AUTHORS

Nicolas Benoit was at the time of writing an external consultant to the OECD. He holds a Master’s degree in International Economics and Development from the University Paris Dauphine - PSL, and a Bachelor’s degree in International Relations from the University of Geneva.

Patrick Lenain is a Senior Associate with CEP. He is also an Adjunct Professor of Economics at Université de Paris-Est Créteil and teaches corporate social responsibility at EM-Normandie business school. Prior to joining CEP, Patrick worked for 23 years with the OECD, where he led policy-advice work. He has co-founded the OECD Global Forum on Productivity and he is as a member of Luxembourg’s National Productivity Council. Patrick also worked for the International Monetary Fund in several senior positions, as well as at the European Commission and the French Treasury.

ABSTRACT

The transition to electric mobility offers a significant opportunity for the future of transportation. In combination with, inter alia, public transport as well as autonomous and shared mobility, mass adoption of electric vehicles (EVs) is a tremendous opportunity to move toward an affordable, secure and clean transportation. Many governments have put in place a broad range of policy initiatives to encourage the switch to EVs. International collaborative efforts are also of paramount importance, as shown by the EU agreement to target that new cars and light commercial vehicles will be zero emissions by 2035. A multilateral consensus on electric mobility encompassing non-EU countries would be a major landmark.

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The transition to electric mobility offers a significant opportunity for the future of transportation. In combination with, inter alia, public transport as well as autonomous and shared mobility, the electrification of cars is a key pillar for a mobility future that is affordable, secure and clean.

**Switching from fossil fuel cars to electric vehicles**

Against this background, many governments have decided to gradually restrict the sales of fossil fuel cars. As an illustration, the European Union has agreed to target that the CO2 emissions of new passenger cars and light commercial vehicles will be reduced by 100% by 1 January 2035. An intermediary step towards zero emissions is that CO2 emissions of new cars will have to come down by 55% by 2030 from 2021. These restrictions apply in terms of EU fleet-wide targets. Canada has decided to require that 100% of car and passenger truck sales be zero emissions by 2035. The United Kingdom has announced that it plans to ban the sales of new gasoline and diesel cars from 2035. In the United States, President Biden has set a goal that at least 50% of all new passenger cars and light trucks sold in 2030 be zero emissions vehicles.

This overall worldwide momentum notwithstanding, progress is taking place at uneven speeds across countries. Following the example of the European Union, a multilateral pledge to electric mobility would therefore be a crucial landmark. The OECD has played a key role recently in promoting environmentally friendly policies, such as with its recent declaration on a resilient and healthy environment for all and on combatting plastic pollution. It could once again encourage all its member and accession countries to make the pledge of achieving electric mobility by 2035. Government leaders from the G20 nations may consider making a comparable commitment at their upcoming summit scheduled for mid-September 2024 in Brazil.

Cars currently account globally for over 25% of crude oil consumption and approximately 10% of global energy-related CO2 emissions. In addition to their impact on global warming, fossil fuel cars contribute to outdoor air pollution that is estimated to cause millions of premature deaths.

Despite these negative externalities, petrol and diesel cars continue to dominate the automotive landscape. Nearly 1.3 billion fossil fuel cars are on the road globally. The number of petrol and diesel vehicles in use continues to increase, primarily led by robust demand in Asia and Pacific (+7% during 2020-22) and Africa-Middle East (+6% over the same period). Sales of electric vehicles (EVs) are also rising rapidly, yet they accounted for only 14% of new cars sales in the world last year.

