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Tax Credits and the Market for Hybrid Vehicles*

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Abstract

The Energy Policy Act of 2005 introduced a substantial income tax credit for individuals who purchase a new gas-electric hybrid vehicle. I use transaction level data on the most popular hybrid, the Toyota Prius, to document the response to this policy and to determine who benefits from the subsidy. The data produce clear evidence that many consumers understood the policy and shifted their transaction dates in order to take full advantage of the subsidy. Evidence suggests that those who failed to take full advantage of the credit differ in ways that suggest they are less savvy car buyers. Reduced-form regression analysis of the influence of the federal tax on transaction prices suggests that buyers capture the majority of the credit. The preferred estimates indicate that consumers capture at least 80 cents per dollar of federal subsidy.

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1 Introduction

Climate change and national security concerns have recently made gasoline consumption a major economic policy issue in the United States. Many political leaders have called for targeted reductions in gasoline consumption and greenhouse gas emissions in the immediate future.¹ Any plan to achieve reductions will have to address the personal transportation sector, which accounts for 40% of gasoline consumption and 20% of greenhouse gas emissions (Environmental Protection Agency, 2007). Most conservation in this sector is expected to derive from fuel saving technologies, rather than reductions in miles driven.

To that end, the Energy Policy Act of 2005 introduced a substantial income tax credit for purchasers of new gas-electric hybrid vehicles, which are typically more fuel efficient than comparable conventional vehicles. Gas-electric hybrid vehicles are one of the key fuel saving technologies already in use. Hybrid vehicles remain a small segment of the new car market; about 1.5% of all new cars sold in 2006 were hybrids. Since 2001, however, the market share of hybrids has been growing at about 100% per year. Despite their growing importance to environmental policy, almost no research exists on hybrids. The exception is a pair of papers that document the correlation between Green Party registration and other signals of environmental preferences with Prius ownership (Kahn, 2007a,b).

In this paper, I determine who benefited from government tax subsidies for hybrids by studying the market for the Toyota Prius. I use descriptive statistics to show how the average Prius buyer differs from other new car buyers. The value of the federal subsidy for the Toyota Prius changed over time because the policy included a phase-out provision. I demonstrate that many buyers understood these changes and shifted their date of purchase to gain a larger credit. Those who did not move their transaction into the higher subsidy time period differ in ways that suggest they are less savvy car buyers. Finally, I use reduced-form regressions to estimate the incidence between buyers and sellers.

I focus on the Prius for several reasons. First, the Prius represents 51% of the hybrid market. Second, the Prius is the most distinct and well-known hybrid vehicle. Third, the market for the Prius is more mature than other hybrids, since it has been through several model year cycles. Finally, the Prius experienced three policy shifts in the sample period. Newer hybrids were introduced when the policy was already in effect, and non-Toyota hybrids have not yet experienced a phase-out.

¹For example, President Bush's 2007 State of the Union speech featured the "Twenty in Ten" objective - the reduction of gasoline consumption by 20% in 10 years.

This paper makes several contributions. First, the paper estimates tax incidence in an important market characterized by imperfect competition. Theoretical models of the incidence between buyers and sellers suggest that tax over shifting – a price movement bigger than the tax – is possible in imperfect markets (Katz and Rosen, 1985; Anderson, de Palma and Kreider, 2001). Besley and Rosen (1999) find evidence that many items have a 100% pass through, and suggest that overshifting occurs for many retail products. There is little existing estimation of taxes in the automobile market. Carbonnier (2007) finds that the pass through rate of a Value Added Tax in Europe on new car purchases is about 50%. Busse, Silva-Risso and Zettelmeyer (2006) study manufacturer incentives (which act like taxes) and find that customer cash rebates are almost entirely captured by consumers.² The hybrid vehicle tax credit differs from the policies considered in these papers because - unlike the European Value Added Tax - it is on a subset of vehicles, and - unlike manufacturer incentives - the rate changes are known in advance.

Second, there is growing interest in tax economics in documenting the extent to which people actually understand tax incentives (e.g. Chetty, Looney and Kroft (2007)). I demonstrate that many consumers understood the policy, in spite of a dearth of official information from the Internal Revenue Service. Furthermore, Prius buyers who stood to gain a larger subsidy by moving their new car purchase by less than two weeks, but failed to do so, differ from other buyers in ways that suggest they are less savvy.

Finally, I know of no other evaluation of benefits of the hybrid vehicle tax credit. Many politicians, including President Bush, have called for an increase in the credit or for a removal of the phase-out provision.³ Political preferences may be determined in part by whether or not sellers are able to raise prices on consumers as a result of the policy.

2 Tax Incentives for Hybrid Vehicles

The federal government has subsidized hybrids through the individual income tax system for several years. Before 2006, the clean fuel vehicle deduction allowed consumers to deduct the “incremental cost” of a clean technology, including hybrids, from their income. The incremental

²The automobile literature has a rich set of simulation studies, following the work of Berry, Levinsohn and Pakes (1995), including Fershtman, Gandal and Markovich (1999) which simulates tax effects, but little estimation based on natural experiments.

³President Bush publicly supports the removal of the cap (USA Today, 2006b). A group of prominent senators (Barack Obama, Richard Lugar, Joseph Biden, Gordon Smith, Arlen Specter, Jeff Bingaman and Norm Coleman) introduced legislation that would remove the phase-out provision of the hybrid tax credit (Press Release, 2007).

cost was capped at \$2,000, and all available hybrids qualified for this maximum amount.⁴ The Energy Policy Act of 2005, passed in August 2005, eliminated the deduction completely for tax year 2006, and replaced it with the more generous hybrid vehicle tax credit. The new law allowed a tax *credit* of up to \$3,400, based not on incremental costs, but on estimated fuel savings. The value of the credit is based on two components: a fuel economy credit and a conservation credit. The fuel economy credit is worth up to \$2,400 and is determined by the percentage gain of the hybrid in city rated fuel economy over a model year 2002 benchmark. The conservation credit is worth up to \$1,000 and is based on the total number of gallons of gasoline saved over a 120,000 mile vehicle lifetime, as compared to the same benchmark. To qualify for the credit, hybrids also must meet stricter emissions standards. Manufacturers are required to send applications for each model year to the IRS, and the IRS then sets the exact benefit.

The certification process has created information lags. The Energy Policy Act of 2005 was passed in August 2005 and took effect in January 2006. The IRS did not, however, certify any vehicles until April 2006.

Furthermore, not every person who purchases a hybrid is eligible to receive the benefit. The credit does not offset tax obligations for those paying the Alternative Minimum Tax. And, the credit is non-refundable. If a vehicle is leased, the lessor may claim the credit, not the lessee. The seller may claim the credit if the buyer is a tax exempt entity.

The Energy Policy Act of 2005 also included a phase-out provision. The provision is triggered when a manufacturer sells 60,000 eligible vehicles. The credit is unchanged in the quarter in which the 60,000th vehicle is sold, and it is unchanged in the next quarter. The credit is 50% of its original value for the next 2 quarters after that, then 25% for another half year.

The phase-out was, allegedly, designed to prevent foreign automakers from benefiting more than domestic automakers over the life of the program (Lazzari, 2006; The New York Times, 2006). Toyota hit the 60,000 mark in the second quarter of 2006, triggering a cut in credit amounts that began on October 1, 2006. The benefit fell again on April 1, 2007, and it will expire completely on October 1, 2007. No other automaker has sold enough qualifying hybrids to trigger the phase-out, as of March 2007, but Honda will probably hit the mark at some point in the summer of 2007.

The sharp date changes provide a natural experiment for the analysis of the influence of the tax policy on the hybrid market. A Prius purchased on or before December 31, 2005 will be

⁴The IRS received many questions about how to calculate incremental cost. In October 2002, the IRS decided to allow filers to use incremental cost estimates provided by the auto manufacturers (Internal Revenue Service, 2002). The result was that all hybrid vehicles qualified for the full \$2,000 maximum.

eligible for a \$2,000 deduction (worth at least \$500 for households in a middle income bracket and up to \$720 for the highest income individuals in 2000). A Prius purchased between January 1, 2006 and September 30, 2006 is eligible for a \$3,150 credit. A new Prius purchased between October 1, 2006 and March 31, 2007 is eligible for \$1,575. A Prius sold between April 1, 2007 and October 1, 2007 fetches a credit of only \$757.50. I use this variation in subsidy size over time to identify the tax incidence between buyers and sellers of the federal income tax credit.

A number of states have also legislated a state income tax credit or a sales tax exemption for hybrids. Table 1 lists the states with tax incentives, along with the type of incentive, the amount and the effective dates. Twelve states have passed tax incentives that subsidize the Prius. Connecticut, Maryland, Maine, New Mexico, New York and Washington, D.C. had or have a full or partial sales tax exemption. Colorado, Louisiana, New York, Oregon, Pennsylvania, South Carolina, and West Virginia had or have a state income tax credit.⁵ Colorado and West Virginia had the largest incentives, which were worth more than the maximum federal credit for some model years. Sales tax exemptions in Connecticut and Washington, D.C., as well as the credits in Oregon and New York were also worth more than a thousand dollars for most Priuses. In a state panel design, I use the variation in the effective dates of these policies within states over time to identify the tax incidence between buyers and sellers of the state tax incentives.

