Do Car Seat Laws Cause People to Buy Larger Cars?

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Abstract

Beginning in 1978, laws mandating the use of car seats for children have been adopted across the United States. Utilizing variation across states in the timing of these laws and their age requirements, we find that these laws have had an unintended consequence of causing parents to switch from sedans to larger vehicles, at a cost of $XXX per child. However, we find mixed results on the aggregate effect of car seat laws on the total number of larger vehicles on the road.

1 Introduction

In 1978, the first car seat law in the United States was passed by Tennessee, requiring car seats for children under four years old. By 1985, car seat laws had been passed in nearly every state in the country, although laws varied considerably in their age requirements. Over the next few decades, age requirements more than doubled from an average of less than three years old in 1985 to nearly seven years old in 2020 (see Figure 1).

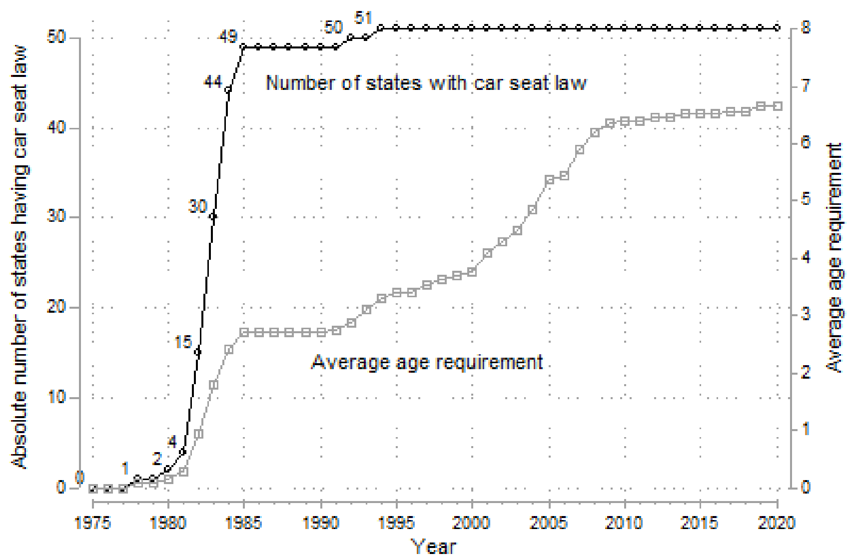

Figure 1: Evolution of car seat laws

Notes: The figure plots the evolution of car seat laws. The line with circles plots the number of states having a car seat law in each year. The line with squares plots the average age requirement of car seat laws in each year (states without laws are coded to zero).

Car seat laws are intended to increase child safety, and car seats themselves go through rigorous testing to ensure they will protect a child in the event of a collision. However, in the pursuit of child safety, policymakers have overlooked an important unintended consequence: car seat laws may induce parents to switch to larger vehicles, namely minivans and sport utility vehicles (SUVs), especially as the age requirements rise. Rising age requirements are especially relevant because the vast majority of regular-size sedans can only fit two car seats in the back seat, so a family with three young children needs a larger vehicle just to accommodate the car seats.[1] Larger vehicles also offer more space and tend to ride higher off the ground, which make it easier to both install and strap a child into a car seat.

We find that car seat laws do cause households to switch from smaller to larger vehicles. Requiring children over two years old to be in a car seat causes households with two or three children to purchase an additional XXX large vehicles per hundred households. The effect is also present, albeit smaller, for households with only one child—an additional XXX large vehicles per hundred households. We find that these increases are almost exactly offset by decreases in the number of sedans, suggesting that households are indeed switching from sedans to larger vehicles.

We estimate these effects by using variation across states in the timing and intensity of child car seat laws. We use a triple-difference specification that compares the responses of households with and without young children in states before and after they enact car seat laws. To illustrate, suppose one state passed a car seat law while its neighboring state did not. Our estimator would calculate 1) the difference between households with and without young children in each state before and after the law change, 2) the difference in that difference over time within each state, and finally 3) the difference in that difference-in-differences across the two states. One advantage of this strategy is that it differences out any national or state-level trends that might also affect vehicle purchases, such as marketing campaigns by car manufacturers or variation across states and over time in fuel efficiency standards.[2] Our key identifying assumption is that, in the absence of the car seat law, the difference in large vehicle ownership between households with and without children in each state would have moved in parallel over time.

