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Cheap Energy at What Cost? The Economic Case for Eliminating Fossil Fuel Subsidies

Many governments still help to keep fossil fuels cheap – sometimes by directly paying part of the supply cost (explicit subsidies), and at other times by not including the hidden costs of pollution and health problems they cause in their price (implicit subsidies). But what is the true cost to us? Would it be a good idea for countries to discontinue these subsidies and ensure that fossil fuel prices reflect the full impact of using these energies? And to what extent would this help countries to achieve their climate targets under the Paris Agreement? We study these questions across a broad range of countries by combining economic modeling with detailed data on fossil fuel subsidies, external costs of fossil fuels and national income and product accounts. We find that a unilateral elimination of explicit and implicit subsidies on fossil fuels would improve public finances in most countries, raise more fiscal revenues for governments and considerably reduce CO₂ emissions. About one third of countries would already meet their climate targets in this scenario, making additional policies like carbon pricing redundant. Eliminating all direct fossil fuel subsidies worldwide would have only a limited effect in curbing global emissions. However, addressing the hidden costs of fossil fuel use – by “getting energy prices right” – could reduce global carbon emissions by one third, while simultaneously increasing both global and country-level welfare. Our findings highlight that economic, fiscal and climate targets can, in principle, be aligned.



KEY MESSAGES

- Many countries continue to heavily subsidise fossil fuels, both explicitly (by undercharging supply costs) and implicitly (by failing to account for the non-market costs associated with local externalities of fossil fuel use).
- We present evidence that there are strong incentives for countries to unilaterally eliminate both explicit and implicit subsidies.
- Countries could benefit by generating significant fiscal revenues, reducing CO₂ emissions and increasing economic welfare (with non-market effects overcompensating market losses).
- About one third of countries would thus meet their climate targets, making additional policies like carbon pricing redundant.
- Even if all countries were to remove explicit subsidies on fossil fuels, the impact on global CO₂ emissions would be minor. However, if implicit subsidies were also eliminated, in order to internalise local externalities, emissions would fall by 32%.
- Removing fossil fuel subsidies and pricing local externalities related to fossil fuel use can help to align economic, fiscal and climate targets.

FOSSIL FUELS CONTINUE TO BE HEAVILY SUBSIDISED WORLDWIDE

It is hard to overstate the importance of fossil fuel subsidies which have historically been one of the most widely used energy and public policy interventions. Recent empirical evidence by the International Monetary Fund (IMF) shows that many countries still heavily subsidise oil products, natural gas and coal. Total global fossil fuel subsidies in 2022 are estimated to have amounted to \$1.3 trillion (1.3% of global GDP). However, these figures only include direct or explicit subsidies spent from government budgets to reduce fossil fuel (consumer) prices to levels below the supply costs (Black et al., 2023).

The use of fossil fuels has been demonstrated to exacerbate local air pollution significantly and pose serious risks to public health. Similarly, oil use in motor vehicles comes along with non-pollutant externalities such as congestion, accidents, and, to a lesser extent, road damage.

Economists use the concept of an externality to refer to a cost or benefit from an economic activity that affects third parties – people who are not directly involved in the transaction – and is not reflected in market prices. By adversely impacting local air quality and public health, the use of fossil fuels imposes external costs on individuals and society that are not captured in the fuels' market prices. This discrepancy between the private cost of supply and the broader social cost constitutes an implicit subsidy for fossil fuel consumption.

Comprehensive empirical evidence recently gathered by the IMF suggests that implicit subsidies on coal, natural gas and oil products worldwide came to \$5.7 trillion (5.8% of global GDP) in 2022 (Black et al., 2023). Figure 1 shows the implicit subsidies differentiated by type of fossil fuel and local externality. In sum, explicit and implicit subsidies amounted to \$7 trillion (7.1% of global GDP) in 2022. Figure 2 shows the magnitude of both explicit and implicit subsidies across various countries and regions worldwide.

