The Transport Challenge: A Nordic Perspective

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Abstract

Despite a high carbon tax introduced over 30 years ago, Finland's transport emissions have not decreased. Analysing data on households' vehicle ownership and driving indicates that fears of regressive fuel taxation may be overplayed.

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Finland is a Nordic country endowed with a cold climate, ample forest resources and a small population sparsely spread around the country. The country consistently ranks high in standard of living evaluations, and places 14th in terms of GDP per capita in the OECD in 2019.[1]The share of renewable energy production has traditionally been relatively large, partly due to the forestry sector which has provided biomass and by-products for energy production. Finland also relies on nuclear power, with four power plants in operation and a fifth one in introduction. In 2019, renewables and nuclear accounted for 56 percent of total energy use, with the share being as high as 70 percent in total electricity consumption. The share of renewable energy will further increase in the near future, with wind capacity expected to double by 2023 and large municipalities planning to replace coal in heat production with heat pump and heat recovery technologies (FWPA 2021). In residential buildings, the share of oil heating has declined from 12 percent to 6 percent, while the share of energy from heat pumps has increased from 4 to 12 percent during 2008–2019.

Transport, however, has not seen visible changes to energy sources or energy use. Given Finland's northern location and low population density, transport forms a large share of final energy use: 17 percent in 2019. Road transport is the largest component of domestic transport, and passenger cars account for around 10 percent of total greenhouse gas emissions. Energy use in transport has increased 8 percent during the past 20 years, and energy sources have not changed. Fossil-based petrol and diesel currently account for almost 90 percent of energy use in road transport, while the shares of electricity and gas are practically zero.[2]

This is all despite Finland being the first country in the world to introduce a carbon tax in 1990. The tax was introduced as a component in fuel taxation, and its value is based on the lifecycle CO2 emissions of each fuel type. Currently, the carbon tax level for petrol is 21.49 euro cents per litre, which amounts to 91 €/tCO2. Overall, fuel taxation has consistently been high, with taxes averaging over 60 percent of the total price of petrol and over 50 percent for diesel during the past 20 years.

What is driving transport emissions?

Our analysis of the Finnish passenger car fleet during 2013–2019 shows that firstly, the number of cars has increased from 2.58 million to 2.72 million. The average number of kilometres driven per car has remained constant at around 15 000 km per year. This implies that driving has increased in aggregate. At the same time, the emission intensity of the vehicle fleet has hardly changed. Using car-specific data on kilometres and emission intensities, we estimated that the aggregate CO2 emissions of the passenger vehicle fleet decreased only by about 2 percent, from just above 7.9 million tonnes in 2013 to just below 7.8 million tonnes in 2019.[3] (Palanne and Sahari, 2021).

One explanation for this increase in demand for driving could be Finland's low population density. There are few cities where public transport has dense operating networks and timetables, providing alternatives to car use. Also, active transport modes, such as cycling and walking, are easier to execute in densely populated areas which have sidewalks and bicycle lanes. However, our regional examination of car emissions reveals that less than 40 percent of total emissions come from sparsely populated or rural areas (Palanne and Sahari 2021). This would imply that not all options for reducing private vehicle use are currently exploited in cities and their surrounding areas.

How to decrease emissions from cars

The current development of transport emissions is in stark contrast with Finland's ambitious goal of being carbon neutral by 2035. This is stricter than the EU target of carbon neutrality by 2055. The current government also wants to halve the emissions from transport by 2030. This is going to be a big challenge, and because emissions are more difficult to cut in heavy duty vehicles, most of the burden will fall on cars.

Reducing emissions from passenger cars would require large and relatively immediate reductions in the number of kilometres driven, given the current composition of the motive powers in the car fleet. However, it seems unlikely that this could be achieved, especially in light of the recent flat trend in the aggregate kilometres driven.

What remains is to cut the emission intensity of cars by replacing existing vehicles with very low-emission alternatives, namely, electric vehicles. Electrification of the passenger vehicle fleet is currently supported by subsidizing investments into the charging network, both commercial and domestic, lower registration tax rates for zero-emission vehicles and preferential treatment for electric cars in company car taxation. There is also a direct purchase subsidy for electric vehicles. The supply of new cars is influenced by EU emission standards. Recent proposals to increase the standards would practically rule out the supply of new combustion engine vehicles by 2030.