1. Popular automobile sites keep lists of which vehicles can fit three car seats. The popularity of these lists suggests that this is a salient issue for families. The lists are dominated by minivans and SUVs with only a few sedans. For examples, see https://www.cars.com/articles/which-cars-fit-three-car-seats-1420668847322/, https://cars.usnews.com/cars-trucks/great-vehicles-that-seat-three-car-seats-across and https://www.carprousa.com/Vehicles-That-Fit-Three-Car-Seats-In-One-Row/a/40.

2. Our strategy will difference out marketing effects to the extent that marketing affects all households rather than disproportionately affecting households with children.

Our paper fits within two literatures. First, we build on a literature estimating the effects of car seat laws. We are most closely related to Nickerson and Solomon (2020), who show that stricter car seat laws have resulted in an unintended consequence of lowering the fertility rate by increasing the cost of having a third child. Other papers have focused on the direct safety benefits of car seat laws. Levitt (2008) and Doyle and Levitt (2010) find that car seats do not reduce fatalities or serious injuries for children over age two. Jones and Ziebarth (2016a) replicate the findings of Levitt (2008) and show that the results extend to later years as well. We also relate to a broader literature evaluating the effects of various transportation safety policies. This includes van Benthem (2015), who evaluate the impact of increasing speed limits, DeAngelo and Hansen (2014), who evaluate the effect of hiring more highway troopers, and Hall and Madsen (2021), who document unintended consequences from highway safety messages.

Our paper proceeds as follows. In the next section, we describe the data and the sources used in this study. Section 3 presents our empirical strategy, and Section 4 provides our empirical results. Section 5 calculates the indirect effects of car seat laws on traffic safety, emissions, and consumer spending, and Section 6 concludes.

2 Data

We collect data on car seat laws, state-level vehicle inventories, and household vehicle ownership and purchases.

2.1 US Child Safety Seat Laws, 1978–2020

We obtain data on U.S. child car seat laws and age requirements through 2013 from Jones and Ziebarth (2017). We extend the data through 2020 using data obtained from the Insurance Institute for Highway Safety (IIHS).

The first car seat law was enacted by Tennessee in 1978, followed by Rhode Island in 1980, and West Virginia and Maine in 1981. Then, in a period of three years, almost all of the states had laws that governed the mandatory use of child car seats. Massachusetts and New Hampshire were the last two states to enact their car seat laws, in 1992 and 1994, respectively.

Perhaps more important than a law's enactment is the age requirement it imposes. For example, when the age requirement is two years, households with multiple children who are two or more years apart would need only one car seat at a time. When the age requirement is 8 years, then households with multiple children would need multiple car seats and may be more likely to switch to a larger vehicle. Figure 2 shows the distribution of the age requirement when the state first enacted its car seat law as well as the distribution of age requirements in 2020. It shows that the age requirements have grown increasingly strict, with the median age requirement climbing from three to eight.

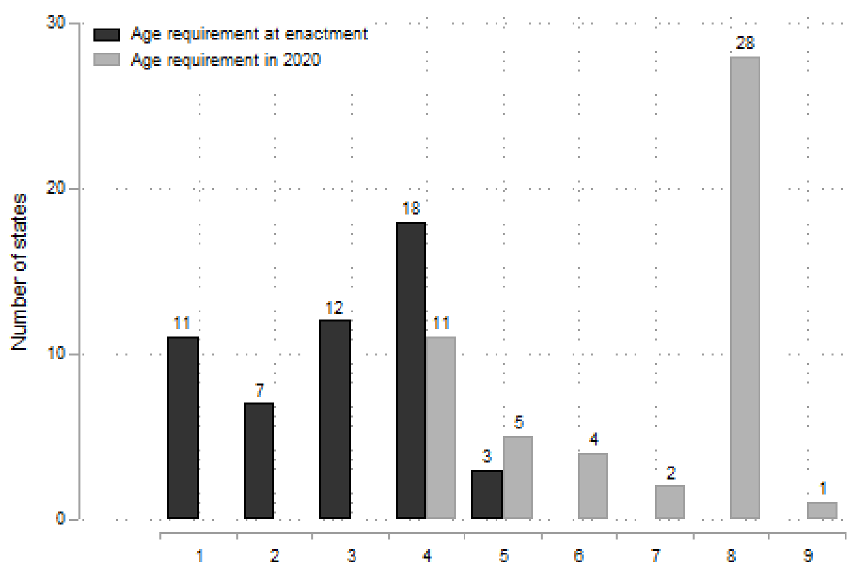

Figure 2: Initial and current car seat age requirements

Notes: The figure plots the distribution of initially chosen car seat age requirements as well as the distribution of age requirements in 2020. For example, eleven states required children under one year old to be in a car seat when their law was first enacted.