In decentralised, market-based economies, prices play a key role in conveying information about value and scarcity, thereby facilitating coordination and promoting allocative efficiency. Consequently, ensuring that fossil fuel prices reflect their true costs and benefits accurately is of fundamental importance. According to this view, the price of a fossil fuel should equal its social cost (or value) of using it:

$$\text{PRICE OF FOSSIL FUEL} = \text{SOCIAL COST OF FOSSIL FUEL}$$

The social cost of using a fossil fuel should comprise its private supply cost (e.g., the cost of extracting fossil resources, producing the delivered energy, and bringing it to the market) as well as its external cost (e.g. caused by local air pollution and negative health effects related to burning fossil fuels to produce goods and services):

$$\text{SOCIAL COST OF FOSSIL FUEL} = \text{PRIVATE SUPPLY COST} + \text{EXTERNAL COST}$$

It is then easy to understand how explicit and implicit subsidies for fossil fuels distort pricing. Even in the absence of external costs associated with fossil fuels, explicit subsidies would create a disparity between private and social costs, leading to allocative inefficiencies (which have to be traded off against the benefits for users in the market who pay lower fuel prices). Without explicit subsidies on fossil fuels, there would be an implicit subsidy relative to the social cost of the fossil fuel, if the external costs were not accounted for:

$$\text{IMPLICIT SUBSIDY} = \text{SOCIAL COST OF FOSSIL FUEL} - \text{PRIVATE SUPPLY COST}$$

Large direct or explicit subsidies for fossil fuels

Understanding implicit subsidies for fossil fuels

The implicit subsidies on fossil fuels are enormous

How should fossil fuels be priced?

Government spending on fossil fuel subsidies benefits certain market participants as it lowers the costs of fossil fuel consumption for them. However, as previously discussed, such subsidies distort fossil fuel prices and fail to account for the negative local externalities associated with fossil fuel use, which are likely to have significant implications for overall economic wellbeing. Moreover, subsidising fossil fuels is directly opposed to the objective of decarbonisation by reducing reliance on these energy sources. Considering these challenges, it is unsurprising that policy efforts to phase out fossil fuel subsidies have been ongoing since the G20's commitments in 2019 and 2020, which were reaffirmed at the United Nations Climate Change Conferences in 2021 and 2022.

When considering whether and how to design a policy response to the elimination of fossil fuel subsidies, key questions include the following:

- » What incentives do countries and regions have to eliminate fossil fuel subsidies and implement energy pricing reforms that reflect both supply costs and local externalities related to fossil fuels?
- » How large are the foregone welfare gains due to the subsidised use of fossil fuels in today's economies, or, put differently, what are the true costs of subsidising fossil fuels?
- » To what extent would the removal of both explicit and implicit fossil fuel subsidies contribute to helping individual countries and the global community achieve the climate targets outlined in the Paris Agreement?

This policy brief summarises new evidence on these questions based on a recent ZEW study which examines the economic effects of eliminating explicit and implicit subsidies for fossil fuels.

Fossil fuels are deeply integrated into the production and consumption of goods and services – domestically and within global supply chains. Consequently, markets and economies are highly interconnected and responsive to climate and fiscal policy decisions with respect to the removal of fossil fuel subsidies. To account for these factors, we developed a state-of-the-art macroeconomic model for the global economy using granular data on explicit fossil fuel subsidies, external costs of fossil energy consumption and comprehensive national income and product accounts. Based on our model, we can quantify the market and non-market effects of fossil fuel subsidies.