The current measures will probably lead to an increasing market share of electric vehicles in new car purchases. However, new cars form a very small share of the passenger vehicle stock. On average, only three percent of the adult population buys a new car each

year, whereas the purchase probability for a used car is over 10 percent. To replace combustion engine vehicles with cleaner cars, the scrappage rate of old cars should increase as should the supply of used electric vehicles.

The challenges of higher fuel taxation

Higher fuel prices are an efficient tool to reduce the kilometres driven by combustion engine vehicles, to speed up the scrappage of these vehicles and to encourage the purchase of more fuel efficient or zero emission vehicles. It is unlikely that the emission reduction targets set for the transport sector can be achieved without increases in petrol and diesel prices.

Combining Finland's early introduction of a carbon tax with the observed increase in road transport energy use would seem to imply that fuel demand is very inelastic to prices and would undermine the effectiveness of taxes in reducing fuel demand. However, looking at the consumer price for petrol over the past 15 years shows that the price has not actually increased. In fact, the price in constant terms is lower now than in 2005. This suggests that increases in fuel taxes could have been more prominent in the recent past and that there is room to further increase the level of taxation.

Higher fuel taxes are often opposed due to the view that they would mostly hurt low-income households, who are assumed to spend a larger share of their income on fuel expenses. However, empirical evidence suggests that this may apply mostly in the US, and that in Europe fuel expenses are more evenly distributed across income levels (Sterner, 2012). Furthermore, revenue recycling could be used to counteract or even reverse the potential progressivity of fuel taxation (see for example Bento et al. 2009 and West and Williams, 2004).

In Finland, the income share of fuel expenses follows an inverse U-shaped pattern across income deciles. The share peaks in the seventh decile at around 4 percent. In the first decile, however, the share is a bit higher than in the second decile, but it should be noted that averages in both the first and last decile are not representative of typical households due to outliers arising from very low and exceptionally high income values. It is also of interest to note that owning a car is not common in the lowest income groups. In the two lowest income deciles, the median value of fuel expenses is zero, as over half of the households in these groups do not own a car. (Palanne and Sahari, 2021).

Higher-income households thus drive more, which is documented both in Palanne and Sahari (2021) using administrative data and in Tiikkaja and Liimatainen (2020), who analyse the National Travel Survey from 2016. Tiikkaja and Liimatainen also show that the share of trips that could have been made by an alternative mode of transport is highest in high-income households.

These facts imply that fuel taxes in Finland may not be as regressive as the public and politicians fear. In the highest income groups, there is potential to avoid higher taxes by switching to other transport modes or replacing the combustion engine car with an electric vehicle. Potential adverse impacts on the lowest-income households could be alleviated by recycling tax revenues. This could also increase the political acceptability of higher fuel taxes.

In conclusion

Finland's goal of reaching carbon neutrality by 2035 will probably not be reached unless transport emissions are reduced significantly. This will require both an increase in the share of electric vehicles in the vehicle fleet and reductions in kilometres driven by the combustion engines that remain on the roads. Politicians have been very reluctant to advocate notable increases to fuel taxes, however it seems unlikely that emission reductions will be realized in the required timeframe if this tool is not used.

Statistics show that first, fuel prices are currently lower in real terms than 15 years ago. This suggests there is room for price increases. Second, high income households are currently driving the most and using a car for trips that could be made with an alternative mode of transport. Higher fuel prices would incite this modal shift and increase the cost effectiveness of electric vehicles. Third, a large share of the lowest-income households does not own a car and is therefore not affected by fuel taxation directly. Remaining concerns of adverse distributional effects of higher fuel taxation could be alleviated by revenue recycling.

Footnotes

[1] https://data.oecd.org/gdp/gross-domestic-product-gdp.htm

[2] The remaining 10 percent is covered by biofuels which are blended into petrol and diesel as required by the blending mandate.

[3] These values are based on reported emission intensities which have been corrected to reflect true emissions as reported by the ICCT (Tietge et al. 2019).

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