It is worth noting that a few states use a child's height or weight, rather than age. For example, when Kentucky enacted their law in 1982, children shorter than 40 inches were required to be seated in car seats. We convert the weight or height requirements into age requirements using the 50th percentile of children's growth charts provided by Centers for Disease Control and Prevention, National Center for

Health Statistics (2000).

In recent years, some states have started to include the mandatory use of booster seats for older children, usually children older than 8 years old. In our analysis, we do not include the requirement of booster seats in our data on car seat laws.

2.2 State Level Vehicle Data

2.2.1 Vehicle Inventory and Use Survey (VIUS), 1977–2002 (Gapped)

The Vehicle Inventory and Use Survey (VIUS), also known as the Truck Inventory and Use Survey prior to 1992, provides data on the physical and operational characteristics of the nation's truck population every five years. The survey is based on a probability sample of private and commercial trucks registered (or licensed) in each state; notably, many states allow pickups, small vans, and utility-type vehicles to be registered as either cars or trucks. The passenger car files were searched, and any such trucks were included in the universe of trucks from which the sample was selected. We collected estimated numbers of larger vehicles of interest, such as vans, minivans, station wagons, and SUVs, from 1977 to 2002 at the state level.[3] This dataset provides the earliest data from the time before the first car seat law was enacted. The data, however, suffer from having long gap years and measurement inconsistencies between surveyed years. We minimize the categorical inconsistencies by aggregating multiple vehicle types of interest. See the appendix for a detailed list of vehicle categories.

2.2.2 Federal Highway Administration (FHWA), 1994–2018

The Highway Statistics Series consists of annual reports, conducted by the Federal Highway Administration, that contain statistical information on vehicle registrations. We collected estimated numbers of vans and SUVs from 1994 to 2018 at the state level.[4] Note that, after 1994, every state had a car seat law.

3. The vehicle categories vary over the years; for example, the category of station wagon existed only before 1992, and SUVs appear only after 1997. VIUS was discontinued after 2002.

4. Before 1994, the number of vans or SUVs was not separately reported from the number of light trucks, which included pickups and delivery vans, which are not within the scope of this study.

2.3 Household Based Survey Data

2.3.1 National Household Travel Survey (NHTS), 1990–2017 (Gapped)

NHTS is a household-based survey on travel by U.S. residents in all 50 states and Washington, DC. NHTS was first conducted in 1969 and was originally known as the Nationwide Personal Transportation Survey. It was renamed NHTS in 2001. The available surveyed years used in this paper are 1990, 1995, 2001, 2009, and 2017.[5] The share of vans and SUVs of all surveyed vehicles increased from 5.53 percent in 1990 to 28.71 percent in 2017. The proportion of households that owned at least one van or SUV also increased from 9.84 percent in 1990 to 46.78 percent in 2017.

NHTS dataset provides, in addition to vehicle information, the information on household demographic characteristics. We use the total number of household members, number of adults, number of children, and composition of household to determine the targeted subgroup of households with two or three children, which are the households most likely affected by car seat laws.

2.3.2 Consumer Expenditure Survey, 1980–2020

The Consumer Expenditure Survey (CEX) provides data on household expenditures, income, and demographic characteristics of U.S. consumers. The surveys are conducted quarterly, with an iterating sample structure. Each household is surveyed four to five times and appears in the original dataset with a short panel of four to five quarters, sometimes crossing a year. Because the panel is so short that we rarely see significant characteristics change within a household, and to ensure a better comparison of the results with the other dataset, we keep only one-quarter of the data for each household, which is the first appearance of the data. After this adjustment, we have about 9,000 unique households per year from 1980 to 2020. Note that we do not have vehicle information for 1982 and 1983, so we exclude these two years from our analysis.

Different from NHTS, CEX categorizes a vehicle as auto and truck or van. SUVs

5. State information was not available before the 1990 survey.

did not have its own category and were mostly put into the truck or van category.[6] We thus use the truck or van category as our primary variable of interest. The share of vans or trucks compared to all surveyed vehicles grew from 15.42 percent in 1980 to 52.93 percent in 2020. The proportion of van or truck owners at the household level also grew, from 21.53 percent to 58.06 percent. The percentage is higher than that of the NHTS data because it includes pickups as well, and we could not dismiss these data entirely (see the appendix for our attempt to adjust the issue by limited make/model information). Similar to NHTS, we also use the household demographics to identify the targeted subgroup of households with two or three children, which are most likely affected by car seat laws.

