

Does Green Performance Affect Market Share in the Automotive Industry? An Empirical Study

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Does “Green” Performance Affect Market Share in the Automotive Industry? *An Empirical Study*

Vehicle emission has been an important issue, especially for the last 25 years. Governments around the world have released legislation to regulate vehicle emission such as the Clean Air Act in the United States and European Emission Standards for the European Union. While carmakers must manage vehicle emissions to meet regulatory requirements, there may also be a market opportunity for manufacturers that do better than regulation requires. Individual consumers care about vehicle emission because it is directly linked with fuel efficiency, the product life span, and personal health. What is less clear is the extent to which emission performance affects a consumer’s purchase decision and whether this creates a market opportunity for manufacturers. Our goal in this paper is to better understand how “Green” performance affects the market share for auto manufacturers.

In this study, we quantify “Green” performance by the four regulated emissions: HC (Hydro Carbon), CO (Carbon Monoxide), NO_x (Nitrogen Oxides) and PM (Particulate Matter). They are closely watched by regulators, carmakers and consumers because their presence indicates poor fuel efficiency, causes air pollution, and threatens human health.

Over the last two decades, carmakers have focused on two elements for their cars: making them more powerful and making them greener. The goal of both efforts is to attract consumers. However, the two pursuits affect emissions in opposite directions. A greener car has lower emission while a more powerful car contributes more to emission.

The automakers actions suggest that customers value both high power and good emission performance.

Based on the fact that customers value both power and “Green” for a car, “Green” has two opposite effects on “Market Share”. On one hand, “Green” has a positive effect on market share through better fuel efficiency and lower emissions. Greener vehicles with high fuel efficiency attract consumers who are conscious about oil price. Besides that, vehicles with low emission are considered to be environment-friendly and are thus promoted by regulators. On the other hand, “Green” also has negative effect on market share through higher costs and lower power. Carmakers incur higher costs to update their plants and technologies to satisfy the emission standards. Moreover, carmakers have to sacrifice vehicle power to cut emission, which hurts the ability to attract the market segment that favors power. Combining the positive effects and negative effects together, it seems reasonable to conjecture that market share is a concave function of the extent of “Green” a carmaker offers.

For our study, we use data collected from 2000 to 2013 by remote sensors installed along a European inter-country highway. Altogether we have 250 thousand records covering 140 different carmakers. We analyze the data to identify the significant drivers of emission and capture their marginal effects on emission. Our analysis of the marginal effects confirms our conjecture that the relationship between “Green” performance and market share is concave (by confirming that the second derivative of the relationship is negative).

After validating the concave relationship between market share and emission, we study the positioning of carmakers (in terms of “Green”) over time relative to each other and

the European standards. Our first observation (confirmed using the linear slope test and the Mann-Kendall test) is that the dispersion of “Green” performance across automakers is shrinking over time as standards get tighter. When emission standards are loose, carmakers display a wide range of emission choices. However, as EU standards tighten over the years, the distribution of automakers’ emission choices converges to a spike close to the standard.

This observation raises the question of the extent to which “Green” performance can be used by automakers to influence market share as emission standards tighten. The European Union (EU) has issued six such standards between 1993 and 2014, each tighter in some dimension than the previous standard. Our analysis indicates that the tightness of standards as well as the anticipated change in standards affects the extent to which automakers can use their “Green” performance to influence market share.

Our first set of results indicate that “Green” is more significant in affecting market share when standards are loose. As standards tighten, “Green” performance has a less significant impact on market share. Our second set of results indicates that when the upcoming changes in the standards are large, “Green” becomes more significant in determining “Market Share,” especially as the change in standards gets closer. Whenever the upcoming changes in standards are large, carmakers with advanced technology can gain market share by providing greener cars to the market before the standards tighten. In this setting, being an early mover on emissions allows a firm to increase market share.

Our research indicates that automakers can use “Green” performance to affect market share as long as they pick the right time to do so.