Chapter 1

The case for measuring support for fossil fuels

The discussion in this first chapter sets the stage for better understanding the present report and the associated database. To do this, Section 1.1 looks at the reasons why fossil-fuel subsidies are generally considered to be harmful for the economy and the environment. Section 1.2 then shows how this helps explain the recent emergence of a consensus for reforming fossil-fuel subsidies, and how this growing consensus has led to a number of policy initiatives internationally and domestically. Section 1.3 then concludes by placing the OECD Inventory onto that broader stage, emphasising the important role it plays in ongoing discussions of energy policies and their reform.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

1.1. Why reforming support for fossil fuels makes sense

Mitigating climate change requires coherent policy signals

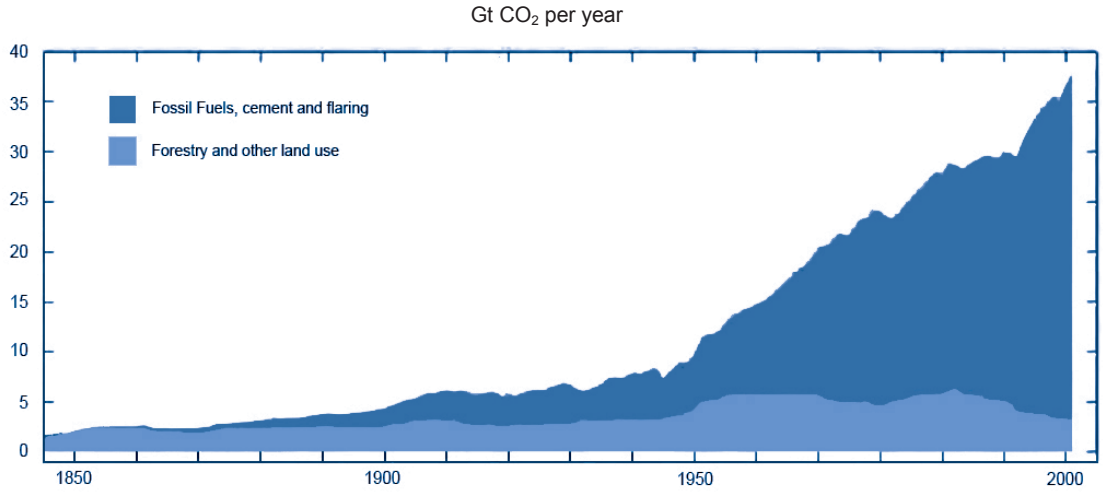
As global greenhouse-gas (GHG) emissions continue to increase, so does the threat of higher average temperatures and their consequences for the environment and human welfare. A recent assessment by the Intergovernmental Panel on Climate Change (IPCC) shows these consequences to include unprecedented increases in sea levels, biodiversity loss, and a higher frequency of extreme weather events such as floods and droughts (IPCC, 2014). The assessment also indicates that emissions from fossil-fuel combustion, cement production, and flaring account for the majority of all anthropogenic emissions of CO_2 (Figure 1), a gas responsible for about two-thirds of all anthropogenic GHG emissions in 2010. This makes the use of fossil fuels a leading contributor to global warming and its effects on the natural environment.

Under such conditions, additional mitigation efforts will imply that significant action be taken to reduce countries' reliance on fossil fuels. Substantial progress has already been made to curb GHG emissions from fossil-fuel combustion in a number of countries, including large emitters like the People's Republic of China,[1] the European Union or the United States. Current efforts are, however, unlikely to be enough to avoid average temperatures increasing by 4ºC above pre-industrial levels by 2100. The IPCC's latest assessment finds, for example, that scenarios in which the average temperature increases by less than 2ºC over the 21st century involve global GHG emission reductions between 40% and 70% by 2050 compared with 2010 levels (IPCC, 2014). To achieve emission reductions on that scale would necessitate the widespread replacement of fossil-fuel-based energy sources with low-carbon energy sources and the deployment of technologies for capturing and storing CO_2.

Achieving the large-scale abatement of GHG emissions poses a number of challenges for policy makers. First among these are the short-term costs that mitigation measures may impose on economic actors, whether firms or households. Recent evidence shows these costs to vary widely depending on which policy instruments are used, with taxes and emission permits usually resulting in lower abatement costs (OECD, 2013a).[2] Reducing these costs further requires that signals and incentives for mitigation be coherent across policy areas, so that one set of policies does not undermine what the other is trying to achieve. In that regard, addressing climate change is as much about introducing new policies as it is about adapting existing ones. This need to better align policies across domains of public action was recently highlighted in an OECD report — *Aligning Policies for a Low-carbon Economy* — that identifies instances in which policy misalignments can hinder the effectiveness of low-carbon policies (OECD, 2015a).

Measures that directly support the production or unabated consumption of fossil fuels are prime examples of policies that run counter to mitigation objectives. Because they reduce the effective price of carbon, fossil-fuel subsidies make it more difficult to operate the necessary shift toward low-carbon energy sources. In that sense, they belong to the broader set of environmentally harmful subsidies (EHS), which have already been the object of several studies in the OECD context (e.g. OECD, 2003). The Organisation's interest in EHS goes back to Objective 1 of the *OECD Environmental Strategy for the First Decade of the 21st Century* that was adopted by OECD Environment Ministers in May 2001, and which already stressed the need to "remove or reform subsidies and other policies that encourage unsustainable use of natural resources — beginning with the agriculture, transport and energy sectors" (OECD, 2001). Objective 2 of the statement also emphasises the importance of "green tax reform", which is of particular importance for tax concessions encouraging the production and use of fossil fuels.

Figure 1.1. The combustion of fossil fuels has been the main contributor to global anthropogenic emissions of CO_2



Note: This figure shows global emissions of carbon dioxide (CO_2) only and therefore omits the emissions of other important greenhouse gases like methane (CH_4) or nitrous oxide (N_2O). The IPCC notes that quantitative information on these other gases is limited for the period 1850-1970.