A key pathway to tackle these problems is to “electrify” the global car fleet as soon as possible. However, under current policies, fossil fuel cars will remain dominant in 2050 (Figure 1). Electric vehicles are slowly increasing their market share, but they represent only 2% of cars in use at present (Figure 1). This is far from enough.
International disparities in the adoption of EVs

OECD member countries have put in place a broad range of policy initiatives to encourage the switch to EVs. Examples include tax incentives, direct subsidies, public support to charging stations, fuel taxes, and zero-emission urban zones. The scope of these policies varies across countries, and so does the actual adoption of EVs (Figure 2). In Australia, Japan, Mexico and most U.S. states, the number of electric cars put on the road remains very low. Conversely, there is a notable enthusiasm among car buyers in nations such as in Norway, where electric vehicles command an impressive share of 88% of new car sales, as well as in Iceland (70%), Sweden (54%), Denmark (39%), Finland (38%), the Netherlands (35%), Germany (31%) and Switzerland (25%). California also stands out, with 39% of registrations in 2021.
EVs are initially mainly purchased by a small group of early enthusiasts, who typically possess higher incomes than the broader population. While these early adopters certainly serve a crucial role in showcasing the potential of electric vehicles, their numbers alone are insufficient.

This is typical of an "S-curve" trajectory followed by new technologies: a gradual start in a niche market driven by early adopters, followed by the broader public adopting the technology as it enters the mainstream, and then a deceleration in progress. This distinctive S-shaped pattern is observable in Iceland, Norway, and Sweden (Figure 3).
Research identifies tipping points that are crucial to graduate from a narrow group of early adopters and reach mass market adoption. These tipping points encompass lowering the total cost of ownership of electric vehicles below that of traditional fossil fuel cars, establishing an extensive network of public charging stations to instill confidence in potential buyers regarding driving range, and maintaining competitive electricity pricing compared to traditional automotive fuels.

**Ensuring cost-effectiveness of fiscal incentives is critical**

Against this background, governments worldwide are deploying a mix of tax benefits, direct subsidies and regulatory measures to stimulate market uptake for EVs. Examples include reduced rates or full exemption from purchase, registration and road taxes and VAT, as well as tax credits for the purchase of an EV. For company cars, tax relief measures include lower or exempt personal income taxation, depending on CO2 intensity, on EVs provided by employers to staff for personal use, as a form of additional remuneration.

As an illustration, in Europe, exemptions from, or lower rates on the car purchase tax are granted in Norway, VAT is lowered in Norway and Iceland, import duties are reduced in Norway, road tax is exempt in Sweden, and the registration tax in Denmark. EV tax incentives have reduced the total cost of ownership of electric vehicles in Norway and the Netherlands below that of similar fossil fuel cars sold in the country. This is considered to have contributed to the spectacular breakthrough of EVs in Norway, together with other cuts in taxes and user fees such as no road tolls, no charges on ferries, free parking, and access to bus lanes.

Some subnational governments also offer incentives, such as California. Using comparisons between U.S. states, researchers have concluded that electric vehicle subsidies increase demand for electric vehicles, though significant government subsidies are needed to pass the stage of early adoption and move towards the high-adoption equilibrium.

That subsidies are effective in increasing demand does not necessarily mean that they are cost-effective. EV fiscal incentives have traditionally been considered among the most expensive policies to reduce greenhouse gas emissions (US$350–640 per tCO2). Recent research suggests similarly high cost ($311 to $423 per tCO2). The IEA estimates that governments spent about US$40 billion worldwide to support the sales of electric cars in 2022. With scarce budget resources in most countries, it is unlikely that such a large fiscal effort will be sustainable as the fleet of EVs increases exponentially.

This makes it essential to design EV tax incentives and direct subsidies as cost-effectively as possible. In many countries, EV incentives have been made available to all car drivers without an income cap. This has been criticized as a wasteful policy because it benefits high-income car buyers. As noted, in a typical S-curve adoption pattern, early adopters have typically higher income and can afford EVs without tax incentives. As the market for EVs moves toward mass-market adoption, governments should provide fiscal support with income caps, thus targeting middle-
income and low-income households who otherwise would not be able to purchase them.

