Evaluating Tax Rebates for Hybrid Vehicles

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Abstract: Concerns about global warming have triggered a slew of tax incentives aimed at increasing the sales of fuel efficient cars. In this paper we evaluate the effectiveness of provincial tax incentives aimed at hybrid electric vehicles purchased in Canada.

When governments offer a tax incentive on the purchase of a fuel efficient vehicle two questions arise regarding its effectiveness. Firstly, what is the effect of the incentive on the sales of the targeted fuel efficient vehicle? Secondly, which vehicles do consumers forgo in response to the tax incentive? In this paper we exploit provincial variation in tax incentives offered in Canada to answer these questions.


Our paper is similar to those above as one of our aims is also to evaluate the effectiveness of government incentives on the purchase of hybrid vehicles. However the main difference is that we include data on the sales of cars other than hybrids. This allows us to estimate not just the increase in hybrid vehicle sales from the tax incentives but it also allows us to estimate the effect of these incentives on the sales of other cars. In other words we can also answer the question, which cars did consumers switch away from as they were induced to buy more hybrid vehicles.

Before the federal tax rebate to hybrid vehicles was announced in 2007, five Canadian provinces, Ontario, British Columbia, Prince Edward Island, Quebec, and Manitoba instituted tax rebates of varying amounts for hybrid vehicles. In the province of Ontario, all hybrid electric vehicles purchased or leased after May 10th 2001 were allowed a rebate of up to $1000 of the Retail Sales Tax (RST). For vehicles purchased after 23rd of March, 2006, this limit was doubled to $2000. In 2003 the province of British Columbia instituted a 30% refund of the Provincial Sales Tax (PST) (also up to $1,000) for all hybrid cars purchased or leased. In 2005 this was extended to a point of sale exemption of up to a maximum of $2,000 of the entire PST paid. A smaller province of Prince Edward Island allowed all hybrid vehicles purchased after March 30, 2004 a rebate of up to $3,000 of the paid PST. In the province of Quebec, all Hybrid vehicles purchased or leased after March 23, 2006, and before February 21, 2007 qualify for a maximum rebate of $1,000 and after February 20, 2007 but before January 1, 2009, the maximum is $2,000. In Manitoba, residents who purchase or lease an eligible hybrid vehicle after November 15th 2006 receive a cheque of $2000 in the mail. The remaining five provinces do not offer tax incentives for the purchase or lease of hybrids. As the provinces instituted different rebates at different times we exploit the provincial variation in tax incentives offered to evaluate the effectiveness of these tax incentives.

For our analysis we have vehicle sales data, by make and model, for each province, and for each year from 1996 to 2006 (provided by DesRosiers Automotive
Each vehicle is classified into a vehicle class. These are: Hybrid, Sub-Compact, Compact, Intermediate, Luxury, Sports Car, Compact Sports Utility Vehicles (SUV’s), Intermediate SUV’s, Large and Luxury SUV’s, Pickup Trucks, Small and Large Vans.\(^1\)

We run a very simple regression equation,

\[
\ln s_{njt} = \kappa + \alpha_i \text{class}_i + \beta_j \text{rebate}_j + \gamma_i \text{class}_i \text{prov}_j + \delta_i \text{class}_i \text{year}_t + \phi_i \text{year}_t + \epsilon_{ijt},
\]

where \(s_{njt}\) is the market share of a vehicle by model \((n)\), province \((j)\), and time \((t)\). The variable \(\text{class}_i\) is a dummy variable for vehicle class. The variable \(\text{rebate}_j\) is the rebate in province \(j\) as a proportion of the sales price of the sales weighted average hybrid vehicle for province \(j\) sold at time \(t\). The interaction term \(\text{class}_i \times \text{rebate}_j\) captures the effect of the rebate on the market share for each class. The interaction of class and provincial dummies \((\text{class}_i \times \text{prov}_j\)) control for correlates varying across provinces such as tastes, population size, fuel prices, geography and other indicators that make people prefer a certain class over others across provinces. The interaction of class and year dummies \((\text{class}_i \times \text{year}_t\)) control for variations across classes across years in properties that determine a market share (for example: size, fuel economy, price etc). Most cars have models that vary across each year and this interaction attempts to account for changes across years in a different class. Finally year dummies \((\text{year}_t\)) control for macroeconomic variables, and other time related correlates. We are interested in the sign of \(\alpha_i\) as this gives us the effect of the rebate on the sales of each class where \(s_{ijt}\).

Our results indicate that a one percent (as a proportion of the sales price) increase in the tax rebate increases the share of hybrid vehicles in the market by 4.5 percent. In 2005 the share of hybrid vehicles in total light vehicle sales in Canada was 0.35%. We also find that while buying more hybrids consumers largely shifted away from similarly priced vehicles. In other words the hybrid tax rebates mostly reduce consumer demand in relatively fuel efficient vehicle classes (compact, intermediate, and compact SUV’s). We find that heavier, and less fuel efficient vehicles do not see a statistically significant reduction in sales from the introduction of these policies. These results seem to indicate that hybrid tax incentives may not be the most effective way to encourage people to switch away from fuel inefficient vehicles. In order to effectively shift people away from fuel inefficient vehicles, the government might need to introduce aggressive fuel taxes or gas guzzler taxes to further skew the relative price between fuel efficient and fuel inefficient cars.

\(^1\) Most classes besides the Hybrid class are based on the US Environmental Protection Agency’s vehicle classification. We classify all hybrid vehicles into a single hybrid class.