3 The Data, and Descriptive Statistics of Prius Owners

This paper utilizes new vehicle transaction microdata from a major automotive research firm. The data set includes the price of each vehicle sold, the exact date of the sale, financing details, cash rebates and the truncated Vehicle Identification Number (VIN). The data also include age, sex and state of residence of purchasers.⁶ I restrict the sample to purchased (not leased) vehicles with complete price information.

The VIN of the new vehicle allows me to identify the make, model, model year, and a variety of other characteristics of each vehicle. The VIN includes information on engine displacement, cylinders, transmission, doors, body type and trim level, but it does not detail all available options packages (e.g., sun roofs or stereo systems). The data include the dealer's cost for the vehicle, including all factory installed options, advertising fees and shipping fees.

The data also include information on customer trade-in vehicles, including vintage and mileage.

⁵Utah had a credit for which the Prius did not qualify.

⁶Sex is imputed from first names, and ambiguous first names are thus missing.

The effective price of a new vehicle purchase must account for several things. I use the transaction price inclusive of factory installed options but exclusive of taxes, fees, service contracts and after-market options. The excluded items do not generally influence the resale value of the vehicle, and they are often negotiated after the final price of the vehicle is determined. I adjust the transaction price inclusive of factory installed options to account for the trade-in allowance, manufacturer's direct to customer cash rebates, and financing incentives.⁷ To construct the value of the financing incentive, I estimate the difference in the present discounted value of the loan actually observed in the data (given the loan amount, interest rate and term) to that same value using the Federal Reserve's 48-month car loan interest rate series.⁸ I call this the "incentive adjusted price."

The data also include an indicator of the days to turn – the number of days that the vehicle was in the dealer's possession – for each vehicle. I use this information to construct a measure of the existing inventory of vehicles at any given time.

I merge official fuel economy ratings from the Environmental Protection Agency's fuel economy guide according to make, model, model year, cylinders, displacement, transmission and trim level.

Table 2 shows the states with the ten highest Prius market shares. These are, not surprisingly, politically liberal states, and there is a strong correlation between this ranking and the set of states with tax incentives.

Table 3 shows descriptive statistics for new Prius owners, along with the entire market of new car buyers and buyers of premium midsize sedans. The Prius is classified as a premium compact car. It is, however, the most expensive car in that segment. For a comparison with cars at a similar price point, I used premium midsize sedans.

Prius buyers are older than the the average new car buyer and the average premium midsize buyer. A new Prius buyer is more likely to be female than the typical new car buyer, but less likely than a premium midsize buyer. Prius buyers are far less likely to trade-in a vehicle when they buy a new Prius. When they do, the average annual miles on their vehicle is slightly lower. This may be surprising because, on the one hand, high mileage drivers would receive the most benefit from fuel efficient vehicles. On the other hand, Prius ownership is correlated with other values that make Prius drivers less likely to drive many miles (Kahn, 2007a,b). If Prius drivers drive less than others, it implies that - purely in terms of energy conservation - there is an

⁷The trade-in over or under allowance is the difference between the amount listed for the trade-in on the contract and the dealer's actual estimated cash value, which is used for entering the vehicle into their own inventory.

⁸This price adjustment methodology follows Corrado, Dunn and Otoo (2006).

allocative inefficiency.

Finally, table 4 shows the average state and federal subsidies for each model year of the Prius. State subsidies have declined, on average, over the sample period. Estimated federal tax subsidies fluctuate slightly in early years due to changes in the marginal tax rate schedule, rise dramatically in 2006 with the hybrid tax credit, and fall with the phase out. Compared to the mean price of a Prius, total government subsidies are substantial in all years, but especially for model year 2006.

The first lesson about the incidence of tax subsidies for the Prius is that they varied significantly by state, both because of state policies and because of the market share of the Prius, so that people in politically liberal states received more from both the federal government and from their own state government. The subsidy went to consumers who were older than the average car buyer and who drive less. Within the group of consumers who bought a Prius, the time at which the car was purchased altered the subsidy significantly. The strategic choice of transaction timing and its role in determining who benefited from the credit is considered in the next section.

4 Consumer Heterogeneity and Strategic Timing

The complexity of taxes and the obscurity of specific provisions complicates the economic interpretation of most empirical tax analysis. Recent literature has emphasize the importance of tax salience - defined as the ease with which the gross of tax price is calculated - in determining behavioral response (Chetty et al., 2007). Chetty et al. (2007) find evidence that demand for groceries and alcohol is sensitive to whether or not posted prices are tax inclusive. Bounded rationality models suggest that salience should matter more in small transactions, where calculating the tax inclusive price may not be worth the cost. Jappelli and Pistaferri (2007) show that the market for mortgage debt in Italy was not responsive to tax reform in a context in which large amounts of money are at stake. In the automobile market, Busse et al. (2006) find that the incidence of customer cash rebates is significantly different than the incidence of dealer incentives.

The latter two results are more likely to be consistent with a lack of information than with a conscious decision not to calculate benefits. They suggest that the analysis of tax response, even in the market for expensive durables, should start with establishing whether or not consumers are informed. Establishing whether or not agents understood the tax implications of their purchases is especially important for this paper because I find little evidence that prices moved

in response to the policy. One expects a zero effect if agents are simply unaware of the policy, as in Jappelli and Pistaferri (2007). By showing both that agents were aware of the policy and the price was insensitive, I can interpret the price results as indicating that the demand curve for the Prius was elastic relative to the supply curve.

There were several reasons why consumers may have misunderstood the value of the hybrid vehicle tax credit. First, the tax credit took effect on January 1, 2006, but the Internal Revenue Service had not issued any official statement regarding certification or credit amounts for any vehicle, by that date. The IRS did not officially certify the Toyota Prius until April 7, 2006 (Internal Revenue Service, 2006a). The American Council for an Energy-Efficient Economy (ACEEE) released a report estimating eligibility and credit amounts in the fall of 2005 (American Council for an Energy-Efficient Economy, 2005). The ACEEE report was exactly correct for the Prius, and very close for all models. Other media cited this report, but I have found no other estimates that were available before the credit took effect.

Similarly, the first phase-out of the credit began on October 1, 2006, but, remarkably, the official IRS statement that the phase-out would begin was not issued until September 20 (Internal Revenue Service, 2006b). Toyota sold over 42,000 hybrids in the first quarter of 2006. Thus, they were certain to reach 60,000 hybrids in the second quarter. In this case, the phase out implications were well understood and correctly reported throughout the media long before the IRS pronouncement.

The hybrid tax credit may have been misunderstood because people do not grasp the difference between credits and deductions.⁹ Thus, many people may have incorrectly calculated the difference between the \$2,000 deduction and the \$3,150 credit.

Consumers may have learned about the credit from news media, various Internet sources or directly from dealers. Figure 1 shows the relative density of searches on Google for the term “hybrid tax credit.” The largest spike occurs around the passage of the policy, with the next largest spike immediately before the policy took effect. The next spike came around official IRS announcements in April 2006. Search volumes remained high throughout the summer, and dipped after the first phase-out, rising as the second phase-out approached. Thus, search volumes for information about the hybrid tax credit imply consumer awareness and reveal their attempt to find out more about the policy in response to the release of information and around the dates of change.

The strongest evidence of consumer awareness comes from looking at the timing of the actual

⁹The New York Times incorrectly referred to the clean vehicle tax deduction as a credit in the summer of 2005 (The New York Times, 2005).

transactions. An examination of the distribution of sales over time provides strong evidence that many agents strategically timed transactions in order to take advantage of the tax, but it also suggests that not all agents were informed. Figure 2 shows the distribution of sales over the 62 days in December 2005 and January 2006 for both the Prius and for non-hybrid Toyota sedans. Relative to Toyota sedans, the Prius was sold more heavily at the beginning of January than at the end of December, suggesting that transactions were shifted into January, where the federal tax credit was available.¹⁰

It is possible that, for some unknown reason, the Toyota Prius has an unusual sales pattern, even in the absence of tax incentives. To account for this possibility, one can look at the sales pattern in previous years. Figure 3 shows the distribution of sales of the Prius versus non-hybrid Toyotas for December 2004 / January 2005. While there are some differences, there is no evidence that the Prius is more likely to sell in early January than late December.

Figures 4 and 5 show the corresponding distributions for September and October. As expected, the Prius shows strong evidence of shifting into September in 2006, when the tax credit phased out. In this instance, Prius transactions were moved to an earlier date, whereas the December / January picture shows that Prius transactions were moved to a later date. This symmetry of response bolsters the conclusions. Figures 6 and 7 provide the same information for March and April 2007, and lead to the same conclusion.

Table 5 quantifies the shift. Three points emerge. First, relative to the monthly sales volume, the shift is large - about 15% on average over the three events. Second, the relative shift is larger for the largest tax change and smallest for the smallest tax change. Third, the sales distribution occurred entirely within the two week window around each change. The distributions are very similar at the beginning and end of the two-month windows. Given the significant amount of money at stake, it is perhaps surprising that cars were not shifted over longer time horizons. This is especially remarkable for December 2005, when all of the vehicles sold that month could have been delayed for a month or less to gain around \$2,500.

