Senior Project

Department of Economics

The Effect of Vehicle Property Tax on Car Sales in South Carolina

Yuzhe Du

Spring 2024

Advisor: *Dr. Ali Enami*

Abstract

A property tax is an ad valorem tax on the value of a property calculated in the percentage of its fair market value just like real estate property tax which is introduced to some states in United States. This paper investigates the effect of vehicle property tax on car sales in South Carolina. Using data from the U.S. Department of Transportation and South Carolina Legislation online from 1984 to 2018 using a two-way fixed effects difference-indifferences model, I ended with the result that one percentage point increase in vehicle property tax rate will cause vehicle sales to drop by 27707(1.44%) in South Carolina compare with states without vehicle property tax. Because there is a lack of studies about vehicle property tax and car sales, my finding contributes to the literature by providing analysis on an area that rarely anyone has analyzed, and this will provide helpful insight to policymakers concerning the financial of local and state government based on changing vehicle demand.

Table of Contents

I. Introduction

A property tax is an ad valorem tax on the value of a property calculated in the percentage of its fair market value just like real estate property tax. While it serves the same purpose as real state property tax-to finance local or state government, many states have eliminated that tax over the years. South Carolina still has vehicle property tax while Ohio is one of the states that doesn't have vehicle property tax.

As one of the states that collects vehicle property tax using the same rate over the entire state, South Carolina adjusted its vehicle property tax rates in 2001. In 1976, the general assembly of South Carolina enacted a joint resolution proposing to amend article X of the S.C constitution to provide for assessments of the fair market value of the property. This states the property tax of all personal property including vehicles excluding real and personal property owned and leased by companies who transport property or people to be 10.5% by 2001. By Act 10 of 2001, Art. X, § 1 was amended so that property tax on personal motor vehicles is being reduced by 0.75% yearly until it reaches a 6% assessment ration in 2007.

Studies show that tax reduces market size and creates deadweight loss (Craft and Schmidt, 2005). Craft and Schmidt (2005) discover that high vehicle property tax is expected to reduce new cars owned per family.

This paper aims to study the effect of vehicle property tax on car sales in South Carolina by provides estimates of the effect of vehicle property tax on vehicle sales by comparing the change in car sales in states without vehicle property tax with South Carolina using two-way fixed difference in difference method. The control group is states without property tax over years. The treatment group is South Carolina. There is a lack of studies about vehicle property tax and car sales with an exception by Craft and Schimt (2005). My analysis uses a different method-

difference-in-difference by comparing between states and this adds to the literature by analyzing a topic that rarely anyone has looked at.

This paper uses two main datasets: the first dataset consists of vehicle sales by state by year from 1984 to 2018 from the Department of Transportation; the second dataset contains different rate of vehicle property tax rates for South Carolina from 1984 to 2018.

The results presented in linear regression model for this paper align with my hypothesis that an increase in vehicle property tax will cause car sales to drop in South Carolina that one percentage point increase in vehicle property tax rate will cause vehicle sales to drop by 27707(1.44%) in South Carolina compared with states without vehicle property tax. However, when running another log-linear model, the result shows that increasing vehicle property tax rates increase vehicle sales which aligns with the results from Craft and Schmidt (2005). By considering the trend line does not look like a log function, I decided that the linear model or the level result is the most preferred model to use in my case.

The remainder sections of this paper are organized as follows: Section 2 provides some literature review on the impact of property tax on other properties and impact of different taxes on car sales; Section 3 describes the data used to illustrate the correlation; Section 4 discusses the theory and methodology; Section 5 presents the results; Section 6 summarizes; Section 7 contains references.

II. Literature Review

Vehicle property tax works the same as real estate property tax. While it serves the same purpose as real state property tax-to finance local or state government, many states have eliminated that tax over the years. There are still states with vehicle property tax or some tax serving the same purpose with a different name. However, there is little study on the effect of vehicle property tax on car sales.

Vehicle ownership relates to many factors like income and population. Income plays a significant role in affecting vehicle demand. Studies show that vehicle demand increases with income per capita, but the relationship is not linear (Dargay and Sommer, 2007). Joyce (2001) mentions that income elasticity is high for middle-level income people but then drops with rising car ownership. Both studies show a positive relationship between income and car demand. Analysis has also shown on the effect of carpooling on car sales in German cities One Free-Floating Car Sharing vehicle reduces annual new car sales by around 3 vehicles or 1.5% overall (Schmidt, 2020).

Tax also plays a role in affecting vehicle demand as well. Analysis by comparing tax reduction policies between China and US reveals that both policies stimulate vehicle sales while the US policy is better at expensive cars and the Chinese policy is better at cheaper vehicles (Chan and Liang,2014). A sales tax can influence the number of car sales as well. Chen and Shum (2010) discover when the tax rate decreases from 20% to 0%, there will be a 3% increase in the production of new vehicles.

For recent decade, electric vehicles have become increasingly popular all around the world. Many countries have implemented subsidies on it to stimulate its sales to bring lower CO2 emissions. With the implementation of new subsidy policy in China, there is an annual increase

of 120% in EV sales from 2009 to 2018 (Ma et al. 2019). Wu et al (2023) also find that subsidies not only have a positive impact on number of EVs, but also a small positive impact on traditional vehicles. In Germany, a subsidy is given in 2009 that results in 84% more new registration of small cars (Scharf et al. 2020). In Japan, an "Eco-car program" become the driving force of promotion of various kinds of electric vehicles (Wang and Matsumoto, 2022). Wang and Matsumoto (2022) find that higher income households are more likely to purchase a new vehicle if a subsidy becomes available. With a subsidy program in place, consumers who are hesitating are more likely to purchase an EV because of lower price and cost of driving which increases the total sales of cars (Ma et al. 2019; Wang and Matsumoto, 2022).

In European countries, studies have been done on registration tax on low emission cars to incentivize their sales. (Anna and Marcus, 2017) Alice and Marcus (2017) discover the effect that a rebate on low emission cars will incentivize the sales for those. This will even result in an increase in CO2 emissions. There have been several studies on how Norway uses tax to manipulate vehicle sales to achieve lower emissions. The Norway government takes an approach in 2007 by reforming vehicle registration tax to resolve environmental effect of car emissions (Alice, 2018). Alice (2018) states that consumers pay 40000 NOK if they purchase a vehicle that is fuel inefficient.

For policy makers concerned about state revenue loss after changing vehicle property tax, the method Virginia used is to decrease the tax rate gradually over 5 years. Laura (2005) points out that if state revenue does not rise by at least 5 percent when the tax rate goes down, the tax reduction remains at the same level for a year. This change is assessed every year until the state has sufficient general fund revenues.

In the study done on the impact of vehicle property tax on car demand by Craft and Schmidt (2005), they reveal one percentage point increase in the effective vehicle property tax rate results in 12.3% new cars per family, while increasing the total number of vehicles per family by 5.5%. This then raises concerns to policy makers that old cars are expected to have greater CO2 emissions unlike new cars with low gas emissions. By researching the impact of changing vehicle property tax has on car sales, my analysis would provide a more recent and accurate result comparing with Craft and Schmidt (2005) Alike them, this paper would control for population and income to eliminate their effect on car sales. This paper in addition includes the comparison between the change in vehicle sales in South Carolina and the change in vehicle sales in other states without a vehicle property tax. My paper adds to the literature because this topic is rarely analyzed by anyone else. Policy makers can use the results to identify whether it is efficient and effective to increase property tax or decrease property tax. The result on car sales for this paper also provides researchers with ideas on environmental factors such as air quality and traffic congestion because of changing car sales.

