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Asymmetric incidence of sales taxes: A short-run investigation of gasoline prices[☆]

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ABSTRACT

This paper investigates the shifting of sales taxes to consumers through retail prices in the short run. Retail data on gasoline prices are used at the station level within the U.S., including observations from all fifty states and the District of Columbia. A difference-in-differences approach is employed to identify the short-run effects of the changes in state taxes as of January 1st, 2015, when five states have increased their gasoline sales taxes, while five other states have decreased theirs. States experiencing such changes in sales taxes (between December 31st, 2014 and January 1st, 2015) are analyzed as the treatment group of a natural policy experiment, where the control group consists of states with no changes in their sales taxes. The results show that both sales-tax increases and decreases are under-shifted to consumer prices, although the under-shifting of sales-tax decreases is much higher (i.e., the asymmetric incidence of sales taxes). The pass-through measures also differ significantly across states, showing the importance of having a nationwide analysis. The results are robust to the consideration of retailer characteristics, wholesale prices, retail brand effects and hourly price changes within each day.

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1. Introduction

The incidence of gasoline sales taxes is a fundamental concept in public economics, because it determines how economic welfare is distributed between gas stations and consumers due to changes in taxes. Since gasoline accounts for about 5% of consumer spending and sales taxes are determined by policy makers, the measurement of the incidence is an essential concern of politicians as well.¹ However, there are only a few studies that have attempted to measure the effects of gasoline sales taxes at the station (i.e., retail-firm) level.² Having an investigation at the retail level is especially important for the gasoline market, because each gas station can pass the effects of taxes on to consumers differently (by over-shifting or under-shifting taxes to consumer prices), which leads a distribution of tax incidence among gas stations and thus a redistribution of economic welfare even within consumers purchasing gasoline from different stations or among stations located in the same political district.

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¹ According to the Bureau of Labor Statistics' (BLS) Consumer Price Index, gasoline accounted for 5.1% of consumer spending, as of October 2014.

² For other retail-firm level studies, see [Poterba \(1996\)](#) and [Doyle and Samphantharak \(2008\)](#). Although they are not comparable to this paper, there are many other studies focusing on retail level (rather than retail-firm level) analysis such as by [Alm, Sennoga, and Skidmore \(2009\)](#), [Chouinard and Perloff \(2007\)](#), [Devereux, Lockwood, and Redoano \(2007\)](#) and [Fullerton and Metcalf \(2002\)](#).

This paper achieves such an investigation at the gas-station level in the short run. Using retail prices of regular gasoline obtained from gas stations within the U.S., including observations from all fifty states and the District of Columbia, we investigate the effects of state-level sales tax changes (on retail prices) that have become effective on January 1st, 2015, when five states have increased their sales taxes, while five others have reduced theirs. Accordingly, these ten states experiencing changes in their sales taxes (between December 31st, 2014 and January 1st, 2015) are analyzed as the treatment group of a natural policy experiment, where the control group consists of states with no changes in their sales taxes. Since all sales tax changes are due to earlier state laws (rather than market conditions), using a difference-in-differences approach is a compelling way to study the effects of tax changes on retail prices, and it is robust to any identification/endogeneity problem. Within this context, the main assumption is that the retailers would re-optimize their pricing decision according to changes in tax rates, since they already know the timing of such changes.

The results of a difference-in-differences approach show evidence for asymmetric incidence of sales taxes. In particular, although both sales-tax increases and decreases are under-shifted to consumer prices, the under-shifting of sales-tax decreases is much higher. In the case of sales-tax increases, the under-shifting corresponds to an increase in gasoline prices less than the increase in sales taxes due to the estimated pass-through coefficients less than one, while in the case of sales-tax decreases, it corresponds to an increase in prices despite the decrease in sales taxes due to the estimated pass-through coefficients less than zero. The latter result is interesting in an environment of gasoline prices decreasing nationwide, because it implies that retailers have either kept their prices constant or have reduced their prices less than the national average, which has potentially resulted in higher rates of return on capital (in a perfectly competitive market) or higher markups (in an environment with imperfect competition). When we further investigate the retailers facing tax reductions, we in fact observe that the average retailer have reduced its price by only 0.1% after the average tax reduction of 0.85%, while the retailers in the control group (with no tax changes) have experienced an average price reduction of 0.71%. Finally, the short-run pass-through measures differ significantly across states, showing the importance of having a nationwide analysis.