Put differently, it is puzzling that anyone would purchase a Prius on December 31, 2006 or October 1, 2006 or April 1, 2007. One partial explanation is that many of the cars were not available during the optimal tax period. Of the cars purchased in the first two weeks of October 2006, only 28% were on a dealer's lot in September. Of the cars purchased in the first two weeks of April 2007, 60% were on a lot in March.

This partly explains why some vehicles were sold in the beginning of April 2007 and October 2006, but it does not explain why more Priuses that arrived in December 2005 were not held

¹⁰January 1, 2006 was a Sunday, accounting for the low sales.

until January for tax reasons. Of all of the Priuses delivered in November 2005, 78% were sold in November. For January 2006, that number is 83%. Of the cars delivered in December 2005, only 56% were sold in December. Again, this shows that many purchases were delayed, but transactions that occurred in late December could have been delayed only slightly in order to make considerable tax gains.

The tax credit is non-refundable, and persons subject to the Alternative Minimum Tax will not receive the benefit. Thus, some new car buyers may be informed but indifferent to timing because they do not stand to benefit. Most persons buying a new car for well over \$20,000, however, probably have a positive tax liability. And, because the Alternative Minimum Tax is modified almost annually, most people subject to the tax cannot be sure of their status prior to tax season.

In the December / January case, extremely impatient consumers might prefer a deduction on their 2005 taxes to a much larger credit for 2006. The discount factor, however, that would imply this preference ordering is astronomical.

Thus, the most likely explanation for why some people purchase a new hybrid on the “wrong” side of a tax change is that they are not informed. In particular, a careful look at the transaction price of new Priuses around the changes is suggestive of heterogeneous consumers.

Figures 8, 9 and 10 show a smoothed price series around each change for the Toyota Prius and for other (non-hybrid) Toyota sedans. Each point represents a weekly moving average of the incentive adjusted price minus dealer cost. If the price reacted in a discontinuous way to the change in the tax subsidy, we would expect the Prius price series to jump up on January 1, 2006 and jump down on October 1, 2006 and April 1, 2007. Instead, the Prius price series jumps in the opposite direction in two cases and looks smooth through the other. The jump appears largest in the March / April case. A large part of this jump is attributable to the fact that Toyota had financing incentives on the Prius in early 2007, which it eliminated on April 1, 2007. The price series for other Toyota sedans does not mimic the Prius pattern. There is a jump up on January 1, 2006. This is likely due to an incentive push to sell cars by the end of the year for accounting considerations. Overall, the price series shows no evidence that consumers on the “wrong” side of a tax change were compensated by a lower price.

One explanation for this is consumer heterogeneity. Savvy, well-informed consumers were more likely to ensure that they purchased a Prius when the tax value was highest. As a result, it is likely that the consumers who purchased a Prius just on the “right” side of a tax change would have secured a lower price than the consumers who purchased a Prius just on the “wrong” side of a tax change, in the absence of any tax policy. Put differently, it is reasonable to expect

that consumers clever enough to secure a Prius on the right date are also better bargainers.

Unfortunately, the data set includes very little information about consumers. Nevertheless, the limited information that is available, combined with details about the transaction, does give some additional evidence that consumers on the “right” and “wrong” side of the tax changes differ in ways that one might expect. Table 6 shows mean characteristics of transactions that occurred within two weeks of a tax change.

Table 6 also shows a coefficient from a difference-in-difference specification in which the characteristics of Prius transactions around each change are compared to the characteristics of other Toyota sedans.¹¹ Savvy buyers are more likely to be women (statistically insignificant) and younger. They are less likely to trade-in a vehicle as part of the transaction. When they do trade, they have a newer car, and they get about the same value for their trade-in as the not savvy.

Dealers gross about \$130 less from savvy consumers. Savvy consumers are less likely to purchase a service contract from the dealer, and their transactions involve less total costs above the cost of the car. These additional costs could include service contracts, additional “hard adds” (e.g. roof racks), undercoating or life insurance. Savvy consumers are also less likely to accept an interest rate that is above the buy rate. The buy rate is the rate that the financing agency quotes to the dealership. Dealers sometimes sign a contract for a higher rate than the buy rate, allowing them to make income on the difference.

Most importantly, the difference in age, service contracts, total after-market options and premium interest rates supports the notion that consumers on the high subsidy side of a tax change differ from people who purchase a car on the low subsidy side of a transaction in ways that are consistent with the high subsidy consumers receiving a better deal.

Overall, this evidence suggests that savvy consumers were able to time their new car purchases to take full advantage of the available credit, but not all consumers were aware of the benefits or able to time their purchase. Another lesson emerges from the price plots. If there was a significant, immediate price response to the tax change, it should be visible in this picture. If there is a jump at the policy change due to the subsidy pass through, and there is a jump in the other direction due to the heterogeneity of consumers, then it appears that the jump due to heterogeneity dominates the tax pass through. In either case, the price series suggests that there is little or no price movement due to the tax, which indicates that the tax pass through

¹¹The difference-in-difference coefficient is the coefficient on a dummy equal to one if a vehicle is a Prius purchased in the high tax value window, with dummies for each month and dummies for each two-month window interacted with a Prius dummy.

is small. This conclusion is corroborated by the regressions in the next section, which use data on the prices over the whole time period, not just close to the changes.

5 The Incidence of the Subsidy Between Buyers and Sellers

The other important incidence question is how the subsidy was split between buyers and sellers. In this section, I use the variation in the tax value over time to identify the change in price. Since the subsidy is not received at the time of the transaction, but is later received by the consumer, an unchanged price indicates that the consumer gained the whole benefit. The results on the influence of the federal tax credit suggest that there is a small price increase due to a higher credit. The baseline estimate is that producers capture only 2.5% of the benefit. The 95% confidence interval for the estimate is -1.2% to 6.2%.

There is evidence of heterogeneity between the three instances of price change, however. When the pass through rate of the tax is allowed to be different for each change, it appears that there was no price effect when the federal credit was introduced, but that prices fell by 21 cents per dollar of subsidy reduction. This heterogeneity is plausibly explained by the tightness of the market for the Prius - many dealers had waiting lists - when the credit was introduced in January 2006. The market had loosened by the phase-out period. Regression analysis using a panel research design on the pass through of state tax incentives yields a similar result.

There are, in fact, three relevant agents who may have benefitted from the subsidy: the manufacturer, the dealer and the consumer. The empirical price analysis below does not distinguish between the manufacturer and the dealer. The split of benefits between manufacturer and dealer mostly operates through incentives that are not visible in the data. I thus use the term “seller” to indicate both the manufacturer and dealer.

To estimate the effect of the federal tax credit on transaction prices, I regress the incentive adjusted (meaning adjusted for cash rebates, financing incentives and trade-in allowance, not for taxes) price of new cars on a set of controls in a sample including the Prius and similar sedans. The sample begins on January 1, 2003 and ends on April 30, 2007. It includes the Prius, all other Toyota sedans, and a set of sedans from other manufacturers in the same price class which were found to have price and quantity correlations with the Prius across geographic markets.¹²

¹²The comparison models are the Accord, Avalon, Aveo, Camry, Charger, Corolla, Echo, Fit, Five Hundred, G6, Grand Prix, Impala, Impreza, LaCrosse, Malibu, Malibu Maxx, Maxima, Milan, Montego, Passat, Sable, Sentra, Yaris and 6.

The regression includes a dummy variable for each vehicle, where a “vehicle” is a unique combination of nameplate, model, model year, trim level, transmission, doors, cylinders, displacement and aspiration. These dummies control for much of the heterogeneity across individual cars. More of the heterogeneity is accounted for by including a variable that measures the dealer’s cost of each car. There is only one vehicle type for each model year of the Prius until 2007, when two higher cost trim levels were introduced.

Prices of identical vehicles vary for several reasons, and the accuracy of the estimation of the tax incidence depends on the degree to which these factors can be accounted for in the regression. First, there is a regular trend in prices over the model year cycle.¹³ I use the number of weeks that a vehicle has been on the market, and this variable squared, to control for the price cycle.

Second, the price of gasoline influences vehicle prices, with lower fuel economy vehicles experiencing a bigger price response to hikes in fuel price (McManus, 2007).¹⁴ I include the weekly national pre-tax wholesale price of gasoline, and this price interacted with dummy variables for whether or not the car is high, medium or low fuel economy.¹⁵ Because the Prius may be uniquely influenced by the price of gasoline, I also include the gas price interacted with a Prius dummy.

Third, other economy wide shocks to demand may cause prices to fluctuate. For this reason, I rely on a difference-in-difference estimation strategy where cars similar to the Toyota Prius are used to pin down the weekly fluctuations in the broader market. I include a dummy variable for every week in the sample. This accounts for seasonal variation and market wide shocks.

Fourth, the available supply of vehicles at a dealership has been shown to influence the price (Zettelmeyer, Fiona Scott Morton and Silva-Risso, 2006). My data do not allow me to construct inventories at individual dealerships, but I am able to construct inventories at the state level. I include in the regression a measure of “days on hand,” defined as the number of cars of a particular model in a state divided by the average number of cars of that model sold in that state per day over the sample period. I also include the square of this measure, and I allow for the Prius to have a unique inventory relationship by including days on hand interactions. This

¹³Corrado et al. (2006) show that the price of a vehicle starts at its highest point and falls steadily, losing 6.1% on average over the model year cycle.