III. Data Analysis

This paper uses data from two primary sources: annual motor vehicle registration by vehicle type and state from the U.S. Department of Transportation (USDT, 2020) and the vehicle property tax for different years on South Carolina Legislation Online (SCLO). Because South Carolina starts calculating vehicle property tax separately from personal properties, this paper focuses on comparison between control group and South Carolina of the number of vehicle registration from 1976 to 2018. However, failure to collect median income for each state before 1984 results in narrowing the comparison to be between 1984 and 2018.

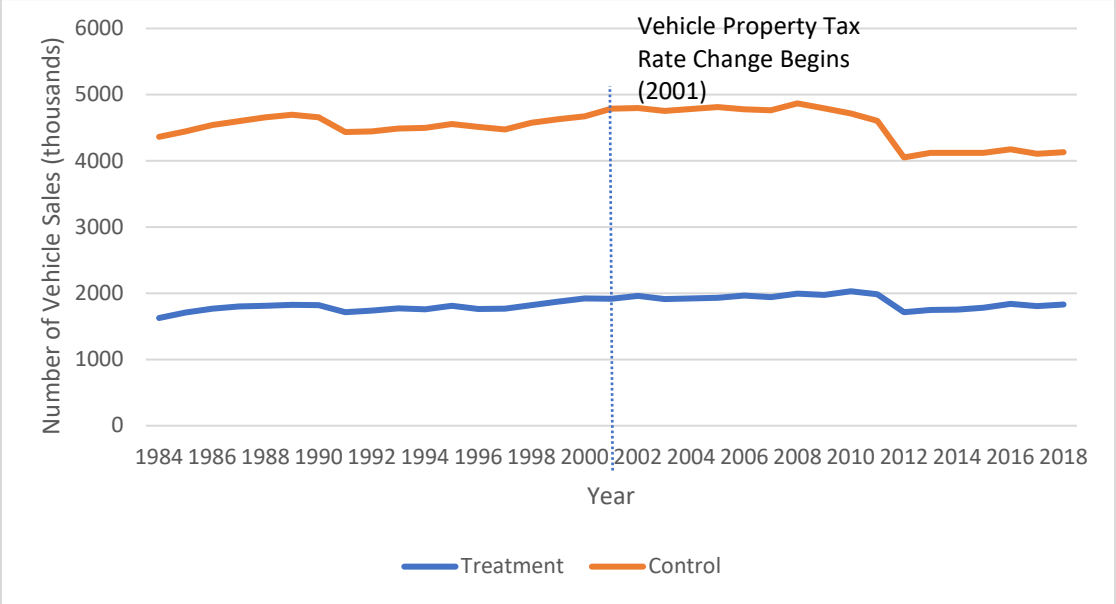
Table 1: Summary Statistics

Variable	Availability	Nobs	Mean	Std Dev	Minimum	Maximum
Auto	1984-2018	805	2794183.81	2654676.81	160090.00	8973047.00
Truck	1984-2018	805	1906419.71	2087017.48	15874.00	13522053.00
Motorcycle	1984-2018	805	129016.42	127973.56	1191.00	673434.00
All	1984-2018	805	4829619.95	4566026.36	210454.00	22116275.00
Median income	1984-2018	805	42587.38	13608.69	16782.00	86223.00
Population	1984-2018	805	6230.09	6221.68	513.7020000	28624.56

Source: U.S. Department of Transportation, Federal Reserve Economic Data St. Louis Fed, and own calculations.

Table.1 above shows the summary statistics of my outcome variable vehicle sales. Median income and population are the controlled variables included in the model. Std Dev is standard deviation. All the variables cover from the year 1984 to 2018. Sales represent vehicle registrations in different states. Median income is the median income in dollars for different states (42587.38 represents the mean of median income of different states from 1984 to 2018). Population is the number of resident populations in different states measured in thousands (513.702 is 513702).

Figure. 1 Number of Vehicle Sales From 1984 to 2018



Source: U.S. Department of Transportation and own calculations.

Note: The Control Group consists of states who do not have vehicle property tax over years (Alaska, Delaware, DC, Florida, Hawaii, Illinois, Maryland, New Jersey, New Mexico, New York, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, South Dakota, Tennessee, Texas, Utah, Vermont, Washington, Wisconsin). The Treatment Group consists of South Carolina who has vehicle property tax. South Carolina starts to reduce its vehicle property tax from 2002.

Figure.1 above shows the comparison of number of vehicle registrations of treatment group and control group. It is important to note that both groups have almost the same pattern in trend. This indicates that the change in number over the years in both groups is very similar.

IV. Theoretical Framework

There are many factors influencing car sales such as income, population, car price, taxes, and tastes etc. While increasing income and population increase demand for cars, higher tax rates and car price decrease demand for cars (Dargay,2001; Chen and Shum, 2010; Wheeler,1998).

Taxes have a substantial influence on car sales. The effect of a tax rate increase will shift the supply curve along the demand curve without shifting demand curve at the same time (Zoutman and Hopland, 2018). Experiments also show people purchase more if the price is tax-exclusive compared with a price that is tax-inclusive (Feldmen and Ruffle).

More specifically, A reduction in sales tax increases car sales (Chen et al. 2010). Sales tax on cars shift supply curve to the left then results in an increase in the price paid by consumers. Because of the higher price consumers pay, the quantity demanded for cars drops. In European countries, studies have been done on registration tax on car sales in Switzerland and Norway (Alberini and Bareit, 2019; Ciccone, 2018). They discover the effect that a rebate on low emission cars will incentivize the sales for those and decrease the sales of high emission cars that experience an increase in registration tax.

I expect vehicle property tax will show the same research results as sales taxes and registration taxes. By controlling other variables like population and income, I aim to determine whether changing vehicle property tax has an impact on car sales in South Carolina. My hypothesis is that after decreasing vehicle property tax by 0.75 percentage points a year from 2001 to 2007, there would be an increase in vehicle sales in South Carolina than those states do not.

V. Empirical Methodology

I determine the effect a changing vehicle property tax has on car sales using a two-way fixed effects difference-in-differences model. This model measures the effect of property taxes on car sales in South Carolina by comparing it to states without such tax while holding other determinants of the car sales constant.

$$Carsales_{st} = B_0 + B_1 VehiclePTax_{st} + X_{st} + State_s + Year_t + \varepsilon_{st} \quad (1)$$

CarSales measures the change in car sales in state s and year t. VehiclePTax is a numerical variable presenting the vehicle property tax in a given year for a given state. X represents several control variables including median income and population. State and Year are state and year fixed effects, respectively. Lastly, ε is the White noise.

$$LogCarsales_{st} = B_0 + B_1 VehiclePTax_{st} + X_{st} + State_s + Year_t + \varepsilon_{st} \quad (2)$$

All variables in model 2 mean the same as model 1 except LogCarsales. LogCarsales measures the percentage change of car sales in state s and year t.

For difference-in-difference method, it is important to show that the treatment and control groups are comparable. To Test if there are no other factors influencing outcome variable besides the dependent variables included in the model. I use balance of regressors and parallel trend test. Balance of regressors test shows whether the mean of control variables in the treatment and control group are statistically different from each other. The parallel trend test shows the trend in average value of car sales from both groups before 2002.

Table 2: Balance of regressors test

Variable	Control	Treatment	Difference
Median income	$32,804	$28,856	$3948**
Population	$5,591.7	$3,461.4	$2130.3***

Source: U.S. Department of Transportation, Federal Reserve Economic Data St. Louis Fed, and own calculations

Notes: The table shows the average value of control variables for the treatment and control groups as well as their difference before. The Difference between Control and Treatment means show that both groups are statistically different before 2002. *, **, *** represent 10%, 5%, and 1% significance levels, respectively.