Source: IPCC (2014), Figure SPM.1 (d), www.ipcc.ch/pdf/assessment-report/ar5/syr/AR5_SYR_FINAL_SPM.pdf.

The particular case of fossil-fuel subsidies

There are several reasons why EHS are generally regarded as bad. Like most subsidies, EHS distort incentives to the extent that they alter relative prices for inputs or consumption goods. This in turn affects the decisions of producers and consumers, creating inefficiencies in the economy[3] and the use of resources. They are also costly in that they compete with other uses of public funds and deteriorate fiscal balances. What makes EHS different from other subsidies, however, is that they also cause environmental damage by definition. This report focusses on fossil-fuel subsidies since they constitute a notable subset of EHS owing to their prevalence and to the scale of their fiscal and environmental impacts. Previous estimates by the OECD and the IEA suggest that subsidies and other forms of support for fossil fuels exceed half a trillion USD worldwide annually (OECD, 2013b; IEA, 2014a), making them far from trivial.

Fossil-fuel subsidies are distortive

Changes in the price of fossil fuels relative to other goods and services can be expected to have large impacts on production and consumption decisions throughout the economy. Fossil fuels still are essential inputs to many economic activities, ranging from primary sectors such as agriculture and mining, to services like air transport and construction. They are also important for households who use them for heating and transport purposes. Furthermore, many countries rely extensively on fossil fuels for generating the electricity they need. By distorting costs and prices, fossil-fuel subsidies thus generate inefficiencies in the production and use of energy economy-wide. Only where subsidies serve to correct a pre-existing market failure can their use be potentially efficient from an economic perspective, such as subsidies for the provision of public goods like national defence and early-warning systems for natural disasters.

Particularly problematic for economic efficiency are subsidies that alter the rate of return on investment in selected assets or activities. Because they change the stream of income investors expect to receive for holding a particular asset, those subsidies influence investment choices and change the allocation of capital across sectors. In the case of certain fossil-fuel subsidies, there is therefore a risk that investors end up favouring sectors that produce fossil fuels or use them intensively, at the expense of cleaner forms of energy and other economic activities more generally. This problem is worse for

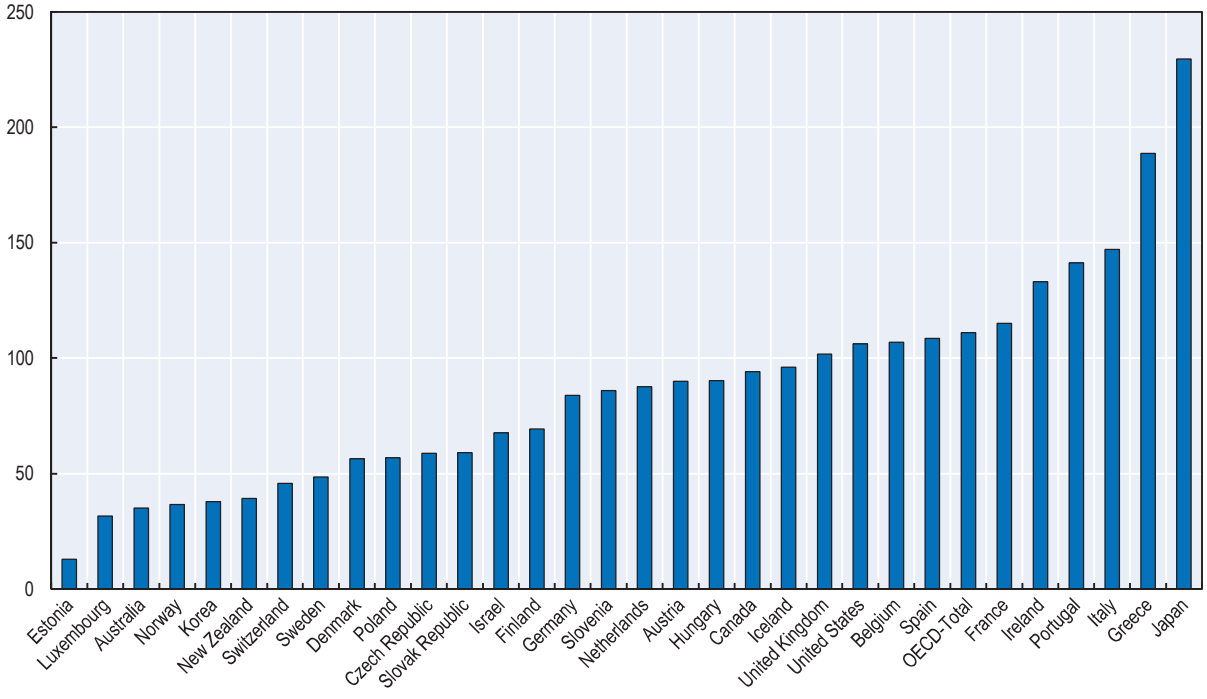
long-lived capital infrastructure since the impact of investment decisions can in that case be felt for years or even decades.[4] For such assets, fossil-fuel subsidies that artificially increase returns on investment can lock in polluting technologies for years to come, thereby retarding the transition to a low-carbon economy. This also raises the chance that these assets become stranded in the face of environmental and regulatory changes (Ansar et al., 2013).

Fossil-fuel subsidies are costly

The Great Recession of 2008-09 and the rocky road to recovery left many countries in bad fiscal shape. Falling tax revenues due to slower economic activity, together with higher spending on stimulus packages, bailouts for the banking sector, and social transfers (including so-called automatic stabilisers) all resulted in record-high public deficits. In an environment characterised by low economic growth and low inflation, these deficits led to the accumulation of large volumes of public debt relative to countries' GDP (Figure 1.2). With many countries now in dire need of fiscal space, governments struggle to identify opportunities for cutting spending and increasing revenues in ways that do not damage the welfare of their citizens. A reform of fossil-fuel subsidies may form part of the solution, particularly in countries where they account for a relatively large share of the total government budget.

