effects of price increases on transport fuels. However, analysis for 21 – mainly European – OECD countries (not including Mexico) has shown that taxes on heating fuels are generally less regressive than often claimed (Flues and Thomas, 2015). With regards to the distributional effects of the carbon tax in Mexico, little analysis appears to be available. Analysis by the Centro Mario Molina, published in Cespedes (2013), indicates that the effects of the tax would be progressive (52% of the tax would be paid by the two richest income deciles). While, again, the tax might disproportionately constrain low-income households in their spending choices, in practice, the carbon tax accounts for only a very small proportion of the final price of the products it covers, and its distributional impacts are likely to be very modest, which may explain the absence of compensation payments to date.¹⁰

In sum, given their differential effect on prices, the direct and indirect distributional effects of the price and tax reforms on transport fuels are likely larger than those of the carbon tax. Though analysis points at both of these effects most likely being progressive overall, they may still constrain the spending choices of the poorest households. Going forward, further liberalising energy prices and increasing taxes may require providing compensation to at least some population groups. Visible flanking policies, targeted at those households with the highest energy affordability risk, might be necessary to mitigate any potential adverse effects of the energy price and tax reforms. Ideally, compensation would be designed such that it does not compromise the environmental effectiveness criterion, i.e. does not weaken the price signal from the carbon tax or other energy taxes. This could be achieved, for example, using income-tested compensation or lump sum transfers. Recent OECD analysis (for 21 predominantly European countries,

⁹ Sterner and Lozada (2012) argue that if lifetime income, instead of the conventional income approach, was used to measure the indirect distributional effect of the tax, the analysis would likely show a more progressive effect of the tax. Lump-sum transfers are shown to be able to mitigate regressive impacts, while income-tested transfers can even result in a progressive impacts of tax reforms (Flues and Van Dender, 2017, forthcoming).

¹⁰ A pilot programme is in place to compensate users for changes in LPG prices, a fuel used mainly by low-income households (Sterner and Lozada, 2012).

not including Mexico) finds that combining an energy tax increase with income-tested compensation using just a third of the additional revenues can improve energy affordability for the poorest population groups (Flues and Van Dender, 2017, forthcoming; see also Schubert, 2017, for some experience with cash transfers in Africa). Consequently, even after having implemented effective flanking policies, substantial amounts of additional revenues can be available to attend to other uses, and compromise on revenue-raising objectives is not necessarily excessive.

3.3 Broader tax system and revenue impacts

The Mexican government budget has been heavily reliant on revenue from the sale of crude oil and petroleum products, through taxes levied on Pemex, and the government budget is directly affected by variations in crude-oil prices, lower-than-anticipated levels of production, the financial difficulties of Pemex. Oil-related income accounted for roughly a third of government revenue prior to the recent reforms, but this share fell to a fifth in 2014 (WSJ, 2016). A shift away from fuel subsidies towards greater reliance on revenues from taxes on energy consumption could help making the Mexican budget more resilient to crude oil price fluctuations.

The increase in the fuel-tax rates already has borne fruit for tax revenues (Table 3). In 2015 – before fixing the tax rates – fuel tax receipts accounted for 8% of total tax revenues, up from a net negative contribution from fuel tax in 2014. In 2015, the fuel tax was thus the third largest tax in terms of revenues in Mexico, after the income tax (52.3% of tax revenues) and VAT (30% of tax revenues) (Mexican Ministry of Finance, 2016a). In 2016 and 2017, the fuel tax rates were fixed such as to account for a similar proportion of revenues (CEFP, 2016). Overall, this represents a significant increase in fuel taxes as a share of total tax revenues, though these figures need to be interpreted against the background of the relatively low tax-to-GDP ratio in Mexico (19.7% in 2014 compared with 34.2% in the OECD on average; OECD, 2016a). As a consequence, modest variations in the components of tax revenues tend to be relatively visible.

Table 3. The fuel tax raises a significant share of tax revenues, but carbon tax revenue remains modest*

	2014 (actual)		2015 (actual)		2016 (predicted)		2017 (predicted)	
	Mio. MXN	% of tax income	Mio. MXN	% of tax income	Mio. MXN	% of tax income	Mio. MXN	% of tax income
Total tax income	1 807 813		2 366 425.5		2 407 717		2 729 347.9	
Fuel tax	-12 369	-0.7%	194 133.70	8.2%	184 438 ¹¹	7.7%	257 466	9.4%
Carbon Tax	9 197	0.5%	7 502.50	0.3%	8 278	0.3%	7 405	0.3%

Source: Author's calculations, Mexican Ministry of Finance (2014a, 2014b, 2015b, 2016a, 2016b)

* The OECD Revenue Statistics (e.g. OECD 2016a) include social security contributions with tax revenues. In this table, tax revenues are calculated as excluding social security contributions, since the required data is unavailable for the more recent years. As a result, and also because Mexico has one of the lowest tax-to-GDP ratios among OECD countries (19.7% in 2014 compared with 34.2% in the OECD on average; OECD, 2016a), the share of the fuel tax in total tax revenues appears relatively large here.