¹⁴Linn and Klier (2007) and West (2007) show a sales response of vehicles to the gasoline price according to fuel economy, whereas McManus (2007) uses transaction data to study the price response.

¹⁵Low fuel economy is defined as less than 25 miles per gallon in the EPA combined rating. Medium is between 25 and 30, and high is greater than 30. A variety of alternative strategies, including the use of various lags and leads of the price of gasoline and the cost per mile (the gasoline price divided by miles per gallon), change the estimates very little.

variable helps account for the times and places in which the Prius was on a waiting list. In such instances, the inventory will be very low. The interacted terms ensure that the low inventory due to high demand is not conflated with low inventory due to the very beginning of the model year for other models.

In addition, there is a regular cyclical component to prices, with slightly lower prices on the weekend and at the end of a month. I include a dummy for the weekend and the end of month to account for this. Relative demand may vary across geographic markets, so I also include state fixed effects. To control for state tax incentives, a measure of the relevant state tax incentives is also included.

The variable of interest then is the value of the federal tax subsidy on the date on which the car was purchased.

This leads to the following estimation equation, in which j subscript a vehicle, s a state and t a time period:

$$P_{jst} = \beta_1 \tau_{jt}^f + \beta_2 \tau_{jst}^s + \beta_3 X_t + \beta_4 X_{jt} + \beta_5 X_{jst} + \mu_j + \gamma_s + \delta_t + \varepsilon_{jst}$$

where P is the transaction price accounting for cash rebates, financing incentives and trade-in allowances (measured in current dollars), τ^f is the federal tax incentive and τ^s is the state tax incentive (measured in current dollars), μ are vehicle specific dummies, γ are state dummies and δ are week dummies. The X matrices are written to indicate at what level they vary. X_t includes a dummy for the weekend and for the end of the month; X_{jt} includes the price of gasoline interacted with fuel economy dummies and vehicle week variables; and X_{jst} includes the days on hand variables.

Table 7 shows the regression results for a variety of specifications. The baseline estimate of the increase in prices that results from a \$1 increase in the federal tax credit is 2.5 cents. The upper bound on the 95% confidence interval is 6.2 cents. The control variables conform closely to expectations. The vehicle cost coefficient is close to one. The vehicle weeks variable is negative, with a positive squared term. Prices are slightly lower on the weekend and at the end of the month. Higher gasoline prices raise the price of high and medium fuel economy vehicles, relative to low fuel economy cars, while the level effect of higher gasoline prices is negative. More cars on hand lowers the price, especially for the Prius. The only unexpected result is on the state tax incentive. As shown below, this variable conforms to expectations in a different specification.

The other columns in table 7 show various specifications. Column 2 shows the result with only Toyota sedans as the comparison group. When vehicle cost is excluded, or when a vehicle

cost interacted with the Prius is included, the federal tax variable changes little. Exclusion of the days to turn variables, for the Prius or for all vehicles, changes the coefficient relatively little. Including a vehicle weeks and vehicle weeks squared term interacted with the Prius also changes things little.¹⁶ Column 8 runs the base specification with prices adjusted for trade allowance and cash rebates, but not financing incentives, on the left-hand side. This also does not change the estimates very much. From all specifications, the highest estimate of the price increase that lies within the 95% confidence interval of any of the specifications is 11.8 cents per federal dollar. These estimates, therefore, are suggestive of a very low price response, implying that consumers capture the vast majority of the subsidy.

The picture changes somewhat when, instead of including the federal tax value at all points in time, I include dummies for each time period in which the federal tax differs, interacted with a Prius indicator. Table 8 shows this alternative. This specification allows the price pass through to be different for each of the regimes. The omitted category is the deduction phase, prior to January 2006. We would expect, therefore, that the value on the full credit dummy to be positive. It is, instead, slightly negative. The coefficients on the phase out periods should be less than the full credit period. This is indeed true. The coefficients imply that prices fell by 21.7 cents for every federal dollar during the phase out.

This heterogeneity is plausibly explained by the changed availability of the Prius. In 2004, 2005 and much of 2006, the Prius was a wait listed vehicle at many dealerships. This implies that prices were already too low for market demand. An increase in demand, therefore, was unlikely to have much of an effect. It is illegal for a dealer to charge more than the manufacturer's suggested retail price without affixing an additional sticker that indicates that an "additional dealer markup" or "additional dealer profit" has been added to the price. Some dealers sold the Prius at a markup during this phase, but many dealerships chose to sell vehicles from a waiting list at sticker price.¹⁷ By the time that the phase-out began, wait lists had disappeared in most markets, and the price was therefore more flexible.

Overall, changes in the federal tax credit have influenced the price of the Prius by less than 12 cents per dollar of the credit. The effect was larger, however, during the phase-out. This

¹⁶Including a specific vehicle trend for each different Prius, however, flips the sign of the federal tax variable. This indicates that the slope of the model year cycle is an important component of the price effect that is being attributed to the coefficient in these specifications.

¹⁷This is supported both by media accounts (Automotive News, 2006; USA Today, 2006a) and by my tabulations. Using a subsample of data that includes factory sticker prices, I find that over 60% of Priuses were sold at the sticker price between 2004 and 2006, with about two-thirds of the remaining cars sold above sticker price.

larger estimate still implies that consumers captured the majority of the benefit. The larger estimate is probably a better guide to future tax changes for the Prius, since the market has loosened.

Federal tax policies were supplemented by state incentives. These state policies provide an opportunity to verify the pass through results, using a state panel research design.

The regressions in table 9 are on a sample of just Priuses, with week dummies and state dummies. They also include all controls from the above regressions that vary across states, within a week. Thus, the coefficient on the tax variable is determined directly by those states which experience a policy change in the sample period, with the non-changing states aiding in the estimation of time period effects. Of the twelve states with tax incentives for the Prius, only eight experienced a change in the sample period: Connecticut, Maine, Maryland, New Mexico, New York, Pennsylvania, South Carolina and West Virginia. This is not a random selection of states. State incentives are clearly associated with political ideology. The timing of such policies, however, is more plausibly exogenous, and it is this variation in timing that drives the regressions.

Table 9 reports the results. The first column shows an estimate remarkably similar to the federal tax estimate above - a point estimate of 2.2%. Sensitivity analysis revealed that the coefficient was very sensitive to the inclusion of New York. New York had a very generous income tax credit and a sales tax exemption, both of which had expired by the spring of 2005. In specifications excluding New York, state tax incentives are shown to have a modest effect on price, around 12 cents per dollar of federal subsidy.

Table 9 also includes specifications that separate sales tax exemptions from income tax credits. The income tax credit is identified by only Pennsylvania and South Carolina. Nevertheless, a test for the equality of the state credit and state exemption coefficients has a p-value of .03. In general, these results are consistent with the results from the federal credit: consumers capture at least 80% of tax incentives on the Prius. The number appears to be even higher for income tax incentives. A higher pass through for the sales tax, which is paid at the time of the transaction, than the income tax, which must be filed later, is broadly consistent with the tax salience results of Chetty et al. (2007).

6 Discussion and Conclusion

The Energy Policy Act of 2005 was intended to raise the number of hybrids sold. The increase in the number of Priuses sold within a model year, however, is not easily identified from transaction

data, because there is no simple way to construct a counterfactual production schedule. There are reasons to believe, however, that the policy did not substantially increase the number of Priuses on the road. First, the Prius was already on a wait list in most locations prior to the introduction of the credit. The market for the Prius remained tight while the credit was in full effect. One might thus suspect that there may have been more Priuses sold during the phase-out period because of the credit. Even during the phase-out, however, the gross margin on the Prius remained considerably higher than other Toyota sedans, as can be seen in figures 8, 9 and 10. Thus, Toyota dealers would likely still prefer to have more Priuses than other sedans, even at the end of the phase out. This implies that at current production levels, the Prius still yields a higher return than other models, suggesting that the model year increases in production capacity are limited not by a lack of demand, but by other considerations, such as plant utilization or major fixed costs. This does not mean that the policy had no effect on the quantity of Priuses sold, but it casts doubt on the likelihood that this effect was large.

As a result, tax subsidies for the Toyota Prius are probably best understood as an example of tax policy being used to reward individuals for specific behaviors. As such, the incidence of the tax gains importance. Overall, the evidence presented here shows that there was considerable, but perhaps not complete, awareness of the tax policy and a shift in transaction timing in response to tax changes. Consumers who shifted their transaction time differ in ways from those who purchased on the low subsidy side of a change in ways that suggest that the shifters are more sophisticated. Buyers captured a majority of the benefit, with all estimates suggesting that buyers retained 80% or more of the tax subsidy.