The policy relevance of reforming fossil fuel subsidies

Key policy questions and focus of this policy brief

Data and method

FIGURE 1: GLOBAL EXPLICIT AND IMPLICIT FOSSIL FUEL SUBSIDIES BY ENERGY PRODUCT AND SUBSIDY COMPONENT

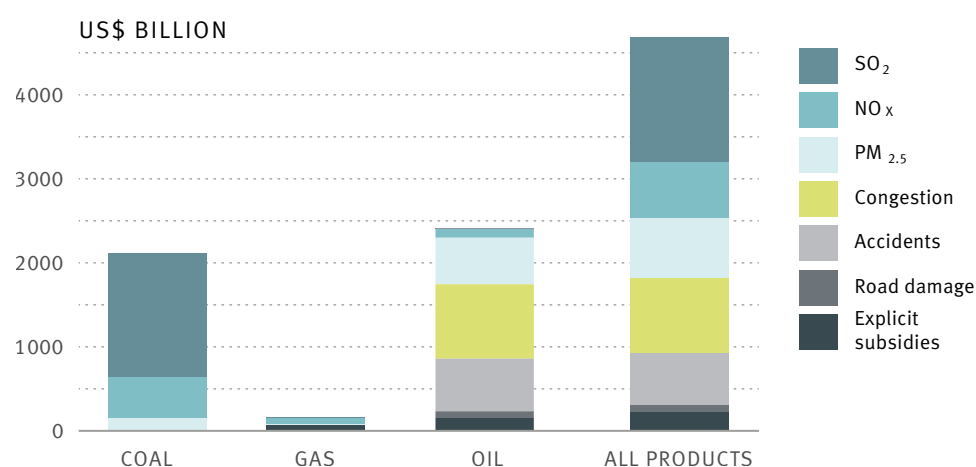
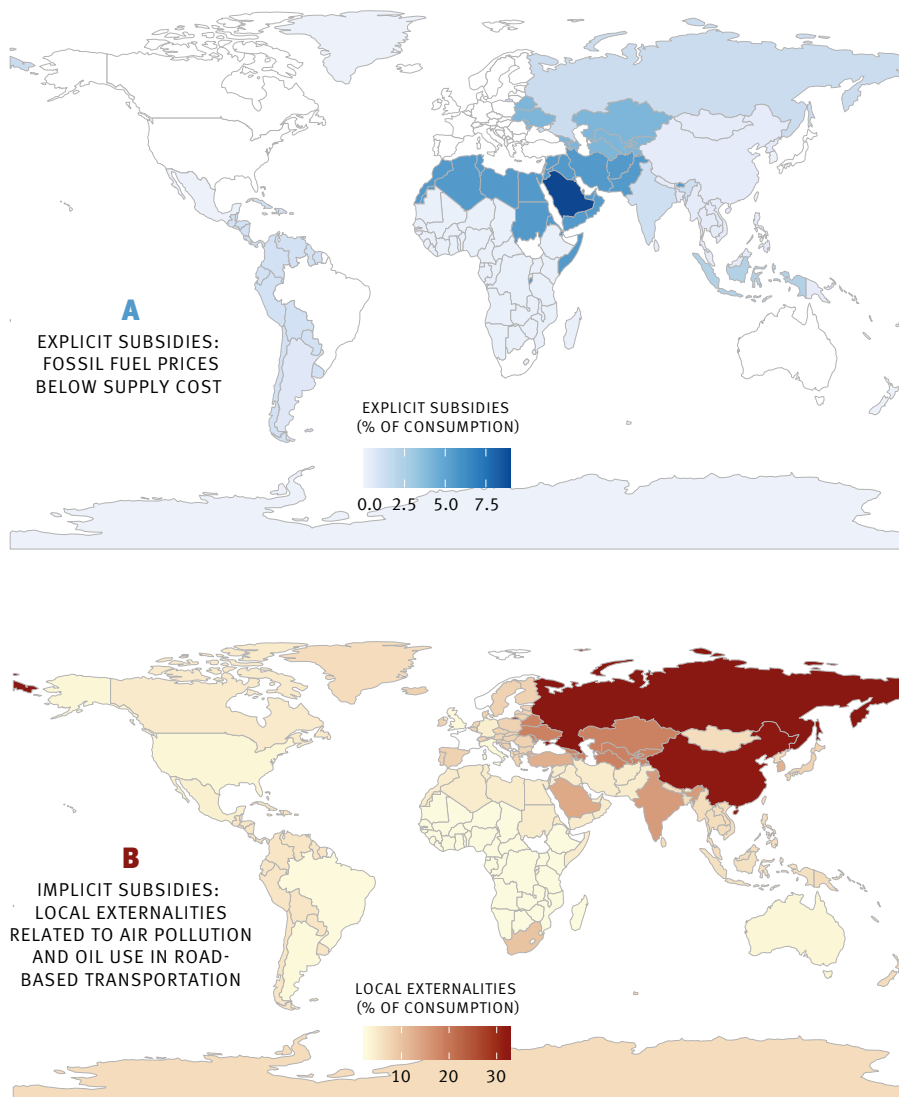