Compared with the fuel tax, the contribution of the carbon tax to tax revenues remains modest, although it has the potential to raise much larger amounts of tax revenue if in the future its rates were to be

¹¹ According to numbers cited in recent newspaper articles, the 2016 fuel tax income has been higher than anticipated, at MXN million 209 386 (El Economista, 2016).

increased. In parallel, the tax base could be expanded, for example to include natural gas, the consumption of which is set to grow in the coming years, partially replacing the use of oil products for electricity generation (EIA, 2015).

3.4 Macroeconomic effects: growth, efficiency and competitiveness

Fossil fuel subsidy reforms and new environmental taxes can have broader economic effects: economic growth, employment, competitiveness and economic efficiency often occupy policy makers' minds. While industry's concerns can influence the debate around the introduction of energy and carbon taxes, recent OECD work found that the feared impacts of carbon prices on indicators of competitiveness often do not materialise (c.f. Flues and Lutz, 2015; Arlinghaus, 2015).

In Mexico, the reforms of fossil fuel pricing and taxation formed part of a broad policy programme aiming to increase growth, efficiency and competitiveness. By opening up the energy sector to private investment, the reforms are expected to improve the country's energy cost competitiveness, along with significant structural changes in fuel markets. As private companies are starting to enter the fuel retail markets, and are allowed to import energy (this task was previously reserved for Pemex), private industry has started voicing criticism of the heavy regulatory and fiscal burden. In particular, the new privately owned fuel retailers argue that heavy reporting requirements, lack of government investment in transport infrastructure, and high fuel prices would impede effective competition in fuel markets (El Economista, 2016). The Mexican government said that it would consider these arguments if they were substantiated by further analysis (*ibid.*).

The carbon tax introduction also met with some opposition, and industry associations, such as the Coordination Council of Enterprises (CCE) and Cespedes, the Mexican chapter of the World Business Council for Sustainable Development, have been opposing the new tax. Arguments were made on the grounds that the tax would hurt the export competitiveness of Mexican manufacturing, among others through higher electricity prices charged by the national electricity company (CFE) and that of the steel industry, a very large electricity user (El Economista, 2013a,b; Manufactura, 2013; Cespedes, 2013).

It may be the case that industry arguments contributed to the lowering of the rate of the carbon tax and the zero-rating of natural gas in the carbon tax design approved by Congress, to attenuate the impact of the carbon tax on electricity prices (almost half of Mexican electricity is made from natural gas). Zero-rating this fuel under the tax is likely to substantially reduce the effectiveness of the carbon tax in reducing emissions, and driving cost-effective abatement. In that sense, part of the environmental effectiveness of the instrument appears to have been compromised to satisfy stakeholder demands.

3.5 Compliance & administration

Tax administration and compliance costs of environmental tax policies influence the cost-effectiveness of a policy instrument, both in terms of its environmental effects, and in terms of its revenue-raising potential. The lack of administrative simplicity is sometimes cited as a reason against the implementation of environmentally related taxes, in particular by lower-income countries. However, in contrast to other taxes directly levied on (air) pollution, carbon taxes are generally seen as easier to implement and collect due to the linear relationship between the energy content of fuels and their carbon emissions at the point of combustion.

In Mexico, administrative simplicity was cited as one of the main reasons to choose a carbon tax over a cap-and-trade system (Messmacher, 2015). The collection and enforcement of the carbon tax payment in Mexico is further simplified since the point of collection is upstream, where the number of suppliers is still relatively small, though this may change as the energy market liberalisation progresses further. However,

the number of taxpayers under a carbon tax can always be expected to be smaller than the number of participants in an emissions trading system, as these emissions trading systems are usually administered at firm level. Taxes on energy or carbon emissions have the further administrative advantage that they are passed through the production chain and are typically incorporated into the final product price. As a result, it is more difficult to evade these types of taxes, compared to direct taxes, and compliance can thus be expected to be relatively high. This aspect might be especially relevant for Mexico, where the informal sector is relatively large compared to other OECD countries.