Figure 1.2. The crisis has left many countries in dire fiscal straits

General government debt as of 2014 (% GDP)



Source: OECD Economic Outlook No. 95, DOI: http://dx.doi.org/10.1787/data-00688-en.

In Indonesia, for instance, consumer subsidies for petroleum products and electricity (largely fossil-fuel-based) accounted for almost 20% of all central-government spending in 2011, an amount roughly equal to that spent on education, and one that was much higher than all spending on health and infrastructure combined (OECD, 2012a). As pressures mounted, the Indonesian Government subsequently managed to phase out entirely gasoline subsidies in its revised 2015 budget, leaving in place the smaller subsidies for LPG, diesel fuel, and kerosene and freeing up resources for more infrastructure investment (Sambijantoro, 2015). A comparable situation prevailed in India until the

Central Government started reducing consumer subsidies for diesel fuel in late 2012. The savings thus realised amounted to about INR 200 billion between the years 2012 and 2014. This represents roughly 10% of the revenues the country derives ever year from all its federal excise duties combined (Ministry of Finance of India, 2015). In the United States, the federal administration has repeatedly proposed that a number of tax preferences benefitting fossil-fuel producers be removed, with the proposed budget for FY2016 estimating the potential revenue gains at over USD 4 billion annually (OMB, 2015).

Fossil-fuel subsidies are environmentally harmful

Although most fossil-fuel subsidies are undoubtedly distortive and costly, the same could be said of many other types of subsidies, like home-ownership subsidies for instance. What really differentiates fossil-fuel subsidies from other types of subsidies are their environmental impacts. Combatting climate change will require large-scale reductions in GHG emissions through a shift toward low-carbon energy sources. Measures that encourage the production or use of carbon-intensive fuels clearly make that shift harder and more costly. This is especially so since many of the assets used in producing or combusting fossil fuels tend to have relatively long life spans, which creates a risk that capital infrastructure ends up locking in carbon-intensive technologies for years or decades to come.

GHG emissions are not, however, the only environmental externality associated with the extraction and consumption of fossil fuels. On the production side, mining activities can, for example, cause the land above to subside, with considerable impact on human activities and biodiversity.[5] While land subsidence is frequently associated with coal mining, the risks also exist for other fossil fuels as evidenced by heightened seismic activity around the Groningen gas field in the Netherlands (Dutch Safety Board, 2015). The contamination of ground and surface water can also occur in the event of an oil spill or where wastewater and residues from the extraction process are improperly disposed of. In addition, extraction techniques for unconventional sources of oil and natural gas (e.g. oil sands and shale gas) require considerable volumes of water, which aggravates the stress on water resources.

On the consumption side, the combustion of fossil fuels in power plants, in vehicles, and in buildings is directly responsible for the emission of numerous pollutants having local and often immediate impacts on the environment and on human health. In particular, ambient air pollution caused by particulate matter (PM), nitrous oxides (NO_X), volatile organic compounds (VOCs),[6] and sulphur dioxide (SO_2) increases mortality risks through a higher occurrence of respiratory diseases, cardio-vascular diseases, and cancers. This imposes very substantial costs on society as a whole. In the case of PM and ozone alone, a recent OECD study looking at ambient outdoor air pollution estimated the associated economic costs to have reached a total USD 3.6 trillion in 2010 in OECD countries, China, and India (OECD, 2014a). Besides impacts on human health, emissions of pollutants from fossil-fuel combustion also damage capital infrastructure (e.g. buildings) and in most cases impair crop yields through acid rain.[7] To the extent they encourage the use of fossil fuels, fossil-fuel subsidies contribute to these various externalities.

Some evidence on the benefits of reforming subsidies and other measures supporting fossil fuels

Analysis undertaken at the IEA and the OECD has until now largely focussed on the under-pricing of fuels in developing and emerging countries, for which data have been available for some time. Using a general-equilibrium model of the world economy, a recent study found that a co-ordinated multilateral removal of consumer subsidies in developing and emerging countries would reduce global GHG emissions by 3% by 2020 relative to a baseline scenario (Durand-Lasserve et al., 2015).[8] Most of that reduction would be driven by emission reductions in non-OECD countries since they are where the measured energy subsidies are concentrated. While aggregate real income would barely change at the global level following the removal of subsidies (+0.33% by 2020), this hides large disparities between importers of fossil energy that gain significantly (e.g. India and Indonesia) and exporters that lose slightly (e.g. Canada and the countries of the Commonwealth of Independent

States). Although the Middle East is a large energy exporter, the efficiency gains brought by the removal of subsidies seem sufficient to outweigh the negative impacts on the region's terms of trade, so that it records a net income gain overall.

The same study also employs a household survey to obtain micro evidence on the distributional impacts of the simulated reform in the Indonesian context. While the survey data indicate that consumer subsidies in Indonesia disproportionately benefitted rich households prior to their recent reform, their removal can, nonetheless, prove detrimental to the poorest segments of the population. Despite the fact that poor households often lack access to electricity and do not generally consume certain petroleum products (e.g. gasoline), a removal of energy subsidies can increase the price of many other goods these households consume, thereby affecting their purchasing power. For that reason, the study goes on to assess the distributional impacts of reform under three different scenarios, each of which involves a different kind of compensatory redistribution scheme, i.e. food subsidies, direct cash transfers to households, and labour-income subsidies. Simulation results suggest that cash transfers are the preferred option from an efficiency and equity standpoint. In particular, food subsidies would introduce new inefficiencies in the economy while wage subsidies would fail to reach the poorest since they do not benefit informal labour.