Although the test does not support that the means of control variables are statistically the same before the treatment takes place in 2002, that does not mean the two groups are not comparable. First, median income is not the same because the control group consists of big states such as New York, Washington, Pennsylvania where cost of living is higher leading to higher median income. Better universities in those areas result in higher education so people end up with higher salaries. A bigger economy and higher paying jobs for financial industries and high-tech industries also lead to higher median income. However, figure.1 shows a perfect parallel trend of vehicle sales before treatment in 2002. A statistical test furthermore shows that vehicle sales of both groups show a parallel trend.

Table 3: Parallel Trend Test

Regressors	Model1
Intercept	-2,450.75 (4,144.29)
Treatment	690.24 (4,171.57)
Year	2.47 (4.17)
Year^2	-0.00 (0.00)
Treatment * Year	-0.70 (4.20)
Treatment * Year^2	0.00 (0.00)
Number of Observations	598
Adjusted R-Square	-0.00648
Overall Significance	4.75***

Source: U.S. Department of Transportation, Federal Reserve Economic Data St. Louis Fed, and own calculations.

Note: robust standard errors are in parentheses. *, **, and *** indicate 10%, 5%, and 1% significance levels, respectively. Treatment is an indicator variable equal to one only for South Carolina because it changes vehicle property tax rate in 2002. It equals zero for all the control states. Y2 is year * year. TY is an interaction term between treatment and year. TY2 is treatment with year squared.

Table 3 above compares the trend in average value of vehicles sales between South Carolina and other control states before 2002. This indicates South Carolina and control states have a parallel trend because the coefficients of treatment, year, TY and TY^2 are all statistically insignificant. Thus, I can conclude that South Carolina and the control group are comparable.

VI. Results

Table 4: Impact of Vehicle Property Tax Rates to Vehicle Sales

Regressors	Autos		Trucks		Motorcycles		All	
	Model1	Model2	Model3	Model4	Model5	Model6	Model7	Model8
VehiclePTax	-110,140.98***	-27,707.31***	-82,960.19***	19,635.25***	-8,013.54***	-2,463.07***	-201,114.71***	-10,535.12**
	(11,155.64)	(3,810.80)	(11,077.66)	(4,649.26)	(589.43)	(284.44)	(19,299.18)	(4,253.09)
Median income		-24.21***		29.29***		1.31***		6.39***
		(1.89)		(2.37)		(0.16)		(2.30)
Population		408.17***		291.81***		16.77***		716.76***
		(7.61)		(11.24)		(0.63)		(9.41)
Intercept	2,835,537.99***	1,292,549.62***	1,937,568.43***	-1,166,167.40***	132,025.23***	-30,500.48***	4,905,131.65***	95,881.74
	(97,344.10)	(103,187.35)	(76,485.36)	(120,496.13)	(4,674.12)	(6,622.97)	(167,374.86)	(103,790.12)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
State Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of Observations	805	805	805	805	805	805	805	805
Adjusted R-Square	0.004433	0.9282	0.003967	0.7960	0.01169	0.6943	0.005155	0.9554
Overall Significance	97.48***	1,416.38***	56.08***	245.05***	184.83***	275.33***	108.59***	2,012.78***

Note: robust standard errors are in parentheses. *, **, and *** indicate 10%, 5%, and 1% significance levels, respectively.

Table 5: Impact of Vehicle Property Tax Rates to Vehicle Sales

Regressors	Autos		Trucks		Motorcycles		All	
	Model1	Model2	Model3	Model4	Model5	Model6	Model7	Model8
VehiclePTax	0.02***	0.06***	0.00	0.06***	-0.04***	0.01	0.01	0.05***
	(0.01)	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)
Median income		-0.00***		0.00***		0.00***		0.00
		(0.00)		(0.00)		(0.00)		(0.00)
Population		0.00***		0.00***		0.00***		0.00***
		(0.00)		(0.00)		(0.00)		(0.00)
Intercept	14.23***	13.53***	13.86***	12.11***	11.18***	9.82***	14.83***	13.70***
	(0.04)	(0.08)	(0.05)	(0.10)	(0.05)	(0.11)	(0.04)	(0.08)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
State Year FE	Yes		Yes		Yes		Yes	
Number of Observations	805	805	805	805	805	805	805	805
Adjusted R-Square	-0.00030	0.7543	-0.00124	0.6502	0.001301	0.5713	-0.00101	0.7454
Overall Significance	16.47***	496.92***	0.05	415.87***	15.35***	271.80***	2.71	482.60***

Note: robust standard errors are in parentheses. *, **, and *** indicate 10%, 5%, and 1% significance levels, respectively.

Coefficients for every model in Table 4 for main regressor vehicle property tax is significant. Since they are all significant, models 2, 4,4,6 and 8 that include control variables are preferred.

According to table.4 model 8 above, one percentage point increase in vehicle property tax will cause all vehicle sales to drop by approximately 201,000 without control variables in the model. With control variables counted for in model 8, one percentage point increase in vehicle property tax would result in a 10535 decrease in vehicle sales. Note that both models have the same negative sign for coefficient of vehicle property tax, so model 8 will be the accurate causal effect estimate to look at for the effect of vehicle property tax on Auto sales. Same for model 2 and model 6, both Autos and motorcycles are going to experience a decrease in sales when vehicle property tax increases. Increase in one percentage point on vehicle property tax is going to reduce auto sales by 27707(1.44%) and motorcycle sales by 2463.

However, it is interesting that trucks are going to see an increase in sales when vehicle property tax increases. This may be because trucks are usually expensive, when there is an increase in property tax, people buy more used trucks instead of new ones so the sales would rise.

In table.5 above, when the main outcome variable becomes Logsales, the results become that one percentage point increase in vehicle property tax will cause all vehicle sales to increase by 1% without control variables in the model. With control variables counted for in model 8, one percentage point increase in vehicle property tax would result in a 5% increase in all vehicle sales. Note that all models in Table 5 have positive coefficients meaning that increasing vehicle property tax increases vehicle sales.

Although table 5's results align with Craft and Schmidt (2005) while using the same log model that increasing vehicle property tax rates increase overall vehicle sales, I think the linear model 1 with linear regression results from model 2,4,6 and 8 is preferred in this case. Because the trend lines for control group and South Carolina does not appear to be a log function. Model 2,4,6 and 8 are the most accurate models to use.

VII. Conclusion

In conclusion, this paper has estimated the effect of vehicle property tax on vehicle sales that one percentage point increase in vehicle property tax decrease car sales by 27707(1.44%) in South Carolina compared with states that do not have vehicle property tax. These results align with the hypothesis I have that an increase in vehicle property tax will cause car sales to decrease.

With the results being correct, I estimated that there will be a 37.9% decrease in government revenue when assuming average vehicle price is the same from 2001 to 2007. A plausible reason South Carolina reduces the vehicle property tax rate is probably to incentivize more vehicle demand. However, my results differ from previous research by Craft and Schmidt (2005) that increase in vehicle property tax rate will cause vehicle sales to rise because I decided to use the results of the linear regression model as the trend lines for control states and South Carolina does not look like a log function line.

However, this paper only focuses on the analysis for South Carolina, certain variables such as income and sales tax will not act similar. Further studies can be done with multiple states in treatment group and compare it with control group to provide a precise estimation for states with vehicle property tax. Still, this paper provides useful insights for policy makers to think as to whether it is an appropriate approach to reduce vehicle property tax or eliminate it or even.

VIII. REFERENCES

Alberini, A., & Bareit, M. (2019). The effect of registration taxes on new car sales and emissions: Evidence from Switzerland. *Resource and Energy Economics*, *56*, 96-112.

Carlson, R. H. (2005). A brief history of property tax. *Fair and Equitable*, *3*(2), 3-9.

Ciccone, A. (2018). Environmental effects of a vehicle tax reform: empirical evidence from Norway. *Transport policy*, *69*, 141-157.

Chan, K. H., Leng, M., & Liang, L. (2014). Impact of tax reduction policies on consumer purchase of new automobiles: An analytical investigation with real data-based experiments. *Naval Research Logistics (NRL)*, *61*(8), 577-598.