As an illustration, in the United States, the clean vehicle tax credits provided through the Inflation Reduction Act are subject to such income caps. However, the tax credit is not refundable and therefore only fully benefits households with tax liabilities that exceed the credit. The government has proposed to ease this constraint by allowing, from 2024, to transfer the tax credit to the car dealer at the point of sale, thus enabling households with lower or no tax liabilities to benefit fully from the incentive. On the other hand, a provision in tax rules allows high-income car buyers to benefit from the tax credit when they opt for leasing rather than purchasing an electric vehicle. Finance companies linked to car dealers buy an EV, get the commercial EV federal tax credit of US$7,500, and can pass some of the credit to the lessee in terms of a lower lease payment, even if the customer’s income is above the cap.

**Widespread and cost-effective charging stations are essential**

One of the main barriers to EV adoption is the lack of charging infrastructure. Both public and private charging stations are important to the mass adoption of EVs by consumers and businesses. The adoption of EVs and the deployment of charging infrastructure need to go hand in hand: drivers will purchase EVs only if charging stations are available, and private investors will deploy charging stations only if EVs are adopted in large numbers. Hence, the adoption of EVs and the deployment of charging stations need to be synchronized. Countries that have invested heavily in public charging infrastructure are also characterized by a higher share of EVs in new car sales. This is supported by Figure 4, which shows a positive relationship between the number of public chargers per 1000 inhabitants and the share of EVs in new car sales at the country level.

Continuous deployment of charging stations is essential. Norway had around 1.3 battery-electric light-duty vehicles (LDVs) per public charging point in 2011, which was more than enough to support the adoption of EVs. However, by the end of 2022, there were 25 EVs per public charging point, showing that the number of charging points has not kept up with the growth of the EV market. EV sales growth will only continue if charging demand is met by accessible and affordable infrastructure, whether private charging at homes or workplaces or publicly accessible charging stations.

Governments can play a key role in ensuring that charging stations are sufficiently available. The U.S. Infrastructure Investment and Jobs Act includes US$7.5 billion to help build a national network of 500,000 electric vehicle chargers along the country’s highways to support the goal of EVs reaching at least 50% of new car sales by 2030.
Affordable electricity tariffs relative to car fuels

Ensuring that electricity tariffs are at affordable levels compared to gasoline prices is another important driver affecting the competitiveness and thus the adoption of EVs. Figure 5 shows the strong negative correlation between the electricity-to-gasoline price ratio and EV adoption. As is to be expected, the lower electricity tariffs are relative to car fuels, the higher the share of EVs in total sales across countries.

High gasoline and diesel prices send a strong signal in the direction of electric vehicles. Research finds that consumers are four to six times more price-sensitive to gasoline prices than electricity prices. Apparently, consumers are less aware about electricity tariffs than gasoline prices. A possible explanation is the fact that the share of electricity in total consumption expenditure is smaller than that of gasoline, and this diminishes the incentive for consumers to inform themselves about how to optimize this cost item. This makes it important to have gasoline and diesel prices at relatively higher levels than electricity tariffs, thus prompting interest for the low cost of vehicles running on electricity.

The present energy crisis -- with sharply higher gasoline prices -- is likely to raise awareness about the advantages of EV adoption. As gasoline prices continue to rise, people are becoming more interested in ways to save money on their transportation costs. EVs offer an increasingly affordable way to do this, thanks to their lower operation cost and to government subsidies upon purchase.

Governments play an important role in accounting for negative externalities of fossil fuels and thus in their price. In Scandinavian countries, where EVs are widely adopted, effective tax rate on energy road use is exceeding EUR 200 per tCO2.
(excluding VAT). By contrast, some countries impose low tax rates on car fuels, or even provide direct subsidies and tax exemptions for the use of car fuels. Raising the taxation of car fuels to reflect, at least, the social cost of carbon -- recently estimated at \text{US$190}/t\text{CO}_2 -- would be an important step to encourage fast EV adoption.