Other recent examples[9] of modelling-based analysis of the impacts of fossil-fuel subsidies and their reform include a study on Yemen that was conducted in 2011 by researchers at the International Food Policy Research Institute (Breisinger et al., 2011). Using a multi-sector model of the Yemenite economy, the study arrived at conclusions that are essentially similar to those of the OECD as regards the impacts of a reform of consumer subsidies. The results thus suggest that the gradual removal of petroleum subsidies in Yemen would increase economic growth relative to a baseline, but that minimising the impact on the poor would necessitate that compensatory measures be taken. In this case, compensation takes the form of direct cash transfers and infrastructure investment.[10] Although the study did not model environmental effects explicitly, it provides yet more evidence that fossil-fuel subsidies hamper economic growth through the impacts they have on fiscal resources and market signals.

In a different vein, in 2013 the United States Congress tasked the National Research Council to undertake a study of the effects of US federal tax policy on the country's GHG emissions (National Research Council, 2013). Among the several policies analysed by the research committee, the study assessed the impacts that certain tax expenditures benefitting energy producers have on domestic GHG emissions, including measures such as the percentage depletion allowance for natural-gas producers. This particular provision allows for the faster recovery of costs that are capitalised into fossil-fuel properties, thereby favouring investment in the exploration and development of US natural-gas resources. Results from a modelling exercise suggest that removing this tax concession would increase drilling costs and reduce incentives to explore and develop new gas supply. Given existing restrictions on the import (export) of natural gas into (from) the United States,[11] domestic natural-gas prices would increase following the reform since a modest increase in gas imports would not be sufficient to compensate for the lower domestic supply. This would in turn reduce natural-gas use in several sectors. Although the model's reference scenario points to a very modest reduction in CO_2 emissions (37 million tonnes over the model's time horizon, i.e. 25 years), this modest result is largely driven by the, now unlikely, substitution of coal for natural gas in the power sector. Considering the new carbon-emission standards for coal-fired power plants that have been proposed by the US federal administration, it is doubtful whether such substitution could occur on a significant scale in today's context. By effectively attaching a higher price to coal used in power generation, the new standards would make a shift from gas to coal unprofitable in most cases, thereby accentuating the projected decrease in CO_2 emissions should the percentage depletion allowance be reformed.

Some evidence on the production side also exists for the Russian Federation in the particular case of government support for the Yamal LNG and Prirazlomnoe upstream projects in the Arctic region (Lunden and Fjaertoft, 2014). In contrast to previous examples that focussed on the aggregate impacts of individual policies, this study adopts a systemic approach to evaluate the effects of government

support and its removal on specific upstream projects. The analysis is here concerned with the combined effects of government funding of exploration and infrastructure development, tax concessions, and the government assumption of environmental risks among others. Results were derived using an *ad hoc* model of the Russian upstream sector and are indicative of the role that tax concessions and other government support play in rendering particular projects viable economically. For Yamal LNG, for instance, the analysis finds that government support did allow the project to move forward. Results are more ambiguous for the Prirazlomnoe project, where government support did not influence the go or no-go decision but was more akin to "a gift, in the amount of [USD] 16.5 billion in undiscounted terms, from the government to [Gazprom] rather than a step to fine-tune the taxation system" (Lunden and Fjaertoft, 2014). In the latter case, it would therefore seem that government support did not help increase hydrocarbon production, and instead ended up wasting public resources that could have been put to better uses.

1.2. A growing consensus for reform

The previous section has shown that there are several reasons why governments may want to consider reforming measures that support the production or use of fossil fuels. The issues raised by these measures are generally not new but the context within which they are adopted and reformed has changed. This might explain why recent years have witnessed an increasing number of international initiatives aiming to phase out or reform those fossil-fuel subsidies that are deemed harmful or "inefficient" by policy makers. This section provides a short overview of these initiatives, focussing on those most relevant to the work of the OECD and emphasising the value of international co-operation in the area of subsidy reform more generally.

The need for international co-operation

Starting in 2009, an international consensus has progressively emerged on the question of subsidies and other measures supporting fossil fuels. While there may be disagreements between certain groups of countries over issues of definitions and scope, governments are increasingly wary of the consequences that fossil-fuel subsidies can have for the environment and the global economy. That these concerns translate into international co-operation is no accident, however. Many of the questions raised by fossil-fuel subsidies and their removal are trans-boundary in nature and may thus require a co-ordinated response by governments.

GHG emissions are a global concern because such gases disperse globally, and stay in the atmosphere for decades or centuries, thereby eventually changing the climate. The IPCC's Fifth Assessment (IPCC, 2014) notes in that regard that:

> Effective mitigation will not be achieved if individual agents advance their own interests independently. Cooperative responses, including international cooperation, are therefore required to effectively mitigate GHG emissions and address other climate change issues.

Similar concerns arise in the case of other environmental externalities related to fossil fuels that cross borders, such as cases in which the PM and the SO_2 emitted by coal-fired power plants in one country affect air quality in another.

The trans-boundary impacts of subsidies and other measures supporting fossil fuels are not, however, confined to the environmental sphere. Like most commodities, fossil fuels are extensively traded internationally so that variations in supply or demand in one large country (or group of countries) can affect international prices, which will in turn affect supply and demand in other countries. Under certain conditions, it is thus possible that the removal of fossil-fuel subsidies in one country (or region) could reduce that country's (or region's) demand for fossil fuels enough that international prices would be lowered, thereby prompting more demand in other countries or regions. Past OECD analysis has shown this "leakage effect" to be plausible, though modelling results clearly

indicate that the increase in fossil-fuel demand in other countries would not fully compensate the initial decrease in demand in countries that reform their fossil-fuel subsidies (Burniaux et al., 2011). Hence the removal of subsidies would still imply a net reduction in global demand for fossil fuels.