Chen, J., Esteban, S., & Shum, M. (2010). Do sales tax credits stimulate the automobile market? *International Journal of Industrial Organization*, *28*(4), 397-402.

Craft, E. D., & Schmidt, R. M. (2005). An analysis of the effects of vehicle property taxes on vehicle demand. *National Tax Journal*, *58*(4), 697-720.

Dargay, J. M. (2001). The effect of income on car ownership: evidence of asymmetry. *Transportation Research Part A: Policy and Practice*, *35*(9), 807-821.

Federal Reserve Bank of St. Louis. (n.d.). *Federal Reserve Economic Data.* data access in March 2024.*https://fred.stlouisfed.org/release/tables?rid=118&eid=259194,* data access on 03/2024

Federal Reserve Bank of St. Louis. (n.d.). *Federal Reserve Economic Data.* https://fred.stlouisfed.org/release/tables?rid=249&eid=259515&od=1984-01-01#, data access on 03/2024.

Feldman, N. E., & Ruffle, B. J. (2015). The impact of including, adding, and subtracting a tax on demand. *American Economic Journal: Economic Policy*, *7*(1), 95-118.

Fhwa. (2020, August 11). *Motor Vehicle Registrations, by Vehicle Type and state: USDOT Open Data*. DOT DataHub. https://datahub.transportation.gov/Roadways-and-Bridges/Motor-Vehicle-Registrations-by-vehicle-type-and-st/hwtm-7xmz/about_data, data access on 03/2024

Ma, S. C., Xu, J. H., & Fan, Y. (2019). Willingness to pay and preferences for alternative incentives to EV purchase subsidies: An empirical study in China. *Energy Economics*, *81*, 197-215.

Nolan, A. (2010). A dynamic analysis of household car ownership. *Transportation research part A: policy and practice*, *44*(6), 446-455.

Ritter, N., & Vance, C. (2013). Do fewer people mean fewer cars? Population decline and car ownership in Germany. *Transportation Research Part A: Policy and Practice*, *50*, 74-85.

Scharf, M., Heide, L., Grahle, A., Syré, A. M., & Göhlich, D. (2020). Environmental impact of subsidy concepts for stimulating car sales in Germany. *Sustainability*, *12*(23), 10037.

Schmidt, P. (2020). The effect of car sharing on car sales. *International Journal of Industrial Organization*, *71*, 102622.

South Carolina legislature online. (n.d.). https://www.scstatehouse.gov/Archives/CitizensInterestPage/PropertyTaxReform/BriefOverviewofPropertyTaxesinSC.doc. Data access on 03/2024

Wang, J., & Matsumoto, S. (2022). Can subsidy programs lead consumers to select "greener" products? Evidence from the Eco-car program in Japan. *Research in Transportation Economics*, *91*, 101066.

Wheeler, L. A. (1998). *An Analysis of the Economic Consequences of Modifying the Property Tax on Motor Vehicles in Georgia: Alternative Proposals and Revenue Effects*. Fiscal Research Center of the Andrew Young School of Policy Studies.

Wu, X., Gong, J., Greenwood, B. N., & Song, Y. (2023). The Effect of Early Electric Vehicle Subsidies on the Automobile Market. *Journal of Public Policy & Marketing*, *42*(2), 169-186.

Zoutman, F. T., Gavrilova, E., & Hopland, A. O. (2018). Estimating both supply and demand elasticities using variation in a single tax rate. *Econometrica*, *86*(2), 763-771.