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Figure 1: Google Trends Chart of Searches for "Hybrid Tax Credit"

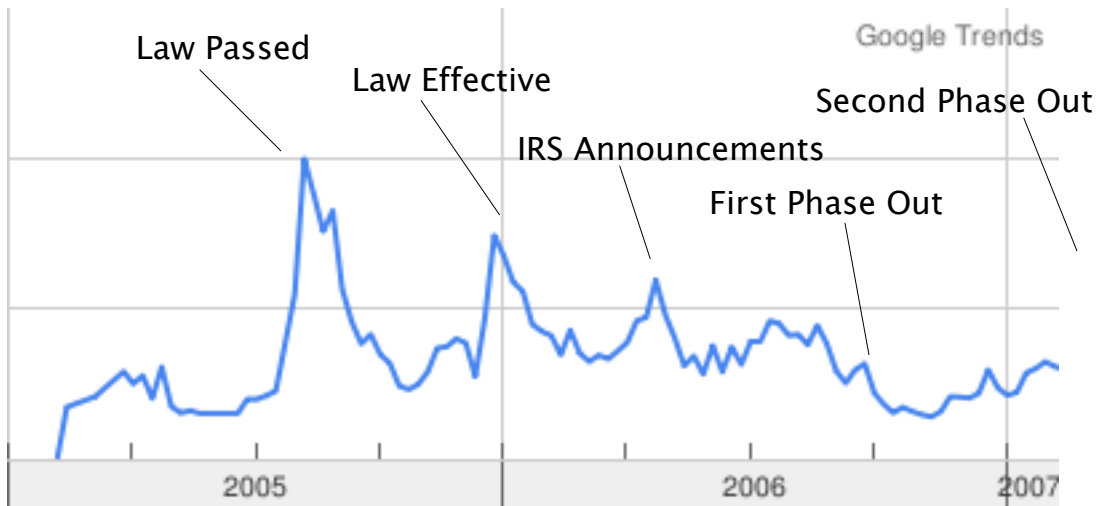


Figure 2: Distribution of Sales December 2005 and January 2006 (Prius & Toyota Sedans)

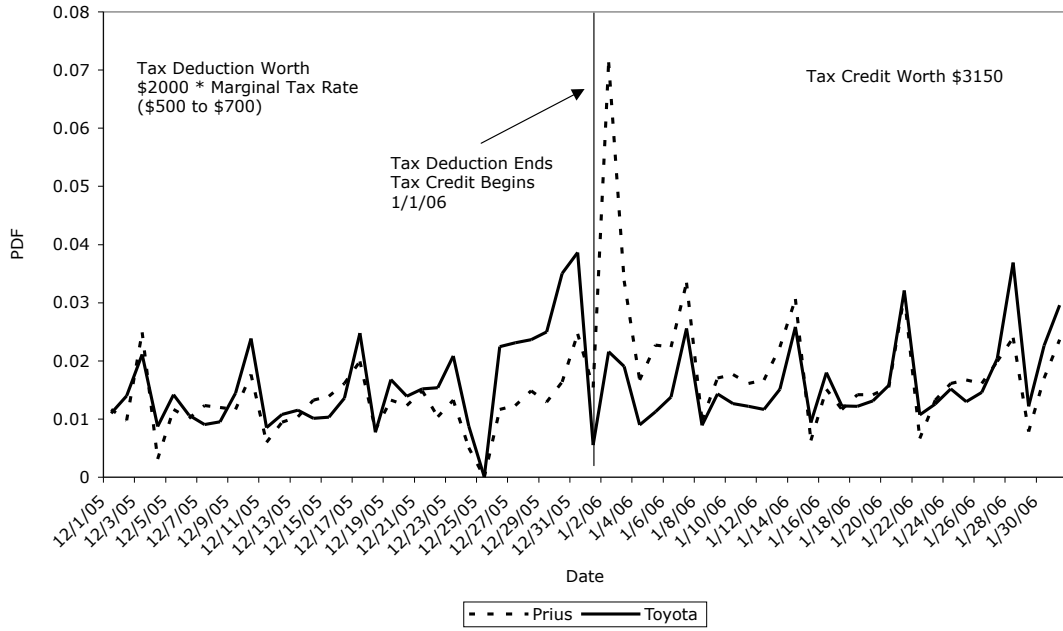


Figure 3: Distribution of Sales December 2004 and January 2005 (Prius & Toyota Sedans)

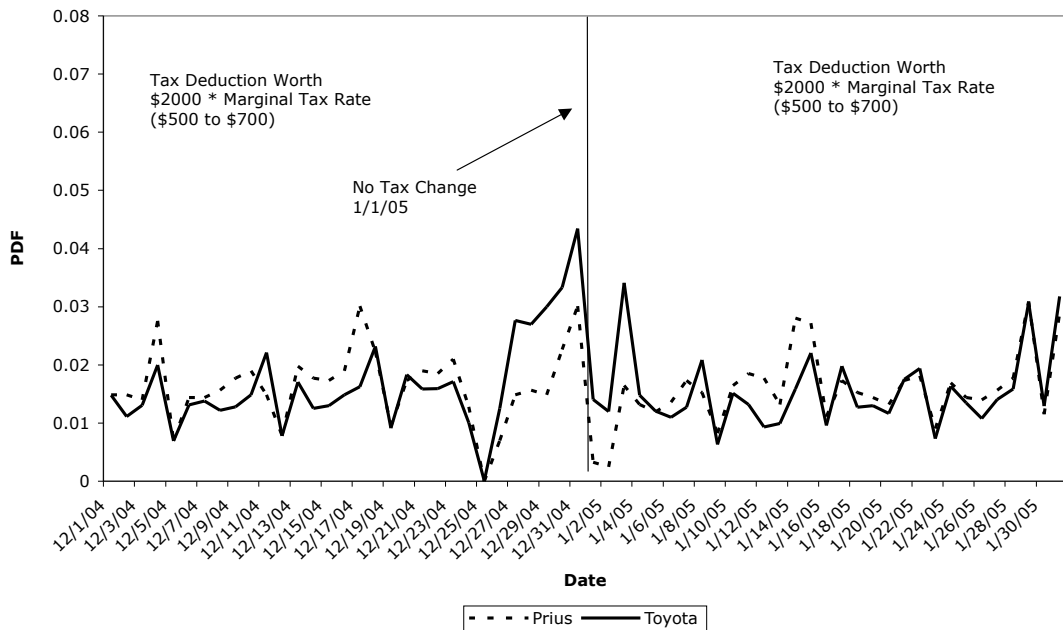


Figure 4: Distribution of Sales September and October 2006 (Prius & Toyota Sedans)

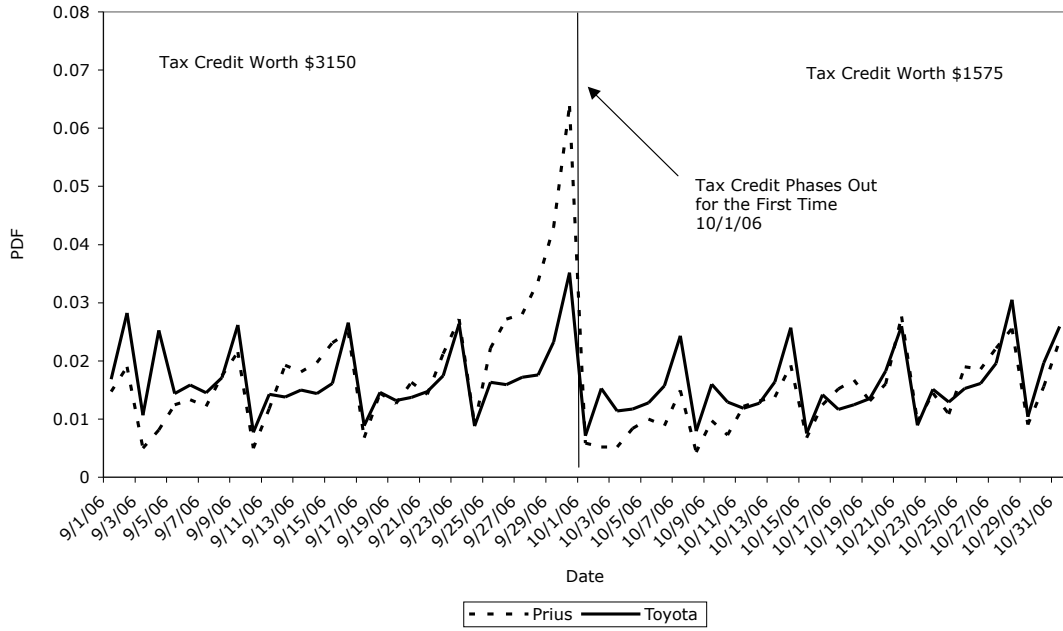


Figure 5: Distribution of Sales September and October 2005 (Prius & Toyota Sedans)