Because they lower the cost for consumers of energy derived from fossil fuels, subsidies and other measures that support the consumption of fossil fuels can also artificially improve the competitiveness of energy-intensive industries in countries that apply such policies. This echoes the earlier discussion of the distortions in costs and prices that subsidies cause, and where it was pointed out that such distortions can alter the allocation of productive resources (e.g. labour and capital) across the sectors of an economy. In the case of countries subsidising the use of fossil fuels in industrial processes, this may cause investment to be channelled toward energy-intensive industries (e.g. steelmaking and cement) while crowding out other economic activities. Here again, modelling analysis by the OECD shows this issue to be of particular concern for countries having relatively large consumer subsidies (Burniaux et al., 2011). For such countries, the analysis suggests that a reform of fossil-fuel subsidies could end up damaging the competitiveness of energy-intensive industries while, by the same token, improving the competitiveness of industries located in countries with no or smaller subsidies. The impacts of subsidies and their removal on industrial competitiveness and international trade constitute in that sense another important argument in favour of international co-operation.

Subsidies and other measures that push domestic fuel prices far below the prices prevailing in neighbouring countries can also encourage the smuggling of fuel across borders, sometimes in both directions.[12] Instances of fuel smuggling have been observed in various contexts, including at times between Singapore and Malaysia or between Brazil and Argentina (Kojima, 2013). In the former case, this has led the Singaporean Government to enact legislation requiring that all drivers leaving the country and entering Malaysia do so with their fuel tanks at least three-quarters full (Singapore Government, 2015). Smuggling is especially problematic for developing and emerging economies that seek to reform their own fuel subsidies but that are located in regions where illegal imports from neighbouring countries with heavy subsidies may end up cancelling partly the benefits of the reform. This has been the case in Colombia, where smuggling from the Bolivarian Republic of Venezuela led the two countries to co-operate at times to curb illegal trade in petroleum products (Kojima, 2013). Although political tensions between the two countries have since put a halt to bilateral arrangements, the example illustrates nevertheless that international co-operation can help make a reform of fossil-fuel subsidies more successful.

Building momentum internationally

International co-operation on the reform of fossil-fuel subsidies has been most visible in the context of the G-20, especially since leaders of its member economies committed in 2009 at the Pittsburgh summit to "rationalize and phase out over the medium term inefficient fossil fuel subsidies that encourage wasteful consumption" (G-20, 2009). Similar versions of this statement were reiterated at subsequent summits of the G-20, notably in Cannes, Los Cabos, Saint Petersburg, and more recently in Brisbane. Leaders of member economies of the Asia-Pacific Economic Cooperation (APEC) forum have made comparable announcements, starting with the Singapore declaration of November 2009, in which they committed to "rationalise and phase out over the medium-term fossil fuel subsidies while providing those in need with essential energy services" (APEC, 2009).

Following up on these commitments, members of APEC and the G-20 have over the past years engaged in annual rounds of self-reporting of their fossil-fuel subsidies, focussing on those that they deem inefficient. Lack of a shared definition and methodology has, however, made it difficult to reach a common understanding of the scope of "inefficient fossil fuel subsidies that encourage wasteful consumption", with individual country submissions varying greatly in depth and length. More recently, some of the G-20 members have agreed to subject themselves to reciprocal peer reviews of their fossil-fuel subsidies, with China and the United States volunteering in 2014 to be first. A similar peer-review process has commenced in APEC, starting with Peru in 2014 and continuing with New Zealand in 2015. Meanwhile, New Zealand has also co-founded and taken a leading role in the

Friends of Fossil Fuel Subsidy Reform (FFFSR) initiative, a group of like-minded, non-G-20 countries dedicated to advocating the reform of inefficient fossil-fuel subsidies on a global scale. Current members of this group include: Costa Rica, Denmark, Ethiopia, Finland, New Zealand, Norway, Sweden, and Switzerland.

The OECD has repeatedly contributed to these various initiatives by sharing its expertise and facilitating the exchange of relevant information among its member countries and other interested parties. As early as June 2009, members of the Organisation were already calling for "domestic policy reform, with the aim of avoiding or removing environmentally harmful policies that might thwart green growth, *such as subsidies: to fossil fuel consumption or production* that increase greenhouse gas emissions; that promote the unsustainable use of other scarce natural resources; or which contribute to negative environmental outcomes" (OECD, 2009; own emphasis). In addition to being an instrument of international co-operation, the OECD has also been a major provider of data on measures supporting fossil fuels ever since it published its first *Inventory of Estimated Budgetary Support and Tax Expenditures for Fossil Fuels* in 2012 (OECD, 2012b). The previous section has shown that this work has gone hand in hand with modelling analysis looking at the climate and economic impacts of simulated subsidy reforms.

In the wake of the Rio+20 United Nations Conference on Sustainable Development held in June 2012, participating countries have agreed to start a process for developing a set of Sustainable Development Goals (SDGs) that would draw in part on the already existing Millennium Development Goals. An *ad hoc* body, the Open Working Group, was subsequently established in January 2013 to oversee that process and work toward a set of proposed SDGs. The group has since issued a proposal in which Goal 12.c advocates the reform of "inefficient fossil fuel subsidies that encourage wasteful consumption […], including by restructuring taxation" while "taking fully into account the specific needs and conditions of developing countries and minimizing the possible adverse impacts on their development in a manner that protects the poor and the affected communities" (United Nations, 2014).

At the regional level, the European Commission's European Resource Efficiency Platform (EREP) has been tasked with providing high-level guidance on how to achieve the transition to a more resource-efficient European economy. Its 2012 policy manifesto already stressed the need to "[abolish] environmentally harmful subsidies and tax-breaks that waste public money on obsolete practices", and this advice was further reiterated in the first set of policy recommendations the Platform adopted in 2013, which states that: "The EU and Member States should as a matter of urgency phase out environmentally harmful subsidies (with the OECD definition in mind), with special emphasis on subsidies to fossil fuels and the use of water in agriculture, energy and industry. This should also cover fiscal advantages as well as distortionary pricing schemes" (European Commission, 2014a). A few regional development banks have also at times taken steps to evaluate or reform fossil-fuel subsidies in the countries in which they operate. This is the case of the Asian Development Bank, which has in recent years provided technical assistance for monitoring and evaluating fossil-fuel subsidies in some of its member countries (ADB, 2011). The Inter-American Development Bank is similarly undertaking technical co-operation for measuring and analysing subsidies for the production or use of fossil fuels in Latin American countries and the Caribbean (IADB, 2013).