Table 1: Summary statistics of household data

	NHTS	CEX
	Mean	Mean
Share of larger vehicle ownerer	0.406	0.411
Household size	2.352	2.517
Share of parents	0.254	0.348
Age of head of household	54.888	47.699
Share of urban households	0.728	0.982
Years covered	1990–2017	1980–2020
Annual data	No	Yes
Larger vehicle category observed	van, SUV	van or truck
Definition of young child	age 0–4	age 0–1
Observations	409,261	405,738

Notes: The table shows the summary statistics and features of each household level data.

6. From limited make/model information, we found that some SUVs were put into the auto category; see the appendix for more detailed information.

3 Empirical Strategy

3.1 Difference-in-Differences (DID)

By nature of the staggered intervention structure, the car seat laws were enacted in different years in different states, with different age requirements. We first exploited the variations at the state level, using a DID model:

$$Y_{st} = \beta_1 I_{ast} + \gamma X_{st} + \theta_s + \theta_t + \epsilon_{st} \tag{1}$$

where Y_{st} is the dependent variable of interest, we used ln(total number of larger vehicles) and ln(number of larger vehicles per capita) in the VIUS and FHWA datasets. I_{ast} is a dummy variable for whether the car seat law exists in state s at year t, or a set of dummy variables that indicates whether children in year a are required to be seated in car seats in state s at year t. X_{st} is the relevant state level covariate controls, θ_s and θ_t are state and year fixed effect, respectively, and ϵ_{st} is an error term. Note that all of our data share the common serial correlation issue that cross-section panel data used to have. Following Bertrand, Duflo, and Mullainathan (2003), we clustered standard errors at the state level in all of our analysis.

The key identification assumption of this DID model is the parallel assumption. Although the state fixed effect captures time-invariant group attributes, time trend captures the time-varying factors that are group invariant. The number of larger vehicles between treated and untreated states should differ only by a fixed amount.

In all DID regression results, we do not find evidence that states with higher age requirements have a greater number of larger vehicles. We suspect that these results are driven mainly by partial compliance. That is, only part of the population is affected by the car seat laws. If the share of this affected subgroup of households evolves differently across states over time, the effects of car seat laws, even with the same age requirement, will be different. We attempted to address this issue by applying an additional control group and altered the DID model into a DDD model.

3.2 Difference-in-Difference-in-Differences (DDD)

In addition to the staggered law enactments differences, using household level data, we identified the sub-group of households that were most likely affected by car seat laws, which are the households with multiple children. We excluded households with more than three children and households with more than six individuals because these households would, in general, need a larger car whether or not they were affected by the law. We estimated the following DDD model:

$$Y_{ist} = \beta_1 I_{ast} \times H_{ist} + \beta_2 H_{ist} + \gamma X_{ist} + \theta_s + \theta_t + \theta_s * \theta_t + \epsilon_{ist} \tag{2}$$

where Y_{ist} is a dummy variable equals to 1 if the household i owns any larger vehicles. I_{ast} is a dummy variable for whether the car seat law exists in state s at year t, or a set of dummy variables that indicates whether children in year a are required to be seated in car seats in state s at year t. H_{ist} is a dummy variable that indicates whether the household has multiple children, and the reference group is the household with no children. X_{ist} is a relevant household level covariate controls, θ_s and θ_t are state and year fixed effect, respectively, and $\theta_s * \theta_t$ is a full set of state-year fixed effects which control for state specific time shocks affecting all households. Finally, ϵ_{ist} is an error term.

In this model specification, β_1 is the triple difference coefficient that captures the difference of the increment of ownership of larger vehicles caused by the household composition between states with and without a car seat law. If the law is binding and causes affected households to buy larger vehicles, we would expect a significant and positive β_1.

The DDD model also requires a parallel trend assumption for the estimated effect to be causal. It requires the relative ownership of larger vehicles of households with multiple children and households without children in the treatment state to trend in the same way as the relative ownership of larger vehicles of households with multiple children and households without children in the control state, in the absence of treatment.

4 Empirical Results

4.1 DDD Results

Table 2 presents the main results of DDD models using households with two or three children and households with no children, based on data from CEX and NHTS. We reported the DDD coefficient β_1, which captures the increment of larger vehicle ownership induced by car seat laws between households with two to three children and households with no children.