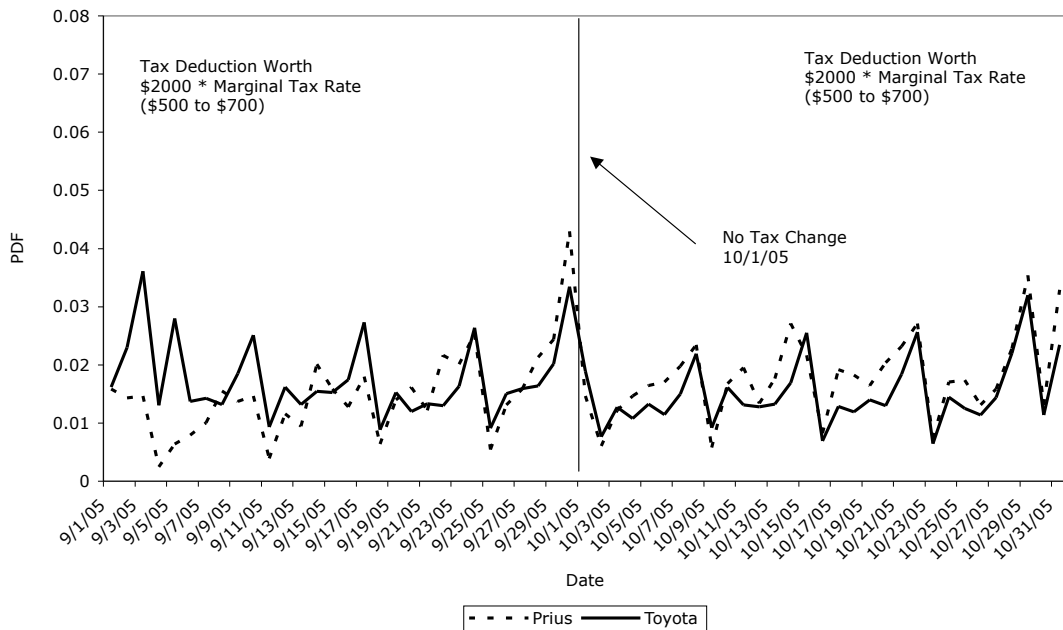


Figure 6: Distribution of Sales March and April 2007 (Prius & Toyota Sedans)

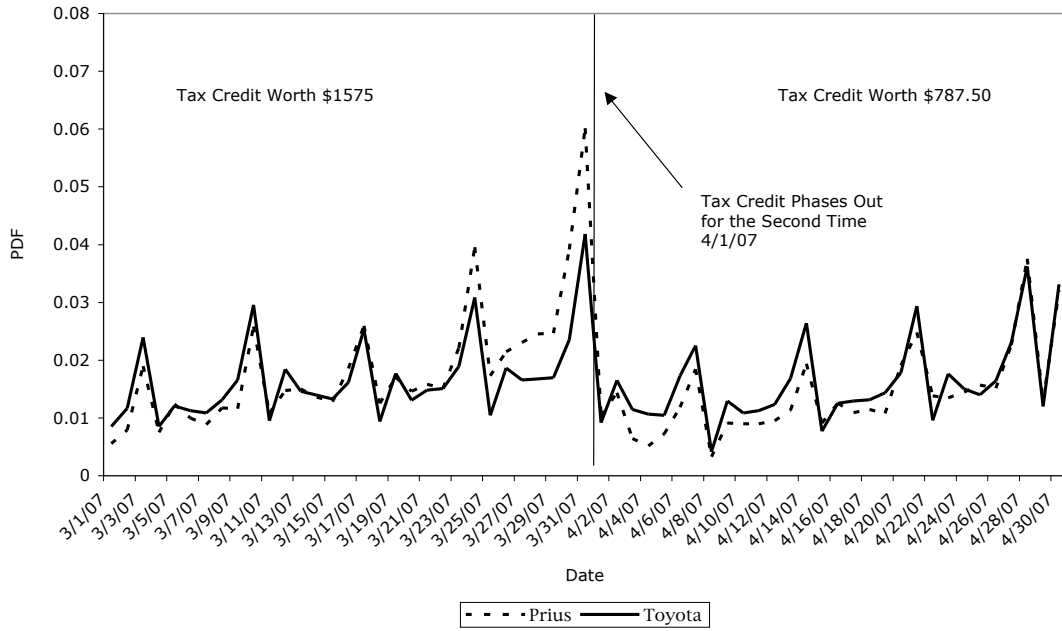


Figure 7: Distribution of Sales March and April 2006 (Prius & Toyota Sedans)

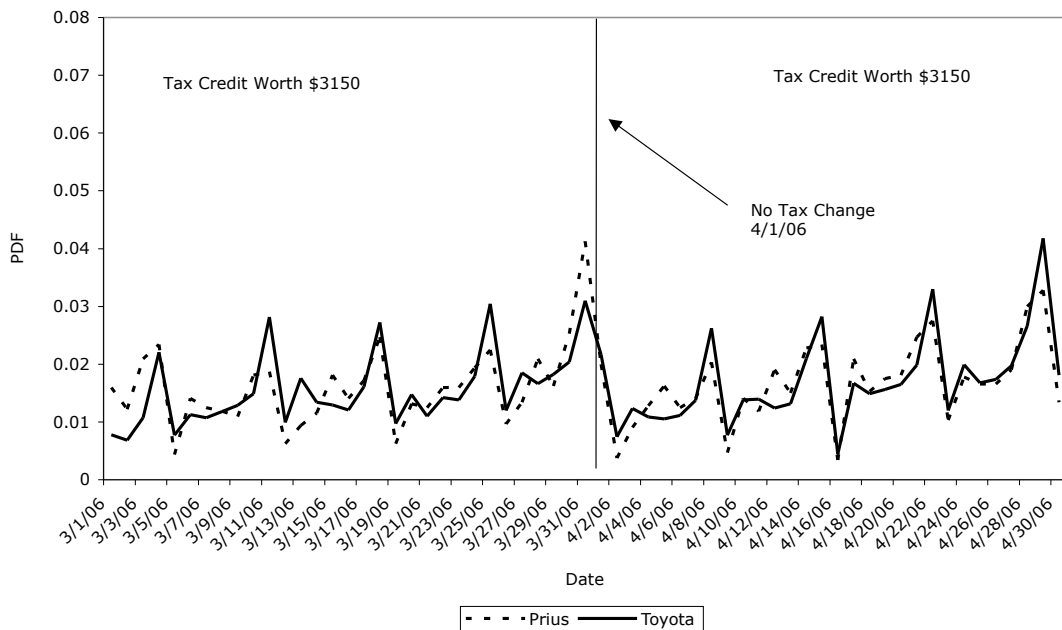


Figure 8: Moving Average of Gross Adjusted Profit September and October 2006 (Prius and Toyota Sedans)

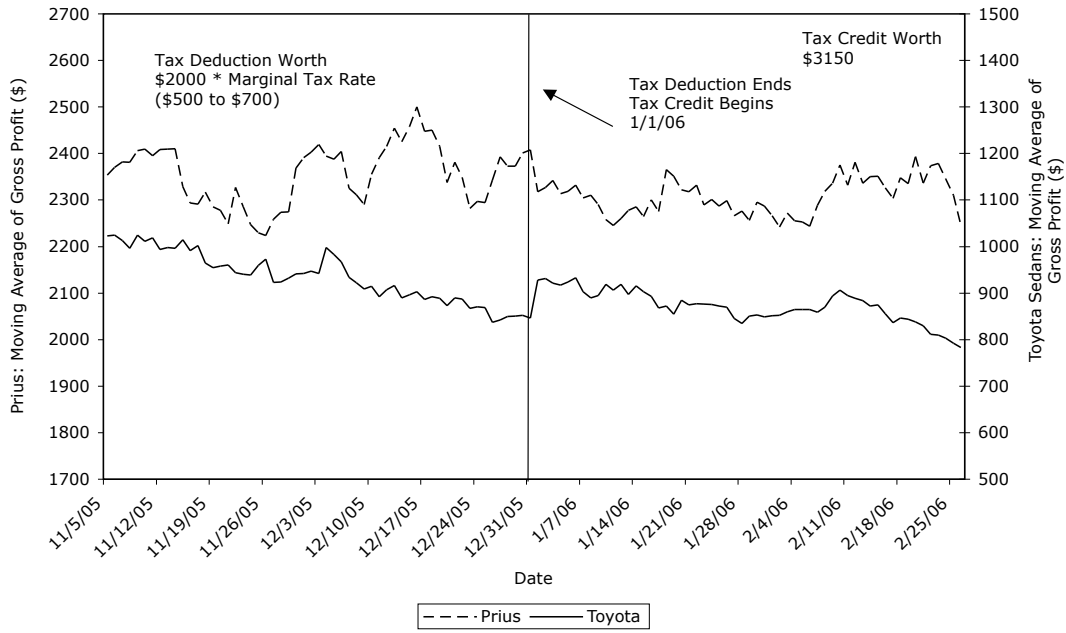


Figure 9: Moving Average of Gross Adjusted Profit September and October 2006 (Prius and Toyota Sedans)

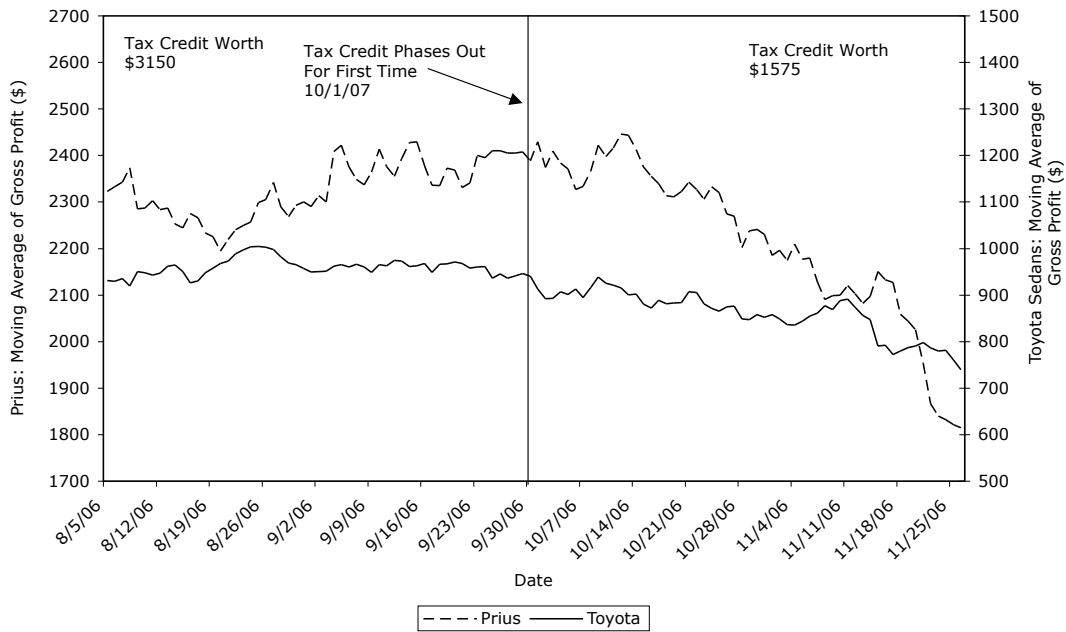


Figure 10: Moving Average of Gross Adjusted Profit March and April 2007
(Prius and Toyota Sedans)

