CAN DEREGULATION OF CNG REVERSE THE OUTCOME OF REGULATION? EVIDENCE FROM THAILAND'S TRANSPORT SECTOR

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Overview

Fossil fuel subsidies are being criticized for causing excessive fuel consumption which contributes to more air pollution and greenhouse gases, as well as being inequitable as it benefits higher income groups. Not all fossil fuel subsidy polices are the same, some may have a net benefit. Unlike other types of fossil fuels, adoption of compressed natural gas (CNG) in road vehicles could be beneficial. CNG fueled vehicles emit greenhouse gases with less global warming potential and less air pollutants (including particulate matter, SO2 and NOx) than gasoline and diesel vehicles (Dholakia et al. 2013). Adoption of CNG could reduce air pollutants which could improve the human health (Foster and Kumar 2011).

Traditional fuel options for Thai vehicle owners include gasoline and diesel fuel. To decrease dependence on global fuel prices, the Thai government introduced CNG as an alternative fuel choice for cars in 2004. The price of CNG have been regulated in two separate parts. First, the government subsidized PTT Plc., the sole distributor of CNG in Thailand, to sell CNG to fueling stations at a lower price. Second, the Thai government has been fixing the retail price of CNG under the market price and repays fueling station owners for their losses.

The Thai government has stopped subsidizing PTT in 2012. The Thai government first agreed to lift the CNG price ceiling in April 2012, but similar to the experiences of fellow Southeast Asian countries, social and political pressure make implementation not as easy. Although CNG subsides today are less than it was before, and CNG retail prices are closer to the market price. Plans to completely deregulate the market have kept postponing.

This research tries to analyze the air pollution benefits of CNG adoption and if its subsidy removal is justified. To answer this question, we also have to understand the mechanisms underlying the set up of CNG retail stations and the adoption of CNG fuel in private road vehicles. To our knowledge, the only paper that have looked at the mechanisms of fuel adoption and its impact on air pollution is Auffhammer and Kellogg (2011).

Research on CNG adoption and air pollution is not new. However, existing research have used poor data as CNG are usually adopted in developing countries with few air pollution monitors and little available information. This research uses atmospheric science modeling to control for meteorological biases, extensive individual fueling station data to control for sources of transport fuel, and data on CO, NO2, O3, SO2, and PM10 concentrations. We find that that increased CNG availability in Thailand improves air quality.

However, the effect of CNG price on air quality is unclear. If prices do not affect consumer decisions to use CNG, then it is beneficial that CNG subsidies are removed. More work is being done to confirm this statement by analyzing the effect of car price and fuel price on fuel adoption.

This research is relevant not just in Thailand. CNG adoption in taxis and buses have been encouraged in cities like New Delhi, Dhaka and Mexico City. CNG subsidy removal, as part of the movement towards fossil fuel subsidy removal, has been a major agenda in global environmental policy discussion. This research shows subsides of CNG can be removed if there are substantial infrastructure that makes CNG available. However, fossil fuel subsidy removal policies should be carefully analysed before implemented on a case by case basis.

Methods

Our preliminary estimation uses reduced form fixed effect estimator to evaluate the effect of gas stations and fuel price on air quality. Our unit of observation is at the air pollution monitor-month level.

To ensure sources of air pollution at each air pollution monitor, a Hybrid Single Particle Lagrangian Integrated Trajectory Model (HYSPLIT; see (Draxler and Hess 1997; Draxler and Hess 1998; Draxler 1999) which could

identify sources of air pollution from each location to each air pollution monitor every day of the year. We use results from the HYSPLIT simulations to weigh the impact of each fueling station and province level fuel prices on each air pollution monitor.

Because the Thai government explicitly states that CNG have been introduced to improve air quality, CNG fuelling stations may be set up in high polluted areas. This selection bias issue could cause a positive bias in the CNG fuelling station coefficient, and undermine its effect on lowering air pollution concentration. To control for this, we use an instrument. We exploit the fact that PTT states that it will distribute CNG to fuelling stations that are close to CNG pipelines, next to major roads and highways, with no other CNG fuelling stations nearby. Hence, we use the interaction term between distance from a major road or highway to a CNG fuelling station and distance from a pipeline to a CNG fuelling station as the instrument for CNG fuelling station.

In our secondary estimation, we use multinomial model of discrete choice to estimate the impact of fuelling stations and fuel prices on sales of new cars of each fuel type. We find that fuel price and distance to fuelling stations are both important determinant of car sales. We calculated the price elasticity of cars of each fuel type and CNG price. We find a positive elasticity of substitution between CNG price and diesel cars, indicating that an increased in CNG price may have boost the sales of diesel cars.

Results

We find that CNG price alone do not have an impact on air pollution. However, CNG fueling stations does have a significant negative impact on air pollution concentration, especially on SO2.

Conclusions

This research shows subsides of CNG can be removed if there are substantial infrastructure that makes CNG available. Although CNG price alone do not impact air quality, CNG price and the government's subsidy, could still impact the opening and closing of CNG fuelling stations.

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