These various initiatives show there is considerable interest in reforming fossil-fuel subsidies internationally. Co-ordinated progress at the international level can be slow and difficult, however. Capitalising on the existing momentum, some countries have therefore taken on themselves to move forward and reform their subsidies unilaterally. Not all such efforts have been successful though, and this underscores the importance of political-economy considerations in building domestic coalitions for reform. Chapter 3 provides examples of successful reforms in a number of countries, drawing on recent experiences in OECD countries and a number of partner economies.

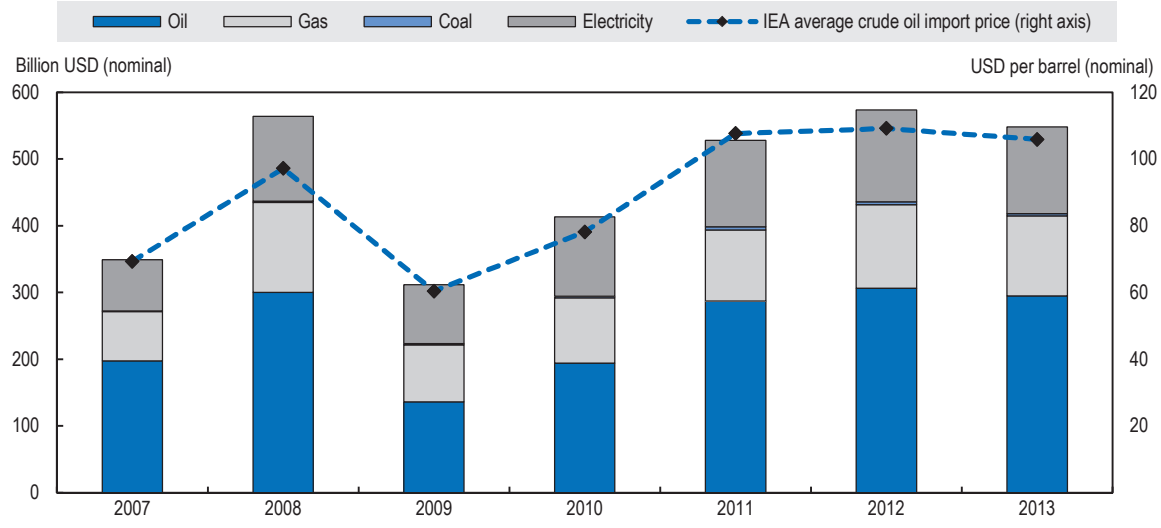
1.3. How the OECD Inventory helps fill crucial data gaps

From looking at symptoms to characterising the disease: Towards establishing a full policy diagnosis

Before the OECD started in 2010 to collect data on measures supporting fossil fuels in its member countries, the only estimates of fossil-fuel subsidies that were available widely were those the IEA has been producing for its annual *World Energy Outlook* (WEO) since 1999. Because the geographical scope of those estimates is large — as is the ground the WEO generally covers — the IEA estimates fossil-fuel subsidies using available information on observed energy prices. By comparing local fuel prices in different countries to a set of reference prices (either import-parity or export-parity prices), the IEA calculates a number of "price gaps" to estimate the extent to which fossil fuels are under-priced in various countries.[13] To the extent lower consumer prices reflect the prevalence of subsidies, price-gap estimates should convey useful information about the magnitude of these policies. The IEA estimates that the fossil-fuel subsidies thus calculated totalled USD 548 billion in 2013 (Figure 1.3). Globally, it has identified 40 countries that subsidise their consumption of fossil fuels, and which together account for over half of the world's energy consumption. Of these, ten countries account for almost three-quarters of the total consumer subsidies measured; five of them — all oil and natural-gas exporters — are in the Middle East or in North Africa.

Price gaps have often been used in various contexts to measure subsidies or support to particular products, sectors or industries, such as where domestic prices exceed international reference prices so that a benefit is conferred to domestic producers. In the case of agriculture, the OECD has used price gaps to estimate market-price support to producers since the 1980s as part of a broader exercise aiming to evaluate total support for the farming sector (OECD, 2014b). The IEA was already calculating indicators of market-price support for coal producers in 1987 using a similar approach (IEA, 1988), though the exercise was subsequently discontinued.

Figure 1.3. The IEA estimates of fossil-fuel subsidies by type of fuel



Source: IEA (2014a), DOI: http://dx.doi.org/10.1787/weo-2014-en.

Although it is undoubtedly valuable and helpful, the price-gap method does not capture certain forms of support for the production and consumption of fossil fuels. As argued by Koplow (2009), "relying solely on this metric would be a mistake" since it leaves out policies that do not lower consumer prices but that do have important fiscal and environmental impacts.[14] Examples of such policies include tax concessions, fuel vouchers and other payments made directly to low-income households, and many producer subsidies (IEA, 2014a). Measurement of producer support through price gaps is not a major feature since most fossil fuels are widely traded on world markets and often subject to low or zero import tariffs (see Tables A.2 and A.3 in the Annex). In this situation, producers only have a very limited ability to influence prices, except where they are large enough to affect world supply significantly (e.g. as with swing producers of oil), or where regulatory barriers and infrastructure bottlenecks insulate the domestic market from international price fluctuations (e.g. as with a lack of liquefaction terminals or pipelines for exporting natural gas). In other words, price gaps alone may not reveal all the producer support provided even as policies successfully increase domestic production of fossil fuels.

