Overview

The extensive use of gasoline for transportation in the US aggravates air pollution and oil dependency. Decreasing the use of petroleum, especially in the transportation sector can significantly mitigate these two issues. Promoting the adoption of plug-in electric vehicles (EVs) serves as one of the recent popular methods to achieve such a goal. In achieving this goal, the US government has launched multiple incentive programs to support potential consumers of electric cars. However, some of these incentives’ effectiveness have yet to be analyzed empirically using state level data, particularly the incentive to promote development of EV charging infrastructure.

In the US, the federal government has initiated a direct financial/purchasing incentive program in 2010, which is still in place now. The federal purchasing program is available in all states. However, state incentive programs for charging stations are only available in a number of states with different starting times. The purpose of this paper is to examine the effectiveness of an incentive scheme that includes both the federal purchasing incentive and a state-run charging station incentive (double incentive scheme), in comparison to a scheme that includes only the federal purchasing incentive (single-incentive scheme). The synthetic control method was used to assess the effect of the charging incentive program on the number of charging stations over time, using Missouri as the treatment state. Then, we estimated the impact of the number of stations on the sales quantity of electric cars. Based on this information, we also estimated the cost of the program for each additional electric vehicle sold.

Our work assesses the effectiveness of current and ongoing incentive programs for building plug-in EV charging stations, using US state level data. In the US, the federal government has initiated a direct financial/purchasing incentive program in 2010, which is still in place now. The federal purchasing program is available in all states. However, state incentive programs for charging stations are only available in a number of states with different starting times. The purpose of this paper is to examine the effectiveness of an incentive scheme that includes both the federal purchasing incentive and a state-run charging station incentive (double-incentive scheme), in comparison to a scheme that includes only the federal purchasing incentive (single-incentive scheme). In other words, we will be isolating the effects of state level incentives for building more EV charging stations. Lack of charging stations is an impediment to greater EV market penetration.

Methods

In order to estimate the effect of the charger incentive program on electric vehicle adoption, we first quantified the direct effect of an incentive program for installing vehicle charging stations on the number of charging stations installed. This was done using the synthetic control method, using Missouri as the treatment state, as the charging station incentive program started in Missouri in January 2015 and ended after December 2016. This method enables us to use data from other states to empirically estimate what would have happened in Missouri in the absence of the charging station incentive program. Essentially, the method will create a synthetic cohort of the treatment state, which is Missouri. It will give us the quantity of charging stations in Missouri when there is no incentive program. This synthetic cohort will be constructed using “donors”, which is the weighted values of the control states. Those control states will include 14 states that do not have either charging station incentive or state purchasing incentive programs during the assessment period, which extends from January 2011 to December 2016. This is because by 2011, every state has had the federal purchasing incentive program available. Additionally, data is obtainable until 2016. The synthetic control approach results suggests that the percentage increase in charging stations will rise over time thanks to the incentive program. Compared to the number of stations in the counterfactual scenario where there was no incentive program, the real number of charging stations in Missouri is 151% higher in 2015 and 254% in 2016.
We then estimated the effect that the number of charging stations has on electric vehicle adoption via sales quantity. We used panel data which includes monthly data at the state level from January 2010 to December 2016 to perform a regression of the number of electric vehicles on the number of charging stations. However, we recognize that a positive externality exists between those two variables, which creates reverse causality. Therefore, we explore the bi-directional causality between number of charging stations and number of electric vehicles. Since endogeneity exists, we employed instrument variables for both equations. The instrument variable for the number of charging stations is the status of a charger incentive program in a state, whereas the instrument variable

**Results**

The synthetic control method showed that compared to the number of stations in the counterfactual scenario where there was no incentive program, the real number of stations in Missouri is 151% higher in 2015 and 254% in 2016.

These figures suggest that the charger incentive program of Missouri can increase the monthly sales of electric cars by 58.5% at the end of 2016 and 98.5% at the end of 2017.

Using these figures and national data on costs of public charging stations, we estimated the cost of the incentive program for each additional EV sold as around $1,250, far lower than the direct purchase incentive cost

**Conclusions**

The cost for an increase of one EV being sold is approximately $1250. This is the incremental sales beyond what is achieved by the federal tax credit of maximum $7,500. Adding charging stations is an important component of a set of policies designed to achieve greater EV market penetration.

**References**