FIGURE 2: FOSSIL FUEL SUBSIDIES AND MAJOR LOCAL EXTERNALITIES RELATED TO FOSSIL ENERGY USE IN PER CENT OF CONSUMPTION FOR SELECTED COUNTRIES AND WORLD REGIONS



PHASING OUT FOSSIL FUEL SUBSIDIES WOULD UNLOCK ECONOMIC AND FISCAL POTENTIAL

We find that there are strong incentives for countries to unilaterally eliminate both explicit and implicit subsidies on fossil fuels. Our analysis focuses on three key aspects that influence these incentives: the impact on economic wellbeing or welfare (which includes market as well as non-market effects such as pollution costs), the fiscal revenues generated by eliminating subsidies (from saving expenses on explicit subsidies and collecting revenues by pricing local externalities), and the impact on the economic costs associated with achieving the country's climate targets (compatible with the Paris Agreement and a 2°C-warming target).

Strong incentives for unilateral fossil fuel subsidy removal

We find that the unilateral removal of explicit fossil fuel subsidies only results in modest welfare gains for most countries – averaging 0.2% globally. In contrast, the unilateral elimination of implicit fossil fuel subsidies (on top of removing explicit subsidies) generates significantly larger welfare gains, averaging 3.7% across countries worldwide. These gains are limited to non-market welfare, however; market welfare tends to be reduced because of the associated increase in energy prices.

Our study shows that the overall net effect is positive for nearly all countries, particularly those with energy-intensive consumption patterns or high external costs per unit of fossil fuel used. These countries include major economies such as China, India, Saudi Arabia and Russia and several European and Commonwealth countries, where welfare improvements range from 5% to 23%.

Furthermore, the pricing of externalities linked to local air pollution captures nearly 90% of these net welfare benefits, underscoring the effectiveness of targeting pollutant-specific reforms. Fiscal revenue implications are substantial: On average, countries could generate fiscal revenues equivalent to 4.9% of consumption through eliminating explicit and implicit fossil fuel subsidies, with regional estimates ranging from 1.8% to 16.2%. In contrast, if only explicit fossil fuel subsidies were removed, this would yield comparatively modest revenues, averaging just 0.4% of consumption annually. We estimate that, aggregated across all countries and regions, total fiscal revenues generated by removing explicit subsidies and taxing local externalities of fossil energy use would amount to 4.9% of global consumption. This is equivalent to \$2.5 trillion per year (in 2017 USD). Economies worldwide remain heavily reliant on fossil fuels. Using these energies entails substantial costs due to adverse local effects that are not internalised in market decisions. A hypothetical scenario where all countries abolish explicit and implicit subsidies, regulating the use of fossil fuels to reflect their full private and social costs, is useful for assessing the welfare gains that are lost when the use of fossil fuels is not regulated. In a sense, this measures the cost of our economic systems, which are geared toward the use of excessively “cheap” (from a social perspective) fossil fuels. We estimate these gains to be 2.4% of global consumption per year. In contrast, eliminating explicit subsidies for fossil fuels would yield a mere global gain of 0.1%.

PAYING THE PRICE: THE CLIMATE TOLL OF FOSSIL FUEL SUBSIDIES

The elimination of fossil fuel subsidies would substantially reduce the economic cost of meeting climate change mitigation targets compatible with 2°C warming as envisaged under the Paris Agreement. On average, country-level carbon prices required to meet the Paris targets would decline by 68%. Conversely, this means that subsidies for fossil fuels increase the price of achieving a country’s climate target.

About one third of countries would already meet their Paris climate targets by removing fossil fuel subsidies only, making additional policies like carbon pricing redundant. These countries include major emitters like China, India and Indonesia for which local air pollution externalities play a key role. By implementing comprehensive fossil fuel subsidy reform, other industrialised and energy-importing nations, including Germany, the United States, Japan and the United Kingdom, would already achieve over 30% of their Paris targets.