To better understand the economic meaning of the coefficients, we use the number from Column (1), as it serves as a simple example. In the states without car seat laws, households with two or three children have, on average, a 7 percent higher probability of owning larger vehicles than do households with no children; this effect is captured by the coefficient β_2 in equation (2). In the states with car seat laws, households with two or three children have, on average, a 15 percent higher probability of owning larger vehicles than do households with no children. β_1 captures the difference between these two differences, which is 8 percent, as shown in Table 2, Column (1).

In Column (2), similar DDD coefficients are reported, but the law dummy was replaced with the nominal number of age requirement to estimate the marginal effect of increasing the age requirement by one year. We also included the quadratic term of the age requirement to allow for non-linear effects. In Column (3), we used a dummy variable equals to 1 if the age requirement is greater or equal to 4 years in that state-year; the reference group has an age requirement of younger than 4 years. Similarly, in Column (4), we further separate the age requirement into four groups, with the reference group as having an age requirement of younger than 2 years.

In Columns (5)—(7), the same model specifications are applied using the data from NHTS. We can examine only the effect of the existence of car seat laws in CEX because it included earlier years, when many states had not yet enacted car seat laws. The direction of the effects of car seat laws are the same in these two datasets but smaller in magnitude in CEX. We determine two factors that drive the estimations downward in CEX. The first is the sampling. The CEX dataset contains

Table 2: DDD result: CEX & NHTS, HH23 vs HH0

	(1) CEX	(2) CEX	(3) CEX	(4) CEX	(5) NHTS	(6) NHTS	(7) NHTS
has law × HH23	0.096***						
	(0.012)						
age req × HH23		0.027***			0.061***		
		(0.005)			(0.016)		
age req^2× HH23		-0.001*			-0.005***		
		(0.001)			(0.001)		
age req 4–9 × HH23			0.070***			0.081***	
			(0.010)			(0.018)	
age req 2–3 × HH23				0.030**			0.058
				(0.009)			(0.042)
age req 4–6 × HH23				0.075***			0.122**
				(0.011)			(0.040)
age req 7–9 × HH23				0.115***			0.121**
				(0.014)			(0.040)
Household controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Urban F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	272,229	272,229	272,229	272,229	325,852	325,852	325,852

Clustered standard errors at state level in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: The table shows the DDD results as described in equation (2) using data from CEX (1980–2020) in columns (1)–(4), and NHTS (1990–2017) in columns (5)–(7). Regressions include households with 2–3 children and households without children.

nearly all urban households and lacks households from some states.[7] Observations for rural households are limited, as only 8.42 percent of households are in rural areas. In contrast, the NHTS dataset shows 27.21 percent of households in rural areas. It is reasonable for people who live in an urban area to have more concerns about whether to get a larger vehicle, as they have to think about the demand for parking spaces and extra fuel consumption induced by traffic congestion and delays (Winston and Yan (2020), Brownstone and Golob (2009)). The urban fixed effect control also shows that households in urban areas are less likely to own a large vehicle than are those in rural areas. If we run the same regressions on the NHTS data, using urban households only, the DDD coefficients decrease a bit, moving toward CEX coefficients.

The second factor is vehicle category. As noted, we could not distinguish pickup trucks from vans and SUVs from the category of van or truck in the CEX data for most surveyed years. Even though some full-size pickups were reported as capable of fitting up to three car seats, this was not as common as vans and SUVs as capable of fitting multiple car seats. As a result, the effect of car seat laws on ownership of larger vehicles was expected to be diluted by including pickup trucks in the CEX data.[8] Due to these reasons, we used estimations from the NHTS data as our main results. Further, these data gave more precise vehicle information, as the survey focused mainly on traffic and transportation.

As seen in Columns (4) and (7), the difference between the lower two groups (age requirements 0—1 and 2—3) was not significant, and the difference between the higher two groups (age requirements 4—6 and 7-–9) also were not significant. We thus conclude that the effects of car seat laws with a lower age requirement, ranging from 0 to 3 years, are similar and distinct from those with higher age requirement, ranging from 4 to 9 years. Consider a household with three children, ages 1, 3, and 5 years, as an example. If this household were in a state with a lower age requirement, then it would need only two car seats at a time. If, however, this household were

7. We did not find any households from Montana, New Mexico, North Dakota, South Dakota, or Wyoming.

8. Again, using the make/model information, we were able to adjust the numbers in given years; see the appendix for our attempt to make this adjustment.

in a state with a higher age requirement, then it would need three car seats until the eldest child became old enough that it was no longer required. As a result, when considering the trade off between the CEX and NHTS datasets, we choose the estimation from Column (6) to conduct the analysis of the subsequent indirect effects of car seat laws on traffic safety issues and emissions.