Appendix:

```
proc import datafile="/home/u60687871/MySaS/original.xlsx"
        out=ddn
        dbms=xlsx
        replace;
getnames=yes;
run;

proc sort data=ddn;
        by year;
run;

ods excel file='/home/u60687871/MySaS/summarystas.xlsx';
proc means data=ddn;
        var Sales "median income"n population;
        where year >= 1984;
run;

ods excel close;

/* balance of regressor */
proc import datafile="/home/u60687871/MySaS/original 2 only contro and sc.xlsx.xlsx"
        out=ddn2
        dbms=xlsx
        replace;
getnames=yes;
run;
```

```
proc sort data=ddn2;
        by year;
run;

data modeldata2;
        set ddn2;
        logsales=log(Sales);
run;

ods output Conflimits=MeanVals ttests=PValue ;
Proc TTest Data = ddn2;
        Where Year < 2002;
        Var "median income"n population;
        Class Treatment;
Run;

data MergedResults;
        merge MeanVals PValue;
        by variable;
        keep probt Star mean class variable;
        Where method ne "Pooled";



        length Star $3;
        if probt=. then star="";
                else if probt le 0.01 then star="***";
                else if probt le 0.05 then star="**";
                else if probt le 0.1 then star="*";
```

```
            else Star="";

        format Mean dollar.2;
        MeanEdited=cats(put(Mean,dollar10.2),star);

        length ColumnName $30;
        if class="0" then ColumnName="Control";
            else if class="1" then ColumnName="Treatment";

run;

Proc Print data=MergedResults;
run;

proc transpose data=MergedResults out=TTestResults;
        Var Mean;
        By variable;
        id ColumnName;
Run;

ods excel file="/home/u60687871/MySaS/balanceregressor.xlsx"
            options(embedded_titles="yes" embedded_footnotes="yes");
Title "Table 1: Balance of regressors";
proc print data=TTestResults(drop=_name_) noobs;
        footnote justify=left "Notes: *, **, *** represent 10%, 5%, and 1% significance levels,
respectively.";
run;
ods excel close;
```

```
/* parallel trend test */
proc import datafile="/home/u60687871/MySaS/original 2 only contro and sc.xlsx.xlsx"
        out=ddn3
        dbms=xlsx
        replace;
getnames=yes;
run;

data modeldata3;
        set ddn3;
        logsales=log(Sales);
        Y2 = year * year;
        Y3 = year * year * year;
        TY = treatment * year;
        TY2 = treatment * year * year;
        TY3 = treatment * year * year * year;
run;

proc surveyreg data=modeldata3;
        class state year/ref=first;
        where year < 2002;
        Model logsales = treatment year TY /adjrsq solution;
```

```
run;

ods output ParameterEstimates=PEforModel1  DataSummary=ObsModel1
FitStatistics=AdjRsqModel1  Effects=OverallSigModel1;
proc surveyreg data=modeldata3;
        *class state year/ref=first;
        where year < 2002;
        Model logsales = treatment year Y2 TY TY2/adjrsq solution;
run;

Data Table_Long;
        length Model $10;
        length Parameter $30;
        set PEforModel1 indsname=M;
        keep Model Parameter EditedResults;
        if        M="WORK.PEFORMODEL1" then Model="Model1";




        /* where Estimate ne 0; */

        if Probt le 0.01 then Star="***";
                else if Probt le 0.05 then Star="**";
                else if Probt le 0.1 then Star="*";


        Results=Estimate;
        EditedResults=Cats(put(Results,comma16.2),Star);
```

```
        output;

        Results=stderr;
        EditedResults=Cats("(",put(Results,comma16.2),")");
        output;


        where StdErr ne 0;

run;

proc sort data=Table_Long out=Table_Long_Sorted;
        by Model Parameter;
run;

data Model1Results(rename=(EditedREsults=Model1))
;
        set Table_Long_Sorted;
        if Model="Model1" then output Model1Results;

        drop Model;
run;

data Table_Wide;
        merge Model1Results ;
        by Parameter;
        if mod(_n_,2)=1 then Regressors=Parameter;
```

```
        length Order 3;
        if  Parameter="treatment" then Order=2;
           else if Parameter="year" then Order=3;
      else if substr(Parameter,1,7)="Y2" then Order=4;
      else if Parameter="TY" then Order=5;
      else if Parameter="TY2" then Order=6;
                else Order=1;


run;


proc sort data=Table_Wide out=Table_Wide_Sorted(drop=Order Parameter);
        by Order;
run;

data NumofObs(keep=Label1  model1);
        merge ObsModel1(rename=(nvalue1=NVMoel1)) ;
        by Label1;
        where Label1="Number of Observations";
        Model1=put(NVMoel1,comma16.0);

run;


Data AdjRsq;
        merge AdjRsqModel1(rename=(cvalue1=Model1)) ;
        by Label1;
```

```
        Where Label1="Adjusted R-Square";
        drop nvalue1;
run;


data OSM1(rename=(EditedValue=Model1));
        set OverallSigModel1  indsname=M;
        Where Effect="Model";
        Label1="Overall Significance";

        if ProbF le 0.01 then Star="***";
                else if ProbF le 0.05 then Star="**";
                else if ProbF le 0.1 then Star="*";

        EditedValue=Cats(Put(FValue,comma16.2),Star);

        if M="WORK.OVERALLSIGMODEL1" then output OSM1;
        keep Label1 EditedValue;
run;

Data OverallSig;
        merge OSM1 ;
        by Label1;
run;


Data OtherStat;
        set NumofObs AdjRsq OverallSig;
```

```
        rename Label1=Regressors;
Run;



Data Table_Wide_Sorted_WithStat;
        set Table_Wide_Sorted OtherStat;
run;


ods excel file="/home/u60687871/MySaS/paralleltrend.xlsx" options(Embedded_Titles="ON"
Embedded_Footnotes="ON");
Title "Table: Parallel Trend Test ";
footnote justify=left "Note: robust standard errors are in parentheses. *, **, and *** indicate
                                                10%, 5%, and 1% significance levels,
respectively.";
proc print data=Table_Wide_Sorted_withstat noobs;
        var Regressors;
        var Model1 /style(header)={just=center} style(data)={just=center tagattr="type:String"};
        format Regressors $VariableName.;
run;
ods excel close;



/*  level result */
proc import datafile="/home/u60687871/MySaS/original 2 only contro and sc   with tax
rates.xlsx"
        out=ddn4
        dbms=xlsx
        replace;
getnames=yes;
```

```
run;

data modeldata4;
	set ddn4;
	logsales=log(Sales);
run;

ods output ParameterEstimates=PEforModel1  DataSummary=ObsModel1
FitStatistics=AdjRsqModel1  Effects=OverallSigModel1;
proc surveyreg data=modeldata4;
	class state year/ref=first;
	where year > 1983;
	Model Sales =  VehiclePTax /adjrsq solution;
run;

ods output ParameterEstimates=PEforModel2  DataSummary=ObsModel2
FitStatistics=AdjRsqModel2  Effects=OverallSigModel2;
proc surveyreg data=modeldata4;
	class state year/ref=first;
	where year > 1983;
	Model Sales =  VehiclePTax "median income"n population/adjrsq solution;
run;


Data Table_Long;
	length Model $10;
	length Parameter $30;
	set PEforModel1 PEforModel2  indsname=M;
	keep Model Parameter EditedResults;
```

```
        if      M="WORK.PEFORMODEL1" then Model="Model1";
        else if M="WORK.PEFORMODEL2" then Model="Model2";




        /* where Estimate ne 0; */

        if Probt le 0.01 then Star="***";
