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Differential demand response to gasoline taxes and gasoline prices in the U.S.



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ABSTRACT

This paper offers new evidence concerning the difference in consumers' reactions to changes in gasoline taxes relative to market-induced changes in gasoline prices. Using microdata from the 2007 to 2009 rounds of the U.S. Consumer Expenditure Survey, we estimate a complete system of demand augmented with information on gasoline excise taxes. By relying on a complete system of demand, we are able to estimate elasticities that take behavioral responses into account. Crucially, the model allows gasoline taxes to affect demand in two distinct ways: through relative prices and as long-run policy signals. Different increases in gasoline taxes are considered for simulation. A 13.2 ¢/gallon tax increase, corresponding to a \$15/tCO₂ carbon tax, is found to cause, in the long run, a reduction in gasoline demand that is about seven times as big as that induced by an equal market-induced price increase. The same measure of differential demand response is derived for tax increases different in size as well as by income quintile and by region. We discuss the implications of our findings for the design of corrective taxation in the private transport sector.

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1. Introduction

A growing literature questions the standard assumption in public finance that consumers respond to commodity tax changes in the same way as they do to price changes caused by market forces (Chetty, 2009; Chetty et al., 2009; Finkelstein, 2009; Congdon et al., 2009; Goldin and Homonoff, 2013;

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Davis and Kilian, 2011; Li et al., 2014; Rivers and Schaufele, 2015). These studies vary in the goods considered, the approaches used, but also in the explanations given for such difference. Behavioral economics contributions focus on the visibility, or salience, of taxes as a determinant of consumer choice. For example, Finkelstein (2009) shows that the demand curve for driving is more inelastic when tolls are charged electronically as compared to manual collection. In a similar vein, Chetty et al. (2009) demonstrate that making sales taxes more salient by including them in posted prices increases demand responsiveness.¹ Another perspective is that tax payments as such may be perceived as a greater burden than equivalent non-tax payments, a phenomenon called tax aversion (McCaffery and Baron, 2006).² But explanations more consistent with rational behavior are also provided. With reference to gasoline demand, Davis and Kilian (2011) and Li et al. (2014) suggest that different demand responses to changes in gasoline taxes and to market-induced changes in gasoline prices may be due to the difference in persistence between the two types of variations. As tax changes are longer lasting, they are more likely to influence price expectations and, thereby, long-run decisions that have an impact on gasoline consumption, such as purchasing a more fuel-efficient car, changing transport mode or moving closer to work. The same authors, however, allow that effects related to subjective perceptions of taxation may also play a role. Indeed, these different explanations are not mutually exclusive. They describe mechanisms that in some measure may all underlie the differences observed between demand responses to tax changes and to market-induced price changes.

The present study specifically deals with the different responses of U.S. consumers to changes in gasoline taxes and equal changes in gasoline prices caused by market forces. Gasoline taxes in the U.S. are very low compared to other countries, notably European ones (OECD, 2013). Nonetheless, they generate more revenue than any other commodity tax, both at State and federal levels. In recent years, growing concerns related to declining fiscal revenues and high CO₂ emissions meant that the option of raising gasoline taxes has received increasing consideration in the public policy debate. Raising gasoline taxes, however, is anything but a popular measure, all the more so in an economy heavily dependent on private transportation. Thus, the hypothesis that consumers may be more responsive to gasoline taxes than to gasoline prices is of special interest. From an environmental standpoint, it would imply that a tax increase would induce lower gasoline use – and hence lower emissions – than standard price elasticities (estimated without distinguishing between the price changes induced by taxation or by the market) would indicate. Of course, it would also mean less revenue would be raised than expected.

Growing empirical evidence shows that indeed consumers respond differently to gasoline tax changes as compared to price changes unrelated to taxation (Davis and Kilian, 2011; Li et al., 2014; Rivers and Schaufele, 2015). The present paper offers corroborating evidence of this phenomenon and contributes to the literature in three fundamental respects. First, the estimated model posits that changes in gasoline taxes impact on gasoline consumption in two distinct ways. Taxes being a price component, gasoline tax changes alter relative prices and, consequently, expenditure allocation. At the same time, as taxes are a fiscal policy instrument, gasoline tax changes constitute policy signals affecting long-run consumer decisions which in turn impact on gasoline consumption. Therefore, in the long run, the effectiveness of gasoline taxes in reducing gasoline use is given by the sum of the two effects: the price effect and the signal effect, respectively. Second, the analysis is carried out within a complete demand system framework. This means that complementarities and substitution relationships among the goods considered are accounted for, thus improving identification of the effects under study. Third, we simulate differential demand responses for different magnitudes of the tax- and price changes, as well as across different income levels and U.S. regions. Not least, we provide new estimates of demand elasticities for a bundle of energy goods, including gasoline. Only a few studies on gasoline demand in the U.S. use micro-founded demand systems while also taking account of household heterogeneity (Nicol, 2003; Oladosu, 2003; West and Williams, 2004, 2007).

¹ Tversky and Kahneman (1974) are precursors of this conceptual strand in stressing that consumers, when making decisions, heavily rely on information that is prominent or readily available.

² Experimental evidence of tax aversion is growing (Kallbekken et al., 2010, 2011; Blaufus and Möhlmann, 2014), but there is no empirical evidence of such a framing effect based on choice, rather than experimental, data.

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