Next, we visualize the effect of car seat laws with age requirement greater than 3 on larger vehicle ownership before and after law enactment in the sense of event-study regression design. We use data from CEX because it provides annual data with longer history. The specification is the same as equation (2), while I_{ist} is defined as the set of leads and lags of law enactment with age requirement greater than 3. In figure 3, the figure plots the DDD coefficient 5 years before and 10 years after the law enactment. The omitted indicator is the year before law enactment. Figure 4.1 shows that more and more households with 2–3 children own larger vehicle after law enactment. More importantly, it shows no significant pre-trend exists, suggesting the parallel assumption holds.

Table 3 presents the results for the same DDD models but for households with only one child and households with no children. We found that the car seat laws also induced households with only one child to get larger vehicles, but the effects were smaller in magnitude as compared to those for households with two or three children. We also checked the effect at the margin of the third children by comparing the effects between households with two children and three children. The difference, however, is minor and not significant.

4.2 Effects of Car Seat Laws on Number of Vehicles Owned

Given that the car seat laws cause more affected households to own larger vehicles, we aimed to determine, using NHTS data, whether these households were replacing their regular size auto with a van or SUV or adding an extra larger vehicle. We applied the same model specification as equation (2), but replacing the dependent variable Y_{ist} to be number of vans or SUVs, number of regular autos, number of motorcycle, number of other vehicles and the total number of all vehicles, owned by household i.

Table 3: DDD results: CEX & NHTS, HH1 vs HH0

	(1) CEX	(2) CEX	(3) CEX	(4) CEX	(5) NHTS	(6) NHTS	(7) NHTS
has law × HH1	0.015						
	(0.009)						
age req × HH1		0.001			0.034**		
		(0.004)			(0.010)		
age req^2× HH1		0.000			-0.003**		
		(0.001)			(0.001)		
age req 4–9 × HH1			0.013*			0.052**	
			(0.006)			(0.015)	
age req 2–3 × HH1				0.001			0.021
				(0.012)			(0.027)
age req 4–6 × HH1				0.009			0.065**
				(0.006)			(0.022)
age req 7–9 × HH1				0.028*			0.069**
				(0.013)			(0.024)
Household controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Urban F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	260,816	260,816	260,816	260,816	317,421	317,421	317,421

Clustered standard errors at state level in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: The table shows the DDD results as described in equation (2) using data from CEX (1980–2020) in columns (1)–(4), and NHTS (1990–2017) in columns (5)–(7). Samples included are households with 1 child and households without children.

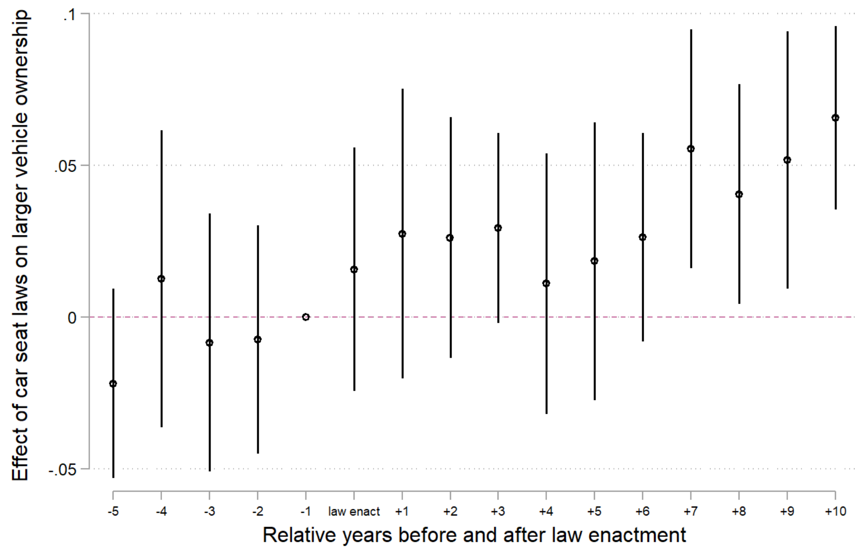

Figure 3: Effect of car seat laws with age requirement greater than three on larger vehicle ownership before and after law enactment

Notes: The figure plots the DDD coefficient from an event study style regression of larger vehicle ownership on leads and lags of car seat law enactment with age requirement greater than three, and the controls and fixed effects as described in equation (2) using data from CEX (1980–2020). Samples included are households with 2–3 children and households without children. The omitted indicator is the year before law enactment. Bars denote 95 percent confidence intervals.