                else if Probt le 0.05 then Star="**";
                else if Probt le 0.1 then Star="*";


        Results=Estimate;
        EditedResults=Cats(put(Results,comma16.2),Star);
        output;

        Results=stderr;
        EditedResults=Cats("(",put(Results,comma16.2),")");
        output;


        where StdErr ne 0;

run;

proc sort data=Table_Long out=Table_Long_Sorted;
```

```
        by Model Parameter;
run;


data Model1Results(rename=(EditedREsults=Model1))
                Model2Results(rename=(EditedREsults=Model2));

        set Table_Long_Sorted;
        if Model="Model1" then output Model1Results;
                else if Model="Model2" then output Model2Results;




        drop Model;
run;

data Table_Wide;
        merge Model1Results Model2Results;
        by Parameter;
        if mod(_n_,2)=1 then Regressors=Parameter;

        length Order 3;
        if  Parameter="Intercept" then Order=4;
           else if Parameter="median income" then Order=2;
      else if Parameter="population" then Order=3;
                else Order=1;
```

```
run;


proc sort data=Table_Wide out=Table_Wide_Sorted(drop=Order Parameter);
        by Order;
run;


data NumofObs(keep=Label1 Model1 Model2 );
        merge ObsModel1(rename=(nvalue1=NVModel1))
ObsModel2(rename=(nvalue1=NVModel2)) ;
        by Label1;
        where Label1="Number of Observations";
        Model1=put(NVModel1,comma16.0);
        Model2=put(NVModel2,comma16.0);


run;



Data AdjRsq;
        merge AdjRsqModel1(rename=(cvalue1=Model1))
AdjRsqModel2(rename=(cvalue1=Model2));
        by Label1;
        Where Label1="Adjusted R-Square";
        drop nvalue1;
run;



data OSM1(rename=(EditedValue=Model1)) OSM2(rename=(EditedValue=Model2)) ;
        set OverallSigModel1 OverallSigModel2 indsname=M;
```

```
        Where Effect="Model";
        Label1="Overall Significance";

        if ProbF le 0.01 then Star="***";
                else if ProbF le 0.05 then Star="**";
                else if ProbF le 0.1 then Star="*";

        EditedValue=Cats(Put(FValue,comma16.2),Star);

        if M="WORK.OVERALLSIGMODEL1" then output OSM1;
                else if M="WORK.OVERALLSIGMODEL2" then output OSM2;


        keep Label1 EditedValue;
run;

Data OverallSig;
        merge OSM1 OSM2;
        by Label1;
run;


Data OtherStat;
        set NumofObs AdjRsq OverallSig;
        rename Label1=Regressors;
Run;
```

```
Data Table_Wide_Sorted_WithStat;
        set Table_Wide_Sorted OtherStat;
run;


ods excel file="/home/u60687871/MySaS/combined1.xlsx" options(Embedded_Titles="ON"
Embedded_Footnotes="ON");
Title "Table: Impact of Vehicle Property Tax Rates to Vehicle Sales";
footnote justify=left "Note: robust standard errors are in parentheses. *, **, and *** indicate
                                                    10%, 5%, and 1% significance levels,
respectively.";
proc print data=Table_Wide_Sorted_withstat noobs;
        var Regressors;
        var Model1-Model2 /style(header)={just=center} style(data)={just=center
tagattr="type:String"};
        format Regressors $VariableName.;
run;
ods excel close;



/* log results */


ods output ParameterEstimates=PEforModel3  DataSummary=ObsModel3
FitStatistics=AdjRsqModel3  Effects=OverallSigModel3;
proc surveyreg data=modeldata4;
        class state year/ref=first;
        where year > 1983;
        Model logsales =  VehiclePTax /adjrsq solution;
run;
```

```
ods output ParameterEstimates=PEforModel4  DataSummary=ObsModel4
FitStatistics=AdjRsqModel4  Effects=OverallSigModel4;

proc surveyreg data=modeldata4;
        class state year/ref=first;
        where year > 1983;
        Model logsales =  VehiclePTax "median income"n population/adjrsq solution;
run;


Data Table_Long;
        length Model $10;
        length Parameter $30;
        set PEforModel3 PEforModel4  indsname=M;
        keep Model Parameter EditedResults;
        if        M="WORK.PEFORMODEL3" then Model="Model3";
        else if M="WORK.PEFORMODEL4" then Model="Model4";




        /* where Estimate ne 0; */

        if Probt le 0.01 then Star="***";
                else if Probt le 0.05 then Star="**";
                else if Probt le 0.1 then Star="*";



        Results=Estimate;
        EditedResults=Cats(put(Results,comma16.2),Star);
        output;
```

```
        Results=stderr;
        EditedResults=Cats("(",put(Results,comma16.2),")");
        output;


        where StdErr ne 0;

run;


proc sort data=Table_Long out=Table_Long_Sorted;
        by Model Parameter;
run;


data
                Model3Results(rename=(EditedREsults=Model3))
                Model4Results(rename=(EditedREsults=Model4));
        set Table_Long_Sorted;
        if Model="Model3" then output Model3Results;
        else if Model="Model4" then output Model4Results;
        drop Model;
run;

data Table_Wide;
        merge Model3Results Model4Results;
        by Parameter;
```

```
        if mod(_n_,2)=1 then Regressors=Parameter;

        length Order 3;
        if  Parameter="Intercept" then Order=4;
           else if Parameter="median income" then Order=2;
      else if substr(Parameter,1,7)="population" then Order=3;
                else Order=1;


run;


proc sort data=Table_Wide out=Table_Wide_Sorted(drop=Order Parameter);
        by Order;
run;

data NumofObs(keep=Label1 model3 model4 );
        merge  ObsModel3(rename=(nvalue1=NVMoel3))
ObsModel4(rename=(nvalue1=NVMoel4)) ;
        by Label1;
        where Label1="Number of Observations";
        Model3=put(NVMoel3,comma16.0);
        Model4=put(NVMoel3,comma16.0);

run;


Data AdjRsq;
```

```
	merge AdjRsqModel3(rename=(cvalue1=Model3))
AdjRsqModel4(rename=(cvalue1=Model4));
	by Label1;
	Where Label1="Adjusted R-Square";
	drop nvalue1;
run;


data  OSM3(rename=(EditedValue=Model3)) OSM4(rename=(EditedValue=Model4));
	set  OverallSigModel3 OverallSigModel4  indsname=M;
	Where Effect="Model";
	Label1="Overall Significance";

	if ProbF le 0.01 then Star="***";
		else if ProbF le 0.05 then Star="**";
		else if ProbF le 0.1 then Star="*";

	EditedValue=Cats(Put(FValue,comma16.2),Star);

	if M="WORK.OVERALLSIGMODEL3" then output OSM3;
	else if M="WORK.OVERALLSIGMODEL4" then output OSM4;


	keep Label1 EditedValue;
run;

Data OverallSig;
	merge  OSM3 OSM4 ;
	by Label1;
```

```
run;



Data OtherStat;
        set NumofObs AdjRsq OverallSig;
        rename Label1=Regressors;
Run;



Data Table_Wide_Sorted_WithStat;
        set Table_Wide_Sorted OtherStat;
run;


ods excel file="/home/u60687871/MySaS/combined2.xlsx" options(Embedded_Titles="ON"
Embedded_Footnotes="ON");
Title "Table: Impact of Vehicle Pro[erty Tax Rates to Vehicle Sales";
footnote justify=left "Note: robust standard errors are in parentheses. *, **, and *** indicate
                                        10%, 5%, and 1% significance levels,
respectively.";
proc print data=Table_Wide_Sorted_withstat noobs;
        var Regressors;
        var Model3-Model4 /style(header)={just=center} style(data)={just=center
tagattr="type:String"};
        format Regressors $VariableName.;
run;
ods excel close;
```