3.6 Policy process¹²

A combination of domestic and international factors helped Mexico advance its environmental tax reform swiftly. Domestically, a broad political and administrative agreement for energy and tax reforms supported their implementation. Tax revenues from both the fuel and the carbon tax flow into the general government budget. This is remarkable in itself, as claims on carbon pricing revenues are often manifold.

Beyond government agencies, the reforms were advised by the Centro Mario Molina, an influential domestic think tank, but other NGOs and civil society groups also positioned themselves in favour of the carbon tax, and are continuing to argue for it to be extended to cover natural gas.

3.7 Consistency

In its pledge for the COP21 climate change conference, Mexico committed itself to a 22% reduction of GHG emissions, compared with business-as-usual. Conditional on a strong agreement, technology transfer and green funding, this target can be increased to 40% (Mexican Government, 2015b). Both the energy reform and the carbon tax are cited in Mexico's national contribution as supporting domestic emissions mitigation. Efforts for emissions reductions are thus broadly in line with international commitments, though more ambitious policies will be needed to reach these goals in time (Climate Action Tracker, 2016).

After COP21, Mexico also passed an Energy Transition Law, which includes a target to gradually increase the share of electricity generated from clean sources¹³ to 35% by 2024. Critically, however, co-generation of electricity – which can come from fossil fuels, including from natural gas – is counted towards fulfilling the clean energy target (Mexican Government, 2014; Climate Action Tracker, 2016). Depending on the evolution of the emissions from co-generation, which is projected to account for up to 9% of emissions from electricity generation, the emissions reductions realised from the clean energy target could turn out to be much smaller than anticipated (Climate Action Tracker, 2016). Re-considering the zero-rating of natural gas under the carbon tax, and increasing tax rates, could help reaching the clean energy target in a cost-efficient way.

4. Outlook

Carbon pricing policy in Mexico can be expected to evolve further over time. While there are currently no plans to increase the carbon tax rates or extend its base, despite large potential, there are

¹² Transitional measures, smoothing the implementation of the reforms, have been discussed earlier in this paper and are not further elaborated on here.

¹³ According to the Electricity Industry Act (Mexican Government, 2014), clean sources include: wind, solar, tide, geothermal, heat generation from waste, hydrogen energy generated in line with energy efficiency regulation, hydro, nuclear, CCS, energy-efficient co-generation, other technology considered as low-carbon under international standards, and those technologies considered as clean by the Environment Ministry, under certain criteria.

moves towards implementing carbon trading, and accepting more carbon offsets from international carbon markets. In particular, the carbon tax law includes a provision that allows taxpayers to settle their carbon tax liability with emissions-reduction certificates from Mexican projects as recognised by the United Nations Framework Commission on Climate Change (UNFCCC) e.g. Certified Emissions Reductions (CERs) or similar instruments, based on their value in the international (secondary) market.¹⁴ At the date of this writing, this remains a theoretical possibility, as no carbon tax payment with CERs has yet been effectuated there is no guidance from practical experience.

Full implementation of this provision would mean that the projects sell (some of) the CERs they generate to the firms subject to the carbon tax, which will then then hand the CERs over to the government to comply with their tax liability. The government would accept these certificates based on the value at which it expects to be able to resell them on the international secondary market. Taxpayers' choice of how to pay their carbon tax liability is then determined by whether Mexican projects can generate CERs at a lower price than their price in the international secondary market. Thus, if the government's prediction of its ability to sell the certificates on the international market turns out to be precise, the government does not forego revenue from this provision. However, the price of CERs has been falling in recent years (World Bank, 2016), implying that certificates cannot be held for very long before they are resold. The prices at which CERs are accepted would also have to be continuously updated, increasing uncertainty for taxpayers.

Paying the carbon tax with CERs may have the further implication that taxpayers use only CERs to pay their carbon tax liability, as long as Mexican projects can generate certificates cheap enough. Once the price of domestically generated CERs surpasses the carbon tax rate, taxpayers might collectively switch their payment modality. Furthermore, the Mexican government's transactions by themselves can affect the price of international CERs, as the market already suffers from oversupply, depressing prices (cf. World Bank, 2016). Allowing carbon tax liabilities to be discharged this way could decrease the predictability and nature of the revenue stream. Importantly, the future of international offset mechanisms is highly uncertain, which could affect the ability of the Mexican government to re-sell CERs on the international market.