Eliminating implicit fossil fuel subsidies on top of carbon pricing to meet the Paris climate target increases welfare by 120% across countries. The reason is that while carbon pricing is a cost-effective way to achieve the climate target (global externality), it does not take into account the non-market welfare cost arising from the local externalities of fossil fuel use. In countries where subsidy removal alone ensures compliance with climate targets, further climate policy is there-

Economic gains from removal of explicit subsidies are small but significant

Unilateral subsidy reform yields gains for nearly all countries

Sizeable fiscal revenues of up to USD 2.5 trillion globally per year

The costs (or unrealised welfare gains) of unregulated fossil fuel use

Carbon prices required to meet 2°C compatible Paris climate targets reduced by 68% on average

One third of countries would meet Paris climate targets by removing subsidies

Lower economic cost of meeting Paris climate targets

fore unnecessary. For countries that do not meet their climate targets solely by removing subsidies, the policy combination enhances welfare compared to relying on carbon pricing alone. „Getting energy prices right“ on a global scale by eliminating explicit fossil fuel subsidies and pricing local externalities would reduce global CO₂ emissions by 32%, while increasing global welfare by 2.4%. While the removal of explicit fossil fuel subsidies alone would have a limited impact on global emissions, addressing the externalities associated with fossil fuel use – particularly those related to local air pollution – could lead to a 26% reduction in emissions. A reduction of this magnitude would significantly advance the global community toward achieving the 2°C trajectory set forth in the Paris Agreement.

POLICY IMPLICATIONS

Our findings (as well as those presented in a series of influential IMF studies¹ strongly suggest that phasing out both explicit and implicit fossil fuel subsidies should be a cornerstone of climate and fiscal policies in the coming decades. These reforms offer the following key benefits: (1) enhanced economic wellbeing by addressing local externalities associated with fossil energy use, (2) substantial fiscal revenues, which can be productively reinvested in areas such as fiscal sustainability, infrastructure, social programmes and sustainable development, and (3) first-order benefits for climate change mitigation.

Given the strong incentives for unilateral subsidy removal, phasing out fossil fuel subsidies may also help address the free-rider problem that undermines global climate change mitigation efforts. As is well known, climate change mitigation is a global public good: While the costs of reducing greenhouse gas emissions are borne locally, the benefits are distributed globally, meaning individual nations capture only a fraction of the global benefits from their actions. This dynamic creates free-rider incentives, which hinder cooperative multinational policies aimed at internalising the climate damages caused by fossil fuel use. However, by tackling the local externalities associated with fossil energy consumption, countries can act in their own self-interest while also contributing to significant co-benefits for climate change mitigation, as demonstrated by our study.

An important drawback, and a key challenge for implementing such a policy agenda, lies in the political economy surrounding fossil fuel subsidy reform. While the economic rationale for eliminating fossil fuel subsidies is compelling, it has yet to gain widespread support as a public policy. Subsidies are often maintained because they are seen as a reliable means for governments to provide benefits to politically influential groups. Furthermore, concerns about unintended distributional consequences and international competitiveness may act as obstacles to phasing out these subsidies. While these concerns are legitimate, they should not hinder the long-term goal of aligning fossil fuel prices with their true social costs, as doing so is essential for market-based economies to deliver outcomes that promote economic well-being.

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Global CO₂ emissions could be curbed by 32%

Reforming fossil fuel subsidies: a cornerstone of future climate and fiscal policies?

Opportunities for overcoming free-rider problems in climate change mitigation

Political economy issues and obstacles to phasing out fossil fuels

1 See [1] Coady et al. (2017): "How Large Are Global Fossil Fuel Subsidies?" *World Development*, 91: 11–27; [2] Parry et al. (2021): „Still Not Getting Energy Prices Right: A Global and Country Update of Fossil Fuel Subsidies." Working paper, IMF; and [3] Black et al. (2023): "IMF Fossil Fuel Subsidies Data: 2023 Update." Working paper, IMF.



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