More generally, by focussing on the symptoms rather than on the disease, price-gap estimates do not provide information on the entire suite of policies and regulations that actually cause domestic fuel prices to fall below international reference prices. Establishing a full policy diagnosis necessitates that the price gap be attributed to specific programmes and measures and that stakeholders (e.g. beneficiaries) be clearly identified (Koplow, 2009; Kojima and Koplow, 2015). Failure to do so can hamper analysis of the full impacts that subsidies and other support measures have on the economy and the environment, and eventually make reforms more difficult by preventing a precise identification of potential winners and losers.

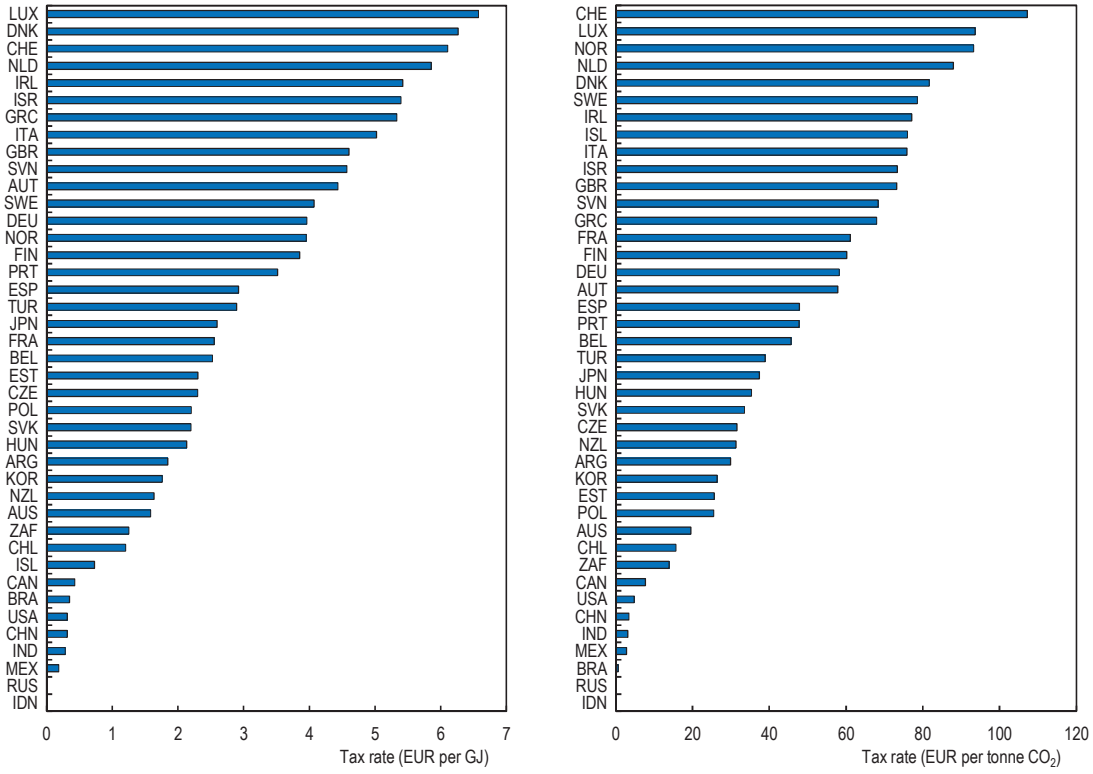
The need for an inventory: Addressing shortfalls in currently available data

The limitations described above in relation to the price-gap approach are especially problematic for OECD countries, where final prices for fuel generally exceed international reference prices due to the large range of indirect taxes that are often levied on the use of energy products there (Figure 1.4). Reasons for why these taxes exist are many, including considerations such as raising revenue and internalising the external costs associated with fuel combustion. Extensive information on the whole range of taxes levied on the use of energy and the corresponding tax rates can be found in *Taxing Energy Use 2015: OECD and Selected Partner Economies*, a companion OECD publication (OECD, 2015b) that also provides a series of graphical profiles of energy use and taxation — in both energy and CO_2 terms — for all OECD countries and a selection of key partners.[15] While this companion publication shows considerable variation in the extent to which different fuels are taxed across countries and sectors, the end result is generally such that domestic after-tax prices exceed international references prices in OECD countries and many partner economies. Because the reference prices used in calculating price gaps often do not comprise indirect taxes — other than value-added taxes (VAT) —, subsidies estimated using the price-gap approach are generally unable to account for support provided in OECD countries and in a number of partner economies.

As indicated earlier, price-gap estimates were the only set of data consistently available across different countries and years at the time G-20 leaders committed in 2009 to "rationalize and phase out over the medium term inefficient fossil fuel subsidies that encourage wasteful consumption." This generated an imbalance in country coverage since subsidies and other forms of support for fossil fuels escape measurement using price gaps in most high-income countries — a group of countries generally characterised by relatively higher taxes on energy use. In addition to creating a divide between high-income and middle-income economies in the G-20 and elsewhere, this lack of information erected additional barriers in the way of broader discussions of energy policy and reform. Transparency and information gathering form, indeed, step one in any policy assessment and reform process.

Figure 1.4. There is considerable variation in the extent to which energy is taxed across countries

Average effective tax rates on energy (left) and CO_2 from energy (right) in the OECD and in selected partner economies



Notes: OECD calculations for the selected partner economies. Tax rates are as of 1 April 2012, except 1 July 2012 for Australia and Brazil and 4 April 2012 for South Africa. For that reason, the rates for Australia include the carbon tax that was subsequently repealed effective 1 July 2014. Energy-use data are for 2009 and are from the IEA. Rates for Canada, India, and the United States include federal taxes only.

Source: OECD (2015b), DOI: http://dx.doi.org/10.1787/9789264232334-en.