/* results with motorcycles and trucks */

```
proc import datafile="/home/u60687871/MySaS/更更新的所有的.xlsx"
        out=ddn5
        dbms=xlsx
        replace;
getnames=yes;
run;

data modeldata5;
        set ddn5;
        logauto=log(auto);
        logtruck=log(truck);
        logmotorcycle=log(motorcycle);
        logall=log(all);
run;



proc import datafile="/home/u60687871/MySaS/更更新的所有的.xlsx"
        out=ddn5
        dbms=xlsx
        replace;
getnames=yes;
run;

ods excel file='/home/u60687871/MySaS/summarystas2.xlsx';
proc means data=ddn5;
        var auto truck motorcycle all "median income"n population;
        where year >= 1984;
```

```
run;


ods excel close;


data modeldata5;
        set ddn5;
        auto1 = auto/1000;
        truck1 = truck/1000;
        motorcycle1 = motorcycle/1000;
        all1 = all/1000;
        logauto=log(auto);
        logtruck=log(truck);
        logmotorcycle=log(motorcycle);
        logall=log(all);
run;


ods output ParameterEstimates=PEforModel1  DataSummary=ObsModel1
FitStatistics=AdjRsqModel1  Effects=OverallSigModel1;
proc surveyreg data=modeldata5;
        class state year/ref=first;
        Model auto1 =  VehiclePTax /adjrsq solution;
run;


ods output ParameterEstimates=PEforModel2  DataSummary=ObsModel2
FitStatistics=AdjRsqModel2  Effects=OverallSigModel2;
proc surveyreg data=modeldata5;
        class state year/ref=first;
        Model auto1 =  VehiclePTax "median income"n population/adjrsq solution;
run;
```

```
ods output ParameterEstimates=PEforModel3  DataSummary=ObsModel3
FitStatistics=AdjRsqModel3  Effects=OverallSigModel3;

proc surveyreg data=modeldata5;

        class state year/ref=first;

        Model truck1 =  VehiclePTax /adjrsq solution;

run;


ods output ParameterEstimates=PEforModel4  DataSummary=ObsModel4
FitStatistics=AdjRsqModel4  Effects=OverallSigModel4;

proc surveyreg data=modeldata5;

        class state year/ref=first;

        Model truck1 =  VehiclePTax "median income"n population/adjrsq solution;

run;


ods output ParameterEstimates=PEforModel5  DataSummary=ObsModel5
FitStatistics=AdjRsqModel5  Effects=OverallSigModel5;

proc surveyreg data=modeldata5;

        class state year/ref=first;

        Model motorcycle1 =  VehiclePTax /adjrsq solution;

run;


ods output ParameterEstimates=PEforModel6  DataSummary=ObsModel6
FitStatistics=AdjRsqModel6  Effects=OverallSigModel6;

proc surveyreg data=modeldata5;

        class state year/ref=first;

        Model motorcycle1 =  VehiclePTax "median income"n population/adjrsq solution;

run;
```

```
ods output ParameterEstimates=PEforModel7  DataSummary=ObsModel7
FitStatistics=AdjRsqModel7  Effects=OverallSigModel7;

proc surveyreg data=modeldata5;

        class state year/ref=first;

        Model all1 =  VehiclePTax /adjrsq solution;

run;


ods output ParameterEstimates=PEforModel8  DataSummary=ObsModel8
FitStatistics=AdjRsqModel8  Effects=OverallSigModel8;

proc surveyreg data=modeldata5;

        class state year/ref=first;

        Model all1 =  VehiclePTax "median income"n population/adjrsq solution;

run;


Data Table_Long;

        length Model $10;

        length Parameter $30;

        set PEforModel1 PEforModel2 PEforModel3 PEforModel4 PEforModel5 PEforModel6
PEforModel7 PEforModel8 indsname=M;

        keep Model Parameter EditedResults;

        if        M="WORK.PEFORMODEL1" then Model="Model1";

        else if M="WORK.PEFORMODEL2" then Model="Model2";

        else if M="WORK.PEFORMODEL3" then Model="Model3";

        else if M="WORK.PEFORMODEL4" then Model="Model4";

        else if M="WORK.PEFORMODEL5" then Model="Model5";

        else if M="WORK.PEFORMODEL6" then Model="Model6";

        else if M="WORK.PEFORMODEL7" then Model="Model7";

        else if M="WORK.PEFORMODEL8" then Model="Model8";
```

```
        if Probt le 0.01 then Star="***";
                else if Probt le 0.05 then Star="**";
                else if Probt le 0.1 then Star="*";


        Results=Estimate;
        EditedResults=Cats(put(Results,comma16.2),Star);
        output;

        Results=stderr;
        EditedResults=Cats("(",put(Results,comma16.2),")");
        output;


        where StdErr ne 0;

run;

proc sort data=Table_Long out=Table_Long_Sorted;
        by Model Parameter;
run;


data Model1Results(rename=(EditedREsults=Model1))
                Model2Results(rename=(EditedREsults=Model2))
                Model3Results(rename=(EditedREsults=Model3))
                Model4Results(rename=(EditedREsults=Model4))
                Model5Results(rename=(EditedREsults=Model5))
```

```
            Model6Results(rename=(EditedREsults=Model6))
            Model7Results(rename=(EditedREsults=Model7))
            Model8Results(rename=(EditedREsults=Model8));

        set Table_Long_Sorted;
        if Model="Model1" then output Model1Results;
            else if Model="Model2" then output Model2Results;
            else if Model="Model3" then output Model3Results;
            else if Model="Model4" then output Model4Results;
            else if Model="Model5" then output Model5Results;
            else if Model="Model6" then output Model6Results;
            else if Model="Model7" then output Model7Results;
            else if Model="Model8" then output Model8Results;



        drop Model;
run;

data Table_Wide;
        merge Model1Results Model2Results Model3Results Model4Results Model5Results
Model6Results Model7Results Model8Results;
        by Parameter;
        if mod(_n_,2)=1 then Regressors=Parameter;

        length Order 3;
        if  Parameter="Intercept" then Order=4;
           else if Parameter="median income" then Order=2;
      else if Parameter="population" then Order=3;
```

```
        else Order=1;


run;


proc sort data=Table_Wide out=Table_Wide_Sorted(drop=Order Parameter);
        by Order;
run;


data NumofObs(keep=Label1 Model1 Model2 Model3 Model4 Model5 Model6 Model7
Model8);
        merge ObsModel1(rename=(nvalue1=NVModel1))
ObsModel2(rename=(nvalue1=NVModel2)) ObsModel3(rename=(nvalue1=NVModel3))
ObsModel4(rename=(nvalue1=NVModel4)) ObsModel5(rename=(nvalue1=NVModel5))
ObsModel6(rename=(nvalue1=NVModel6)) ObsModel7(rename=(nvalue1=NVModel7))
ObsModel8(rename=(nvalue1=NVModel8));
        by Label1;
        where Label1="Number of Observations";
        Model1=put(NVModel1,comma16.0);
        Model2=put(NVModel2,comma16.0);
        Model3=put(NVModel3,comma16.0);
        Model4=put(NVModel4,comma16.0);
        Model5=put(NVModel5,comma16.0);
        Model6=put(NVModel6,comma16.0);
        Model7=put(NVModel7,comma16.0);
        Model8=put(NVModel8,comma16.0);


run;
```

```
Data AdjRsq;
        merge AdjRsqModel1(rename=(cvalue1=Model1))
AdjRsqModel2(rename=(cvalue1=Model2))  AdjRsqModel3(rename=(cvalue1=Model3))
AdjRsqModel4(rename=(cvalue1=Model4)) AdjRsqModel5(rename=(cvalue1=Model5))
AdjRsqModel6(rename=(cvalue1=Model6)) AdjRsqModel7(rename=(cvalue1=Model7))
AdjRsqModel8(rename=(cvalue1=Model8));
        by Label1;
        Where Label1="Adjusted R-Square";
        drop nvalue1;
run;



data OSM1(rename=(EditedValue=Model1)) OSM2(rename=(EditedValue=Model2))
OSM3(rename=(EditedValue=Model3)) OSM4(rename=(EditedValue=Model4))
OSM5(rename=(EditedValue=Model5)) OSM6(rename=(EditedValue=Model6))
OSM7(rename=(EditedValue=Model7)) OSM8(rename=(EditedValue=Model8));
        set OverallSigModel1 OverallSigModel2 OverallSigModel3 OverallSigModel4
OverallSigModel5 OverallSigModel6 OverallSigModel7 OverallSigModel8 indsname=M;
        Where Effect="Model";
        Label1="Overall Significance";

        if ProbF le 0.01 then Star="***";
                else if ProbF le 0.05 then Star="**";
                else if ProbF le 0.1 then Star="*";

        EditedValue=Cats(Put(FValue,comma16.2),Star);

        if M="WORK.OVERALLSIGMODEL1" then output OSM1;
                else if M="WORK.OVERALLSIGMODEL2" then output OSM2;
                else if M="WORK.OVERALLSIGMODEL3" then output OSM3;
```

```
            else if M="WORK.OVERALLSIGMODEL4" then output OSM4;
            else if M="WORK.OVERALLSIGMODEL5" then output OSM5;
            else if M="WORK.OVERALLSIGMODEL6" then output OSM6;
            else if M="WORK.OVERALLSIGMODEL7" then output OSM7;
            else if M="WORK.OVERALLSIGMODEL8" then output OSM8;


        keep Label1 EditedValue;
run;

Data OverallSig;
        merge OSM1 OSM2 OSM3 OSM4 OSM5 OSM6 OSM7 OSM8;
        by Label1;
run;



Data OtherStat;
        set NumofObs AdjRsq OverallSig;
        rename Label1=Regressors;
Run;



Data Table_Wide_Sorted_WithStat;
        set Table_Wide_Sorted OtherStat;
run;

ods excel file="/home/u60687871/MySaS/combined3.xlsx" options(Embedded_Titles="ON"
Embedded_Footnotes="ON");
Title "Table: Impact of Vehicle Property Tax Rates to Vehicle Sales";
```

```