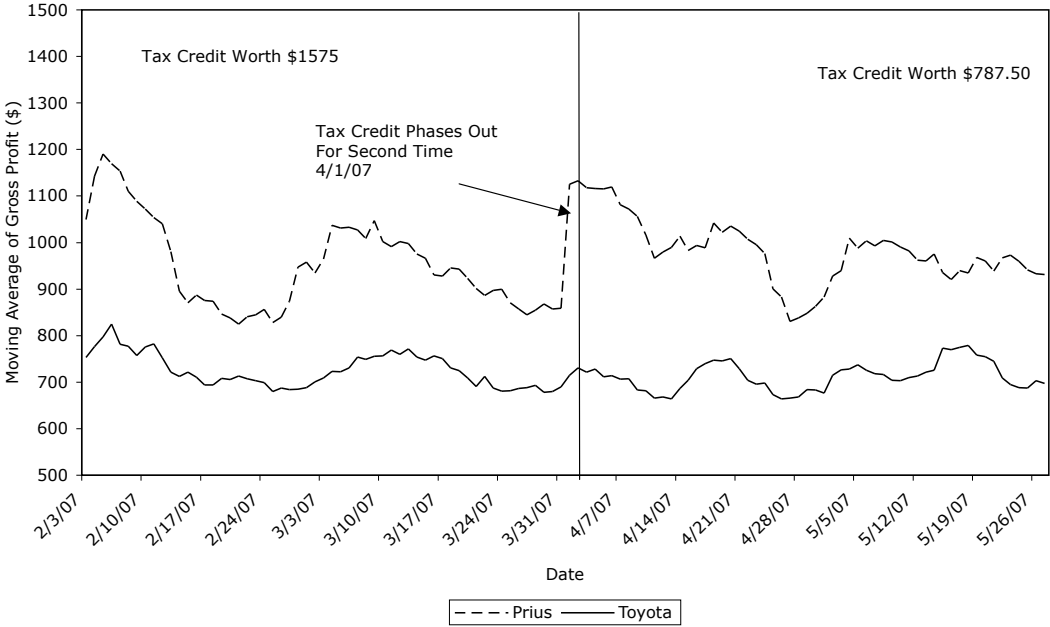


Table 1: State Tax Incentives for the Toyota Prius

State	Subsidy Type	Amount	Start Date	End Date
Connecticut	Full Sales Tax Exemption	6% (\$1500)	10/1/04	Still Effective
Colorado	Income Tax Credit	\$3150 to \$4622	7/1/00	Still Effective
Louisiana	Income Tax Credit	2% (\$500)	1991	Still Effective
Maryland	Partial Sales Tax Exemption	\$1000 max	7/1/00	7/1/04
Maine	Partial Sales Tax Exemption	2.5% (\$625)	1997	12/31/05
New Mexico	Full Sales Tax Exemption	3% (\$750)	7/1/04	Still Effective
New York	Partial Sales Tax Exemption	\$240	1/1/01	2/28/05
New York	Income Tax Credit	\$2000	1/1/01	12/31/04
Oregon	Income Tax Credit	\$1500	1/1/98	Still Effective
Pennsylvania	Rebate	\$500	3/25/05	Still Effective
South Carolina	Income Tax Credit	\$630	1/1/06	Still Effective
Washington, D.C.	Full Sales Tax Exemption	7% (\$1750)	4/15/05	Still Effective
West Virginia	Income Tax Credit	\$3150 to \$3750	7/1/97	6/30/06

For full sales tax exemptions, the value of the exemption on a \$25,000 car is included in parentheses, for ease of comparison.

Table 2: States with the Most Priuses, as Percentage of New Car Market

Rank	State
1	Maine
2	California
3	Washington
4	Virginia
5	Oregon
6	Massachusetts
7	Colorado
8	Washington, D.C.
9	Iowa
10	Maryland

Table 3: Descriptive Statistics of Prius Buyers

	Prius	New Car Market	Premium Midsize Sedans
Mean Age	51	46	49
Percent Female	39.9%	35.1%	43.3%
Percent with Trade-In	30.7%	46.7%	45.5%
Annual Miles on Trade-In	12,799	13,687	13,118

Sample includes model years 2002 to 2007.

Table 4: Average Federal and State Subsidies of the Prius by Model Year

Model Year	Mean Federal Subsidy	Mean State Subsidy	Mean Price	Subsidy / Price
2002	540	294	21,211	3.9%
2003	500	275	21,159	3.7%
2004	500	181	24,489	2.8%
2005	509	153	25,091	2.6%
2006	2990	121	26,357	11.8%
2007	1353	121	25,028	5.9%

All prices are in nominal dollars.

All subsidies are calculated assuming full receipt of benefits.

I use a marginal federal income tax rate of 27% in 2002 and 25% in 2003-5. This is the rate that applies for a married, filing jointly, payer with income between \$47,000 and \$113,000 in 2002; \$57,000 to \$115,000 in 2003, \$58,000 to \$117,000 in 2004; and \$59,000 to 120,000 in 2005.

Table 5: Differences in Sales Share Near Tax Changes

	Sales Share Two Weeks Before Change Minus Sales Share Two Weeks After Change	Sales Share Rest of First Month Minus Sales Share Rest of Second Month
PRIUS		
December 2005 & January 2006	-18%	-6%
September 2006 & October 2006	20%	-3%
March 2007 & April 2007	20%	-4%
OTHER TOYOTA SEDANS		
December 2005 & January 2006	6%	-7%
September 2006 & October 2006	4%	0%
March 2007 & April 2007	7%	-3%
DIFFERENCE IN DIFFERENCE (PRIUS MINUS OTHER TOYOTA)		
December 2005 & January 2006	-24%	2%
September 2006 & October 2006	16%	-3%
March 2007 & April 2007	13%	-2%

All sales shares are based on the total sales over the two month period surrounding the tax change.

Table 6: Mean Characteristics Near Tax Change, and Difference-in-Difference Estimates

		High Subsidy Prius Buyers within 14 Days of Change	Low Subsidy Prius Buyers within 14 Days of Change	Difference-in-Difference Between Prius and Other Toyota Sedans	P-value
DEMOGRAPHICS					
Percent Female	Dec - Jan	39.0%	35.7%		
	Sept - Oct	43.3%	41.9%	0.0135	0.364
	Mar - Apr	40.3%	40.1%		
Age (Years)	Dec - Jan	50.32	51.61		
	Sept - Oct	49.93	50.15	-1.278	0.008
	Mar - Apr	50.02	50.99		
TRADE-IN DATA					
Percent with Trade-In	Dec - Jan	27.8%	32.1%		
	Sept - Oct	28.0%	31.8%	-0.0621	<.000
	Mar - Apr	38.0%	43.4%		
Trade-In Vintage (Year)	Dec - Jan	2000.01	2000.02		
	Sept - Oct	2000.69	2000.98	-0.3979	0.033
	Mar - Apr	2000.77	2001.32		
Trade-In Allowance (\$)	Dec - Jan	-84.9	-90.8		
	Sept - Oct	-25.2	30.6	-16.1	0.815
	Mar - Apr	86.2	79.9		
CONTRACT DETAILS					
Dealer Gross Profit (\$)	Dec - Jan	2276	2368		
	Sept - Oct	2385	2396	-134	<0.001
	Mar - Apr	870	1052		
Total Down (\$)	Dec - Jan	5262	6124		
	Sept - Oct	5717	5835	-609	0.001
	Mar - Apr	4525	5031		
Percent with Service Contract	Dec - Jan	38.2%	46.2%		
	Sept - Oct	42.8%	48.4%	-0.0458	<.001
	Mar - Apr	43.8%	46.6%		
Service Contract Profit (\$)	Dec - Jan	598	751		
	Sept - Oct	706	831	-92.2	<.001
	Mar - Apr	729	784		
Total Cost of After-Market Options (\$)	Dec - Jan	2795	3064		
	Sept - Oct	2986	3215	-165.63	<.001
	Mar - Apr	2856	2973		
Average Dealer Interest Rate Above Buy Rate	Dec - Jan	0.207	0.264		
	Sept - Oct	0.211	0.261	-.082*	<.001
	Mar - Apr	0.048	0.230		

* The coefficient excluding the March - April change, in which Toyota changed a financing incentive, is -.033 with a p-value of .287.