Table 4 presents the effect of car seat laws on number of vehicles owned by a household. In Column (1), the dependent variable is number of vans or SUVs owned. The coefficient is similar to what is seen in Column (6) of Table 2, but bigger, because Y_{ist} is no longer capped at 1. In Column (2), the dependent variable is number of regular size vehicles. The coefficient is negative and significant. In Column (3), the dependent variable is number of motorcycles. The coefficient is also negative and significant. In Column (4), the dependent variable is number of other vehicles. In Column (5), the dependent variable is number of all kinds of vehicles owned by the household. We found that the increment of total vehicles induced by car seat laws is limited and not significant. In Columns (6)-–(10), the same regressions were replicated, using households with only one child. The direction of coefficients is consistent with households with two or three children but weaker in magnitude and significance. We thus concluded that car seat laws cause parents to replace their regular-size auto with a van or SUV, instead of adding a larger vehicle.

Table 4: DDD results: NHTS, number of vehicles

	(1) # of van or SUV	(2) # of sedan	(3) # of motorcycle	(4) # of other vehicles	(5) # of all vehicles
			Panel A: Households with 2–3 children		
age req 4–9 × HH23	0.124***	-0.059*	-0.017***	-0.028**	0.020
	(0.027)	(0.023)	(0.005)	(0.010)	(0.020)
Observations	325,852	325,852	325,852	325,852	325,852
			Panel B: Households with 1 child		
age req 4–9 × HH1	0.077***	-0.038	0.002	-0.004	0.037
	(0.020)	(0.020)	(0.004)	(0.012)	(0.020)
Observations	317,421	317,421	317,421	317,421	317,421

Clustered standard errors at state level in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: The table shows the effects of car seat laws with age requirement greater than 3 on number of vehicle owned using data from NHTS (1990–2017). In each column, the dependent variable is number of vehicle of different type as labeled in the title. In panel A, included samples are households with 2–3 children and households without children. In panel B, included samples are households with 1 child and households without children.

5 Effects of Car Seat Laws and Increased Larger Vehicles Induced by Car Seat Laws

The effect of using car seats on child traffic safety has been widely investigated. Earlier studies (Kahane (1986), Partyka (1988), Evans and Graham (1990), Cohen and Einav (2003), Starnes (2005), Sen and Mizzen (2007)) find that child safety seats reduce fatality rates and severe injury risks relative to riding unrestrained. More recent papers (Levitt (2008), Doyle and Levitt (2010), Jones and Ziebarth (2016a)) argue that the use of child safety seats is no better than the use of traditional seat belts beyond children aged two, as long as they fit properly. The studies note that the installation of car seats did not help to decrease the child fatality rate in car crashes. Further, Daly et al. (2006), Jones and Ziebarth (2016a) show that riding in SUVs, as compared to other vehicles, does not provide additional safety for children, even with the use of restraints.

Although the previous papers focus on the impact of using a car seat, Jones and Ziebarth (2016b) and Nickerson and Solomon (2020) test whether the car seat laws themselves affect car crash fatalities. Both studies find that the evidence for car seat laws as reducing the child fatality rate in a car crash is weak and inconsistent. Overall, the literature suggests that neither using car seats nor enacting car seat laws helps to improve child traffic safety.

We have shown, however, that car seat laws cause affected households to own larger vehicles. The shift in vehicle fleet composition has negative impacts on traffic safety. White (2004), Anderson (2008), Li (2012), and Anderson and Auffhammer (2014) all find that larger and heavier vehicles protect the occupants better but induce negative externalities to others on the road. The "arms race" phenomenon is causing Americans to buy more vans and SUVs to self-protect, and, as a result, public traffic safety is worsened by the increasing share of larger vehicles.

In this section, we estimated the number of larger vehicles increased by car seat laws, using the point estimates of our DDD coefficients using NHTS data. We first estimated the number of larger vehicle owned by each households. We then calculated the number again in 2017, which is the latest wave of NHTS, but fixing age requirement of car seat laws at 3 for all states, following the spirit of Levitt (2008) that seat belts are as good as car seats for children beyond age 2. By contrasting the numbers, we get the number of larger vehicles that would not had been purchased if we roll back the age requirement to 3.