The existing empirical literature on sales tax incidence, mostly focusing on tax shifting, has mixed evidence in terms of under-shifting (i.e., incomplete pass-through measures of below 100%), full-shifting (i.e., full pass-through of 100%) or over-shifting of taxes (i.e., more than full pass-through measures of above 100%) on retail prices. For instance, earlier studies such as by [Poterba \(1996\)](#), analyzing clothing prices) have found evidence for both over-shifting and under-shifting, while studies such as by [Besley and Rosen \(1999\)](#), analyzing commodities such as bananas, bread, and milk) or by [Kenkel \(2005\)](#), analyzing alcoholic beverages) have found evidence for full-shifting and over-shifting of sales taxes. However, almost all of these studies are subject to identification problems (i.e., their analysis potentially suffer from not distinguishing between market conditions and policy changes) due to not having a natural policy experiment as in this paper.³

In the context of gasoline retail prices, this paper is closest to the excellent study by [Doyle and Samphantharak \(2008\)](#) who have also considered a natural policy experiment using a difference-in-differences approach to investigate the short-run effects of state-level sales tax changes in the gasoline retail market. By considering the tax suspension and reinstatements in two Midwest states, Illinois and Indiana, DS have found that 70% of the tax suspension is passed on to consumers in the form of lower prices, while 80–100% of the tax reinstatements are passed on to consumers. However, one may criticize their methodology in some aspects, which may potentially result in biased measures of pass through. First, DS have considered the asymmetry when the increases and decreases happen at different times in Illinois and Indiana. Such an approach would ignore potential changes across these states over time (and thus lead to omitted variable bias); instead, this paper focuses on the effects of concurrent increases and decreases of sales taxes by using data on the very same days of December 31st, 2014 and January 1st, 2015 across all states for both treatment and control groups, which makes the results robust to similar issues. Second, in the formal analysis of DS, the only time-varying right-hand-side variable is the policy reform (i.e., sales tax rate), which ignores any potential change in wholesale prices or brand-specific costs over time (and thus again lead to omitted variable bias); instead, this paper considers time-varying wholesale prices and brand-specific costs to resolve such potential issues.⁴ Third, since DS consider control variables at the zip-code level, they fail to capture any retailer-specific characteristics in their short-run difference-in-differences approach analyzing the tax incidence; as an alternative, this paper considers the change in retail prices which effectively eliminates such characteristics in the regression analysis. Finally, this paper takes into account potential differences between the retail prices collected at different hours of the day, while DS do not have the information on the hour of day when the data have been collected. The latter issue is important especially if retailers follow a pattern in their pricing strategy during peak versus off-peak hours within a particular day. Overall, the results in this paper are robust to many of the concerns that one would have in the literature.

³ There are also other studies in the literature that investigate tax incidence by using aggregate-level (rather than retail-level) data. For example, [Devereux & Lanot, 2003](#), analyzing mortgages) and [Chouinard & Perloff, 2004](#), investigating gasoline taxes) have depicted pass-through measures in the interior between 0% and 100%, respectively. Other studies such as by [Young and Bielinska-Kwapisz \(2002\)](#) have shown that excise taxes on alcohol are over-shifted. Similarly, [Marion and Muehlegger \(2011\)](#) have found at least full, and potentially more than full, pass-through of both federal and state diesel and gasoline taxes to consumers. Also see [Eckert \(2013\)](#) for an excellent survey of studies based on gasoline retailing.

⁴ It is important to note that DS have considered wholesale prices in a separate regression analysis where wholesale prices have been used as the dependent variable. They have found that the effects of taxes on wholesale prices were small.

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