The difference-in-difference coefficient is the coefficient on a dummy equal to one if a vehicle is a Prius purchased in the high tax value window, with dummies for each month and dummies for each two-month window interacted with a Prius dummy.

Table 7: Estimation of the Pass Through of the Federal Tax Credit to the Incentive Adjusted Price of New Automobiles

	1	2	3	4	5	6	7	8
Federal Tax Value (\$)	0.025 (0.018)	0.050 (0.030)	0.069 (0.030)	0.032 (0.018)	0.070 (0.022)	0.078 (0.019)	0.013 (0.019)	0.013 (0.020)
Credit at Full Value (\$3150)								
Credit at Half Value (\$1575)								
Credit at Quarter Value (\$787.50)								
State Tax Incentive (\$)	-0.101 (0.019)	-0.063 (0.022)	-0.168 (0.024)	-0.095 (0.018)	-0.107 (0.020)	-0.108 (0.020)	-0.101 (0.019)	-0.095 (0.014)
Vehicle Cost (\$)	0.990 (0.061)	1.072 (0.023)		0.866 (0.036)	0.991 (0.061)	0.991 (0.061)	0.990 (0.061)	0.992 (0.060)
Vehicle Cost Interacted * Prius Dummy (\$)				0.229 (0.035)				
Weeks Type of Vehicle Has Been Available	-10.4 (11.6)	5.4 (14.5)	-5.2 (10.4)	-9.3 (11.5)	-8.7 (12.0)	-9.0 (11.9)	-9.6 (12.7)	-12.5 (8.5)
Weeks Type of Vehicle Has Been Available Squared	0.194 (0.070)	0.233 (0.070)	0.024 (0.045)	0.169 (0.063)	0.196 (0.070)	0.204 (0.070)	0.180 (0.076)	0.180 (0.058)
Weeks Type of Vehicle Has Been Available * Prius Dummy							-10.8 (5.25)	
Weeks Type of Vehicle Has Been Available Squared * Prius Dummy							0.285 (0.103)	
Weekend Dummy	-68.3 (8.0)	-66.9 (12.2)	-66.3 (12.1)	-66.1 (8.1)	-65.2 (7.5)	-64.1 (7.5)	-67.9 (8.2)	-2.8 (9.6)
End of Month Dummy	-58.1 (17.0)	-35.7 (19.0)	-53.1 (23.1)	-59.5 (16.8)	-58.2 (17.2)	-58.2 (17.2)	-58.4 (17.0)	-48.3 (11.8)
Gas Price * Prius	0.7 (3.3)	6.1 (0.7)	-0.5 (4.5)	-0.2 (3.3)	1.8 (3.3)	1.8 (3.4)	2.8 (3.1)	2.6 (3.1)
Gas Price * High Fuel Economy Vehicle	9.8 (3.8)	2.2 (1.3)	10.4 (3.8)	10.0 (3.7)	9.6 (3.8)	9.9 (3.8)	9.9 (3.8)	4.7 (3.3)
Gas Price * Medium Fuel Economy Vehicle	5.7 (2.4)	2.3 (0.5)	2.5 (2.9)	5.2 (2.3)	5.8 (2.3)	5.6 (2.4)	5.7 (2.3)	3.7 (2.1)
Gas Price	-13.5 (3.2)	-8.4 (4.2)	-15.6 (4.5)	-12.9 (2.9)	-13.6 (3.2)	-13.5 (3.2)	-14.2 (3.1)	-5.5 (3.8)
Days on Hand	-0.350 (0.843)	-0.096 (1.954)	-0.220 (1.052)	-0.286 (0.841)	-1.817 (1.241)		-0.729 (0.887)	-0.811 (0.787)
Days on Hand Squared	0.001 (0.002)	0.006 (0.011)	0.001 (0.003)	0.001 (0.002)	-0.004 (0.004)		0.000 (0.003)	-0.002 (0.002)
Days on Hand * Prius Dummy	22.4 (4.2)	19.5 (3.7)	32.5 (6.6)	21.3 (3.3)			21.1 (3.4)	19.2 (3.7)
Days on Hand Squared * Prius Dummy	-0.192 (0.029)	-0.179 (0.022)	-0.287 (0.055)	-0.180 (0.021)			-0.185 (0.023)	-0.151 (0.027)
Observations	184,860	104,583	184,860	184,860	184,860	184,861	184,860	184,860
Sample Restriction		Only Toyotas						
Includes Vehicle Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Includes Dummy for Each Week in Sample	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Includes State Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Different Vehicles	560	134	564	560	560	560	560	560
R-squared Within Group (Vehicles)	0.44	0.58	0.03	0.44	0.44	0.44	0.44	0.62

Robust standard errors in parentheses, clustered at the model level.

Sample includes cars from model years 2003 to 2007, sold between January 1, 2003 and April 30, 2007.

The left-hand side variable in columns 1-7 is the vehicle price, net of trade allowance, manufacturer's customer rebate and interest subvention.

Column 8 includes uses the vehicle price, net of trade allowance and manufacturer's customer rebate, but does not adjust for financing incentives.

Table 8: Alternative Specification of the Pass Through of the Federal Tax Credit on Incentive Inclusive New Vehicle Prices

	1	2
Federal Tax Value (\$)	0.025 (0.018)	
Treatment Dummy 1: Credit at Full Value (\$3150)		-132 (68)
Treatment Dummy 2: Credit at Half Value (\$1575)		-516 (104)
Treatment Dummy 3: Credit at Quarter Value (\$787.50)		-644 (135)
State Tax Incentive (\$)	-0.101 (0.019)	-0.102 (0.019)
Vehicle Cost (\$)	0.990 (0.061)	0.990 (0.061)
Weeks Type of Vehicle Has Been Available	-10.4 (11.6)	-9.9 (11.7)
Weeks Type of Vehicle Has Been Available Squared	0.194 (0.070)	0.190 (0.069)
Weekend Dummy	-68.3 (8.0)	-67.6 (7.9)
End of Month Dummy	-58.1 (17.0)	-58.9 (16.8)
Gas Price * Prius	0.7 (3.3)	1.5 (3.3)
Gas Price * High Fuel Economy Vehicle	9.8 (3.8)	9.8 (3.7)
Gas Price * Medium Fuel Economy Vehicle	5.7 (2.4)	5.6 (2.3)
Gas Price	-13.5 (3.2)	-13.6 (3.2)
Days on Hand	-0.350 (0.843)	-0.342 (0.826)
Days on Hand Squared	0.001 (0.002)	0.001 (0.002)
Days on Hand * Prius Dummy	22.4 (4.2)	20.5 (4.1)
Days on Hand Squared * Prius Dummy	-0.192 (0.029)	-0.179 (0.028)
Observations	184,860	184,860
Includes Vehicle Dummies	Yes	Yes
Includes Dummy for Each Week in Sample	Yes	Yes
Includes State Dummies	Yes	Yes
Number of Different Vehicles	560	560
R-squared Within Group (Vehicles)	0.44	0.44

Robust standard errors in parentheses, clustered at the model level.

Sample includes cars from model years 2003 to 2007, sold between January 1, 2003 and April 30, 2007.

The left-hand side variable is the vehicle price, net of trade allowance, manufacturer's customer rebate and interest subvention.

Table 9: The Pass Through of State Incentives on the Incentive Adjusted Price of New Priuses

	1	2	3	4
Total State Tax Incentive (\$)	0.022 (0.029)	0.122 (0.037)		
State Income Tax Credit (\$)			-0.077 (0.04)	0.014 (0.06)
State Sales Tax Exemption (\$)			0.174 (0.05)	0.182 (0.05)
Vehicle Cost (\$)	1.09 (0.01)	1.09 (0.01)	1.09 (0.01)	1.09 (0.01)
Weeks Type of Vehicle Has Been Available	49.2 (27.0)	44.6 (27.0)	49.4 (27.0)	44.7 (27.0)
Weeks Type of Vehicle Has Been Available Squared	0.051 (0.05)	0.069 (0.05)	0.048 (0.05)	0.067 (0.05)
Weekend Dummy	-72.1 (16.2)	-71.9 (16.2)	-72.1 (16.1)	-71.9 (16.3)
End of Month Dummy	-37.0 (28.5)	-36.3 (28.3)	-37.3 (28.5)	-36.3 (28.3)
Days on Hand	-11.9 (1.8)	-11.7 (1.9)	-12.0 (1.8)	-11.7 (1.9)
Days on Hand Squared	-0.13 (0.02)	-0.13 (0.02)	-0.13 (0.02)	-0.13 (0.02)
Observations	66,486	64,945	66,486	64,945
Sample Restriction		New York Excluded		New York Excluded
Includes Dummy for Each Week in Sample	Yes	Yes	Yes	Yes
Includes State Dummies	Yes	Yes	Yes	Yes
R-squared Within Group (Weeks)	0.66	0.66	0.66	0.66

Robust standard errors in parentheses, clustered at the model level.

Sample includes Priuses from model years 2003 to 2007, sold between January 1, 2003 and April 30, 2007.

The left-hand side variable in columns 1-7 is the vehicle price, net of trade allowance, manufacturer's customer rebate and interest subvention.