To address this problem, the OECD started in 2010 to collect information on all budgetary transfers and tax expenditures that encourage the production or consumption of fossil fuels in its member countries. These efforts soon led to the release of a first *Inventory of Estimated Budgetary Support and Tax Expenditures for Fossil Fuels* in 2012 (OECD, 2012b), and have since become a regular OECD exercise. By looking at the fiscal implications of individual support policies, the Inventory makes it possible to assess a whole range of government interventions at various points along the supply chain for fossil fuels, from the extraction stage to their combustion in vehicles or power plants. In particular, this approach accounts for support provided through the tax system, and more generally for various forms of support that do not push domestic fuel prices below international reference prices.

The Inventory thus assembled has fed into various publications and projects within the OECD and elsewhere. In addition to being an important input for recent OECD work on *Taxing Energy Use* (OECD, 2015b), its findings have frequently been used in the *Environmental Performance Reviews* and *Economic Surveys* of particular countries. Information from the Inventory will also contribute to a forthcoming OECD report that takes stock of the climate-change mitigation efforts undertaken to date in member countries, the European Union, and ten non-member economies (OECD, 2015c, forthcoming). Beyond the OECD, the European Commission has adopted the Inventory's method and framework to produce a follow-up study looking at budgetary support and tax expenditures for fossil

fuels in those EU Member States that are not members of the OECD (IVM, 2013). This add-on was then followed a year later by a report seeking to enhance the comparability of data on budgetary support and tax expenditures for fossil fuels in the EU (European Commission, 2014b). The Inventory also formed the basis for some of the country submissions on fossil-fuel subsidies that were made in the context of APEC.

In that respect, the Inventory fulfils an important additional objective by promoting the transparency of public policies and government budgets, and eventually a greater accountability for how public resources are used. It can also be understood as a contribution toward the broader issue of how to make fiscal policy and tax systems "greener" or more environmentally friendly. In the same way that revenues from environmental taxes can be used to reduce other more distortive taxes (e.g. taxes on labour income), the reform of budgetary transfers and tax expenditures for fossil fuels could yield a so-called "double dividend" where revenue gains are significant.

For all its qualities, this Inventory should, nevertheless, be understood as a complement to the price-gap approach rather than a substitute. Both approaches serve distinct roles in discussions of fossil-fuel subsidies, and they should therefore not be opposed to one another. In particular, estimates derived using the price-gap method are particularly well suited for analytical work at the macroeconomic level, which facilitates subsequent analysis of the impacts of subsidies on international trade flows and global GHG emissions. They are also likely to be more accurate and comprehensive in certain countries that "lack the capability or will to provide accurate information on energy-related government activities" (Koplow, 2009).

Notes

1. Henceforth "China".
2. There are indications that stringent environmental policies — including measures for reducing GHG emissions — are not necessarily detrimental to short- or medium-term economic performance, whether measured in terms of productivity (Albrizio et al., 2014) or exports (Sauvage, 2014). See Koźluk and Zipperer (2013) for a survey of empirical findings on the topic. Arlinghaus (2015) and Flues and Lutz (2015) provide additional evidence on the impacts of carbon prices and energy taxes on firm competitiveness using a variety of indicators (e.g. output or employment).
3. These distortions also extend to foreign producers and consumers since virtually all economies are exposed to international trade. This forms the basis for the discipline of subsidies under the WTO's Agreement on Subsidies and Countervailing Measures (SCM).
4. The U.S. Internal Revenue Service sets, for example, the normal recovery period for pipelines used in carrying petroleum products and natural gas at between 15 and 22 years (IRS, 2014).
5. See Butt et al. (2013) for an overview of the various risks that fossil-fuel extraction poses for biodiversity.
6. NO_X and VOCs are also precursor gases of ground-level ozone (O_3), which causes a host of respiratory issues and affects the production of oxygen from leafy plants.
7. Some soils, such as those that are too alkaline, can benefit from acid rain. There is also some research suggesting that acid rain can reduce methane emissions from wetlands. See, for example, Gauci et al. (2008).
8. The OECD's ENV-Linkages model is a global recursive-dynamic, computable general-equilibrium (CGE) model, which simulates the interactions between firms and households across several sectors, regions, and years. The model's baseline scenario assumes no further policies than those already in place and its energy projections are calibrated on the IEA's

World Energy Model. See Chateau et al. (2014) for a presentation of the ENV-Linkages model.

9. This sub-section does not seek to provide a comprehensive review of the literature analysing the impacts of fossil-fuel subsidies and their reform. The intention here is rather to provide a few concrete examples of studies that do such analysis in order to illustrate the earlier discussion of the reasons why fossil-fuel subsidies are often regarded as harmful for society. See Ellis (2010) for a review of modelling and empirical studies on the effects of fossil-fuel subsidy reform that were undertaken between the early 1990s and 2009.

10. Because the study was conducted in 2010-11, some caution should be exercised when interpreting its results as a rebellion has since erupted in Yemen, casting doubt on the political feasibility of subsidy reform there.

11. In its current amended version, the Natural Gas Act of 1938 still requires that any company importing (exporting) natural gas into (from) the United States obtain prior authorisation from the US Department of Energy, irrespective of whether the gas is traded in gaseous or liquid form. Authorisation is, however, granted automatically to those selling natural gas to countries that have signed a free-trade agreement with the United States (IEA, 2014b).

12. Imports from neighbouring countries that subsidise their fuel is called "fuel tourism" when the transporter is also the final consumer of the fuel. Fuel tourism reduces the tax revenues that would otherwise be earned by the country in which the "tourist" is normally resident.

13. See Chapter 9 of the 2014 edition of the WEO (IEA, 2014a) for a description of the price-gap approach to estimating fossil-fuel subsidies.

14. On that issue, see also Kojima and Koplow (2015).

15. Box 2.3 in Chapter 2 provides more information on this companion publication.