Mexico is also advancing moves towards implementing carbon trading. In that regard, the country agreed with Californian, Quebecois and Ontarian authorities to facilitate an exchange on lessons learned from implementing and administering emissions trading systems, with a view to linking the systems, if implemented (Bloomberg, 2016). In August 2016, the country also announced the implementation of a year-long pilot cap-and-trade market, in which 60 domestic and international firms would trade carbon certificates. Linking offset trading between Mexico and California would add a further layer to the dynamics around offset trading described earlier in this section, with the price differential between the offsets generated in Mexico and in California potentially becoming an important variable driving offset trade and carbon-tax payments.

5. Conclusion

This case study has applied a set of dimensions for a holistic and systematic evaluation of environmental tax reform to the Mexican energy tax and price reforms. Concerning the criterion of environmental effectiveness, the gradual deregulation of gasoline and diesel prices, to be completed by 2018, and the substantial increase in the fuel tax rates, together translate into substantial increases in tax

¹⁴ For example, if the price of a CER on the international secondary market is EUR 0.17 per tCO₂ (the average CER price on this market in 2014 according to World Bank (2015)), equivalent to MXN 3.35 per tCO₂, approximately 20 CERs need to be used to settle 1 tonne of carbon tax liability (MXN 70.68 per tCO₂).

rates on transport fuels. This improves the extent to which taxes reflect the external cost of carbon and other pollutants (and indirectly the external costs of congestion and accidents). Depending on the evolution of pre-tax prices, the tax increases could trigger reductions of emissions and other external costs – in a cost-effective manner across all energy use covered. These emissions reductions are combined with larger revenues flowing into the government budget, a positive effect. Given recent debate it could be important, to ensure that the reforms are taken forward, and that potential adverse impacts of the reforms on the poorest households are addressed, e.g. via targeted social cash transfers.

The higher tax rate is confined to the transport sector, but two thirds of energy use and carbon emissions come from residential heating, industrial processes and electricity generation. While these emissions are partially taxed under the newly introduced carbon tax, they are taxed at very low rates that do not always reflect the carbon content of the underlying fuels. In particular, natural gas is exempt from the carbon tax, though it accounts for a third of Mexican energy use, and is expected to grow further (potentially partly but not only because of the zero carbon tax rate), and coal is taxed at a relatively low rate.

While the carbon tax substantially increases the share of emissions covered by a policy-driven price signal, its tax rates should be further increased in the coming years and they should reflect the carbon content of each fuel more uniformly, if the tax is to produce a meaningful price signal on the external costs of carbon emissions and trigger GHG emissions reductions. A higher carbon price across sectors and fuels could also help Mexico reach its commitments under the UNFCCC process in a cost-effective way.

Environmental effectiveness is sometimes, and reasonably, seen as the main objective of environmental tax reform, but policy change affects other relevant socio-economic outcomes as well. This paper highlights that valuable additional revenue is raised through the reforms. These additional revenues could partly be used to finance social compensation, however, this would be just a first step towards making the Mexican government budget less dependent on revenue from selling oil and increasing the overall tax-to-GDP ratio.

While the effects of the tax and subsidy reform can be expected to differ across income groups, their overall effect likely enhances the progressivity of government taxation. Initially, the staged transition coupled with low crude oil prices and low initial carbon tax rates improved the acceptability of the reform to Congress and the general public. In the case of the fuel tax, however, worsening exchange rates and increasing oil prices caused a spike in fuel prices at the start of 2017.

Introducing a carbon tax at a low level might set the stage for gradually increasing tax rates and broadening the base in coming years. Such gradual increases could have multiple benefits: they could substantially increase the tax revenues and – if the increases are announced well in advance – would allow businesses and households to adjust behaviour – both in terms of consumption and production – accordingly, so providing an opportunity to adapt while taxes are still relatively low. Tax-base erosion might be a consequence in the very long term, but can be expected to occur only very gradually, and revenue planning can anticipate this. Given some of the discussed changes to the carbon tax design and payment modalities (such as payment with CERs, or the introduction of an emissions trading system), it could be important to ensure that effective price signals for carbon emissions abatement are retained.

Tax compliance and administration aspects of the environmental tax reform are crucial to its ultimate success. The presence of a large informal sector increases the importance of these policy dimensions, as do the high level of tax avoidance and evasion. Taxes on carbon emissions or energy use seem especially well suited environmental and tax policy instruments in this context, due to their relative ease of administration and collection. In the future, it will be important to evaluate some of the policy changes discussed, including moves towards carbon trading and increased recognition of carbon offsets, against some of the

framework dimensions outlined in this paper. In particular, it could be important to ensure that the environmental effectiveness, administrative simplicity and potential to raise revenue associated with the current policy setup are retained.

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