footnote justify=left "Note: robust standard errors are in parentheses. *, **, and *** indicate
                                                    10%, 5%, and 1% significance levels,
respectively.";
proc print data=Table_Wide_Sorted_withstat noobs;
        var Regressors;
        var Model1-Model8 /style(header)={just=center} style(data)={just=center
tagattr="type:String"};
        format Regressors $VariableName.;
run;
ods excel close;
```

```
/* logresults */
ods output ParameterEstimates=PEforModel1  DataSummary=ObsModel1
FitStatistics=AdjRsqModel1  Effects=OverallSigModel1;
proc surveyreg data=modeldata5;
        class state year/ref=first;
        Model logauto =  VehiclePTax /adjrsq solution;
run;

ods output ParameterEstimates=PEforModel2  DataSummary=ObsModel2
FitStatistics=AdjRsqModel2  Effects=OverallSigModel2;
proc surveyreg data=modeldata5;
        class state year/ref=first;
        Model logauto =  VehiclePTax "median income"n population/adjrsq solution;
run;
```

```
ods output ParameterEstimates=PEforModel3  DataSummary=ObsModel3
FitStatistics=AdjRsqModel3  Effects=OverallSigModel3;

proc surveyreg data=modeldata5;

        class state year/ref=first;

        Model logtruck =  VehiclePTax /adjrsq solution;

run;


ods output ParameterEstimates=PEforModel4  DataSummary=ObsModel4
FitStatistics=AdjRsqModel4  Effects=OverallSigModel4;

proc surveyreg data=modeldata5;

        class state year/ref=first;

        Model logtruck =  VehiclePTax "median income"n population/adjrsq solution;

run;


ods output ParameterEstimates=PEforModel5  DataSummary=ObsModel5
FitStatistics=AdjRsqModel5  Effects=OverallSigModel5;

proc surveyreg data=modeldata5;

        class state year/ref=first;

        Model logmotorcycle =  VehiclePTax /adjrsq solution;

run;


ods output ParameterEstimates=PEforModel6  DataSummary=ObsModel6
FitStatistics=AdjRsqModel6  Effects=OverallSigModel6;

proc surveyreg data=modeldata5;

        class state year/ref=first;

        Model logmotorcycle =  VehiclePTax "median income"n population/adjrsq solution;

run;
```

```
ods output ParameterEstimates=PEforModel7  DataSummary=ObsModel7
FitStatistics=AdjRsqModel7  Effects=OverallSigModel7;

proc surveyreg data=modeldata5;

        class state year/ref=first;

        Model logall =  VehiclePTax /adjrsq solution;

run;


ods output ParameterEstimates=PEforModel8  DataSummary=ObsModel8
FitStatistics=AdjRsqModel8  Effects=OverallSigModel8;

proc surveyreg data=modeldata5;

        class state year/ref=first;

        Model logall =  VehiclePTax "median income"n population/adjrsq solution;

run;


Data Table_Long;

        length Model $10;

        length Parameter $30;

        set PEforModel1 PEforModel2 PEforModel3 PEforModel4 PEforModel5 PEforModel6
PEforModel7 PEforModel8 indsname=M;

        keep Model Parameter EditedResults;

        if        M="WORK.PEFORMODEL1" then Model="Model1";

        else if M="WORK.PEFORMODEL2" then Model="Model2";

        else if M="WORK.PEFORMODEL3" then Model="Model3";

        else if M="WORK.PEFORMODEL4" then Model="Model4";

        else if M="WORK.PEFORMODEL5" then Model="Model5";

        else if M="WORK.PEFORMODEL6" then Model="Model6";

        else if M="WORK.PEFORMODEL7" then Model="Model7";

        else if M="WORK.PEFORMODEL8" then Model="Model8";
```

```
        if Probt le 0.01 then Star="***";
                else if Probt le 0.05 then Star="**";
                else if Probt le 0.1 then Star="*";


        Results=Estimate;
        EditedResults=Cats(put(Results,comma16.2),Star);
        output;

        Results=stderr;
        EditedResults=Cats("(",put(Results,comma16.2),")");
        output;


        where StdErr ne 0;

run;

proc sort data=Table_Long out=Table_Long_Sorted;
        by Model Parameter;
run;


data Model1Results(rename=(EditedREsults=Model1))
                Model2Results(rename=(EditedREsults=Model2))
                Model3Results(rename=(EditedREsults=Model3))
                Model4Results(rename=(EditedREsults=Model4))
                Model5Results(rename=(EditedREsults=Model5))
```

```
                Model6Results(rename=(EditedREsults=Model6))
                Model7Results(rename=(EditedREsults=Model7))
                Model8Results(rename=(EditedREsults=Model8));

        set Table_Long_Sorted;
        if Model="Model1" then output Model1Results;
                else if Model="Model2" then output Model2Results;
                else if Model="Model3" then output Model3Results;
                else if Model="Model4" then output Model4Results;
                else if Model="Model5" then output Model5Results;
                else if Model="Model6" then output Model6Results;
                else if Model="Model7" then output Model7Results;
                else if Model="Model8" then output Model8Results;



        drop Model;
run;

data Table_Wide;
        merge Model1Results Model2Results Model3Results Model4Results Model5Results
Model6Results Model7Results Model8Results;
        by Parameter;
        if mod(_n_,2)=1 then Regressors=Parameter;

        length Order 3;
        if  Parameter="Intercept" then Order=4;
           else if Parameter="median income" then Order=2;
      else if Parameter="population" then Order=3;
```

```
        else Order=1;


run;


proc sort data=Table_Wide out=Table_Wide_Sorted(drop=Order Parameter);
        by Order;
run;


data NumofObs(keep=Label1 Model1 Model2 Model3 Model4 Model5 Model6 Model7
Model8);
        merge ObsModel1(rename=(nvalue1=NVModel1))
ObsModel2(rename=(nvalue1=NVModel2)) ObsModel3(rename=(nvalue1=NVModel3))
ObsModel4(rename=(nvalue1=NVModel4)) ObsModel5(rename=(nvalue1=NVModel5))
ObsModel6(rename=(nvalue1=NVModel6)) ObsModel7(rename=(nvalue1=NVModel7))
ObsModel8(rename=(nvalue1=NVModel8));
        by Label1;
        where Label1="Number of Observations";
        Model1=put(NVModel1,comma16.0);
        Model2=put(NVModel2,comma16.0);
        Model3=put(NVModel3,comma16.0);
        Model4=put(NVModel4,comma16.0);
        Model5=put(NVModel5,comma16.0);
        Model6=put(NVModel6,comma16.0);
        Model7=put(NVModel7,comma16.0);
        Model8=put(NVModel8,comma16.0);


run;
```

```
Data AdjRsq;
        merge AdjRsqModel1(rename=(cvalue1=Model1))
AdjRsqModel2(rename=(cvalue1=Model2))  AdjRsqModel3(rename=(cvalue1=Model3))
AdjRsqModel4(rename=(cvalue1=Model4)) AdjRsqModel5(rename=(cvalue1=Model5))
AdjRsqModel6(rename=(cvalue1=Model6)) AdjRsqModel7(rename=(cvalue1=Model7))
AdjRsqModel8(rename=(cvalue1=Model8));
        by Label1;
        Where Label1="Adjusted R-Square";
        drop nvalue1;
run;



data OSM1(rename=(EditedValue=Model1)) OSM2(rename=(EditedValue=Model2))
OSM3(rename=(EditedValue=Model3)) OSM4(rename=(EditedValue=Model4))
OSM5(rename=(EditedValue=Model5)) OSM6(rename=(EditedValue=Model6))
OSM7(rename=(EditedValue=Model7)) OSM8(rename=(EditedValue=Model8));
        set OverallSigModel1 OverallSigModel2 OverallSigModel3 OverallSigModel4
OverallSigModel5 OverallSigModel6 OverallSigModel7 OverallSigModel8 indsname=M;
        Where Effect="Model";
        Label1="Overall Significance";

        if ProbF le 0.01 then Star="***";
                else if ProbF le 0.05 then Star="**";
                else if ProbF le 0.1 then Star="*";

        EditedValue=Cats(Put(FValue,comma16.2),Star);

        if M="WORK.OVERALLSIGMODEL1" then output OSM1;
                else if M="WORK.OVERALLSIGMODEL2" then output OSM2;
                else if M="WORK.OVERALLSIGMODEL3" then output OSM3;
```

```
            else if M="WORK.OVERALLSIGMODEL4" then output OSM4;
            else if M="WORK.OVERALLSIGMODEL5" then output OSM5;
            else if M="WORK.OVERALLSIGMODEL6" then output OSM6;
            else if M="WORK.OVERALLSIGMODEL7" then output OSM7;
            else if M="WORK.OVERALLSIGMODEL8" then output OSM8;


        keep Label1 EditedValue;
run;

Data OverallSig;
        merge OSM1 OSM2 OSM3 OSM4 OSM5 OSM6 OSM7 OSM8;
        by Label1;
run;



Data OtherStat;
        set NumofObs AdjRsq OverallSig;
        rename Label1=Regressors;
Run;



Data Table_Wide_Sorted_WithStat;
        set Table_Wide_Sorted OtherStat;
run;

ods excel file="/home/u60687871/MySaS/combined4.xlsx" options(Embedded_Titles="ON"
Embedded_Footnotes="ON");
Title "Table: Impact of Vehicle Property Tax Rates to Vehicle Sales";
```

```
footnote justify=left "Note: robust standard errors are in parentheses. *, **, and *** indicate
                                                    10%, 5%, and 1% significance levels,
respectively.";
proc print data=Table_Wide_Sorted_withstat noobs;
        var Regressors;
        var Model1-Model8 /style(header)={just=center} style(data)={just=center
tagattr="type:String"};
        format Regressors $VariableName.;
run;
ods excel close;
```