According to the OECD, about 50 countries levy taxes on gasoline and diesel that remain below the social cost of carbon, including high-income countries such as Australia, Luxembourg, Japan, and the United States. Raising these tax rates would not only ensure that the full cost of fossil fuels is accounted for, but also generate tax revenue that governments can use to support the purchase of electric vehicles and to deploy charging stations across national roads and rural areas.

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figure5.pdf}
\caption{Adoption of EVs is linked to the high prices of car fuels relative to electricity tariffs}
\end{figure}

Source: Authors’ calculations based on IEA and OECD

\textbf{A successful transition to EVs calls for clear, consistent and sustainable long run policies}

Mass adoption of EVs is a tremendous opportunity to move toward an affordable, secure and clean transportation.

Governments that have already committed to phasing out fossil fuel vehicles and promoting the widespread adoption of EVs should remain steadfast in their dedication to these goals and consistently carry out their plans. For those governments that have not yet made such commitments, it is imperative that they develop comprehensive plans and diligently put them into action. When it comes to major transitions, such as the switch to electric mobility, consumers are more likely to embrace change if they know that their government is committed to supporting the transition over the long term. Clear and consistent long-run policies can provide
certainty for consumers and businesses and make them more willing to invest in new technologies.

For example, the Norwegian government has been committed to supporting EV adoption for many years. This commitment is evident in the country's generous EV subsidies, its investment in public charging infrastructure, and its regulations that favor EVs. As a result of these policies, Norway has one of the highest EV adoption rates in the world.

Therefore, to accelerate EV adoption, governments should develop and implement clear and consistent long-run policies that support the transition to electric transportation. This should include:

- **Sustainable and cost-effective fiscal support to EVs.** Providing direct subsidies and tax expenditures that are fiscally sustainable increases the confidence of consumers that EV support will be available for the long term and makes them more likely to make the switch. Such support needs to be designed to reduce the cost of the avoided ton of CO2 below the current high levels, with targeting based on income caps. Implementing caps on the prices of electric vehicles eligible to fiscal incentives further enhances cost-effectiveness.

- **Comprehensive EV strategies** that outline the government's plans for supporting EV adoption can help coordinate efforts across different ministries and departments. This can ensure that EV support is cost-effective. Comprehensive EV strategies should include whole-government initiatives such as targets for full EV adoption, plans for developing public charging infrastructure, and appropriate taxation of car fuels. Ramping up the production of renewable electricity is equally important.

- **Multilateral consensus.** As illustrated above, the pace of EV adoption is enormously diverse across nations. This uneven policy stance is creating difficulties due to "waterbed effects". As an illustration, strict car emission standards in one country can encourage carmakers to redirect their fossil-fuel cars to other countries. As well, second-hand gasoline cars can be exported and sold in other countries, where they will continue to pollute. Programmes such as “cash for clunkers” appear effective to avoid it. In addition, collaborative efforts across countries are also of paramount importance, as shown by the EU agreement to target that new cars and light commercial vehicles will be zero emissions by 2035 in all member states. A multilateral consensus on electric mobility encompassing non-EU countries would also be a major landmark. This could follow the framework of an "OECD Declaration", such as the recent pledge made by the organisation's 42 member and accession countries and the European Union to achieve net-zero greenhouse gas emissions by 2050, and to eliminate plastic pollution in the environment. An agreement among OECD member and accession
countries to target that new cars and vans will be zero emissions by 2035 would be a critical step. Furthermore, non-OECD countries could be invited to join this pledge during the summit of G20 Leaders in Brazil scheduled to take place in mid-November 2024, similar to the pledges to restore degraded ecosystems and to end plastic pollution made by G20 Leaders in New Delhi in September 2023.

By implementing policies encouraging electric mobility, OECD and G20 government leaders could show their resolve to end the deleterious impact of fossil fuel passenger cars and progress toward affordable, secure and clean transportation. Much will remain to be done to reform freight, maritime and air transportation – but this would be a good start.