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Energy pricing reform and energy efficiency in China: Evidence from the automobile market☆

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ABSTRACT

Promoting energy efficiency by undertaking a market-oriented reform of the energy-pricing mechanism is one of the top priorities of China's ongoing reform effort. In this study, we examine the impacts of China's gasoline-pricing reform implemented in January 2009 on the fuel economy of the country's new automotive fleet. In particular, we distinguish the effects of two common elements of China's energy-pricing reform packages: the effects of the energy tax increase (i.e., the gasoline tax increase) and the effects of the energy-pricing mechanism reform (i.e., the adoption of a market-oriented pricing scheme for gasoline). By exploiting a rich dataset of monthly new passenger vehicle sales at the vehicle-model level in China between 2008 and 2013, we are able to control for potential correlations between unobserved product and consumer characteristics and products' fuel efficiency. Our empirical results infer that fuel costs have a significant influence on new vehicle sales in China, while the presented policy simulations suggest that the gasoline-pricing reform in China has led to an approximately 6.25 percent increase in new vehicle fuel economy. Moreover, the two major elements of the reform, the gasoline tax increase and expedited adjustment cycles for gasoline prices, make similar contributions to the increase in the new vehicle fleet's fuel economy, with the former contributing 3.43 percent and the latter, 2.82 percent.

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1. Introduction

Although China has been reforming toward a market economy for more than 30 years, such reforms have only just begun in certain sectors. The energy sector is one example of where the government still heavily regulates prices, such as those of electricity and natural gas (Fan et al., 2007). However, China has started to reform its energy-pricing scheme with the aim of letting the market have greater influence and therefore giving consumers suitable economic incentives for their energy consumption decisions (Zhou et al., 2010). How these reforms to the energy-pricing scheme affect energy efficiency in downstream sectors has important implications for policies that aim to address the host of challenges related to energy consumption in China, such as energy independence, air pollution, and climate change (Adams and Shachmurove, 2008).

In this study, we investigate how the market-oriented reform of the energy-pricing mechanism in China affects its energy efficiency in the context of the country's automobile industry. Specifically, by using a dataset of monthly new passenger vehicle sales in China from January 2008 to August 2013, we study how gasoline-pricing mechanism reform affects the fuel efficiency of China's new vehicle fleet. We first estimate the sensitivity of new vehicle sales to changes in gasoline prices and then evaluate through simulations how the reform of the gasoline-pricing mechanism affects the average fuel efficiency of the country's new automotive fleet. Specifically, we quantify the effects of two elements of China's major gasoline-pricing reform implemented in January 2009: gasoline tax changes and the adoption of expedited adjustment cycles for gasoline prices.

We use gasoline prices and the automobile market in China as our research context for two reasons. First, China is the world's second largest oil consumer after the United States, while its oil market was one of the first in the country's energy sector to undergo market-oriented pricing reforms (Lin and Liu, 2013). Therefore, the gasoline-pricing scheme in China provides us with an ideal opportunity to study the impact of a market-oriented pricing-scheme reform in China's energy sector.

Second, the effect of gasoline prices on the fuel economy of new automobiles is central to the evaluation of the ongoing efforts to reduce gasoline consumption in China. China's new automobile market has grown dramatically during the past 15 years, surpassing that of the United States in 2009 to become the world's largest (Hu et al., 2014). Oil consumption by automobiles is expected to account for two-thirds of the country's total oil consumption by 2020 (Lin and Liu, 2013). As a response to such a rapid increase in oil consumption by automobiles, China has steadily raised gasoline tax in the past several years.[1] Evaluating such energy-saving measures requires the accurate estimation of the effect of gasoline prices on the average fuel economy of the country's new automotive fleet.

With our analysis, our work makes two main contributions to the growing body of research studying the effect of energy-pricing reforms on energy efficiency in China. First, to the best of our knowledge, we are among the first studies to distinguish the effects of two common elements of China's energy-pricing reform packages: the effects of energy tax changes (e.g., the gasoline tax increase) and the effects of the energy-pricing mechanism reform (e.g., the adoption of a market-oriented pricing scheme for gasoline).

Second, by using a rich dataset of new passenger vehicle sales in China, we are able to examine the impacts of China's energy-pricing reform on energy efficiency at the *product* level, and we are able to circumvent one major challenge faced by most existing studies that use aggregated industry-level data to quantify the effects of energy-pricing reforms on energy efficiency in China (e.g., Hu and Wang, 2006; Jiang et al., 2014; Wei et al., 2009). Studies using aggregated data are not able to account for the possible correlation between energy efficiency (e.g., vehicles' fuel economy) and unobserved consumer and product (e.g., vehicles) characteristics (Li et al., 2009). For example, in the context of automobile demand, as household incomes increase, consumers tend to prefer vehicles with higher power and better functionality (e.g., SUVs), which are typically fuel inefficient. Ignoring such correlations would result in biased estimates of the effects of energy prices on energy efficiency. Our study, as we elaborate on later, follows Klier and Linn (2010) by using a simple yet flexible strategy to

[1] The Chinese government raised gasoline tax from 0.2 to 1.0 RMB\l in January 2009, and increased it further to 1.12, 1.40, and 1.52 RMB\l in November 2014, December 2014, and January 2015, respectively.