The number of larger vehicles removed on the road is estimated to be about one million in 2017, which accounted for 1.1 percent of all vans and SUVs in that year. Following the calculation by White (2004), between 34 and 93 additional people are saved due to the decreased number of larger vehicles, with the value of the lives equivalent to between $365 and $998 million in current dollar value.[9]

9. The estimated value of a statistical life was around $10 million in 2017 dollars, calculated by Kniesner and Viscusi (2019).

In addition to traffic safety hazards, the number of larger vehicles serves as a determining factor in greenhouse gas emissions. According to Cozzi (2019), since 2010, SUVs have become the second-largest contributor to the increase in global CO_2 emissions, only after the power sector. On average, SUVs consume about a quarter more energy than do regular-size cars, equivalent to about 1.15 more metric tons of carbon dioxide per vehicle per year. Using the official U.S. social cost of carbon calculated by Interagency Working Group (2010), the estimated value of emissions due to the reduced number of larger vehicles induced by car seat laws is about $31.2 million.

Finally, according to KBB's average vehicle transaction price report in 2017, the cost difference between regular auto and SUV is about $17 thousand per vehicle. The reduced cost of upgrading vehicle is about $18 billion nationwide in 2017.

Table 5: Impacts of fixing age requirement at 3

	DDD, assuming 0 effect to non-parents	DID
Number of larger vehicles removed on the road	3,627,754	-253,244
Proportion of total number of larger vehicle	.0404	-.00282
Traffic fatalities saved (min)	123	-8.61
Traffic fatalities saved (max)	337	-23.6
Value of traffic fatalities saved (min) (million dollars)	1,323	-92.4
Value of traffic fatalities saved (max) (million dollars)	3,620	-253
Reduced CO2 emission (million tons)	4.17	-.291
Value of reduced CO2 emission (million dollars)	113	-7.91
Reduced cost of upgrading vehicle (million dollars)	5,450	-380

Notes: The table shows the impact of fixing age requirement at 3 in all states in 2017.

6 Conclusion

This paper has two key objectives. First, we examined the effect of car seat laws on the increase in larger vehicles, such as vans and SUVs. We note that more restrictive car seat laws do not cause all households to buy larger vehicles to replace regular-size cars, only households with children. Compared with households with no children, the laws that require children under 4 to 9 years old to be restrained in car seats cause 10 percent more households with two or three children to purchase larger vehicles. The effect on households with only one child is also significant but only by two-third magnitude. Second, we estimated the increased number of vans and SUVs that result from car seat laws. If the laws were rolled back to only covering children under 3 years old, about a million larger vehicles would not been purchased. The change to vehicle fleet composition would save more people in car crashes, and reduce more carbon dioxide emissions.

Although the effect of car seat laws on child safety remains questionable, it had been shown ways that the negative effects and externalities of car seat laws are notable. It might be the case, however, that policymakers were unaware of the extra costs to society of these laws, and, thus, car seat laws were enacted universally, and lawmakers continued to raise the age requirements. This paper aims to serve as an indication of the extra cost brought about by car seat laws, which are the increased number of larger vehicles and the subsequent negative effects on public traffic safety and greenhouse gas emissions.

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A Appendix

A.1 Evolution of VIUS vehicle category 1977-2002

In each state-year survey, the estimated number of vehicles was reported. The categories, however, changed from year to year. As a result, the numbers shifted between different categories. For example, in California in 1977, the number of panel vans or vans is 536.4 (thousands), while the total number of light trucks is 2636.1; in California in 1987, the number of panels or vans is 528.8, while the total number of light trucks is 4462.9. It is not likely that vans are decreasing in numbers over the years while the total number of larger vehicles was increasing. Some of the counts went into other categories, such as mini-vans and station wagons, in 1987. To address this inconsistency, we selected the categories of vehicles that households were most likely to use for personal transportation and aggregated them to construct the variables of interest at the state-year level (Table 6).

Table 6: Evolution of VIUS vehicle category 1977–2002

Year	1977	1982	1987, 1992	1997, 2002
Vehicle categories	pickup panel or van multistop or walk-in platform with added devices low boy or depressed center other platform	pickup panel or van utility station wagon multistop or walk-in	pickup minivan panel or van utility station wagon	pickup minivan other light vans sport utility armored
Selected categories for aggregation	panel or van	panel or van station wagon	minivan panel or van station wagon	minivan other light vans sport utility

Notes: The table shows the vehicle categories in the original VIUS data and the the categories we select to include in analysis.

A.2 DID results

In Table 7, we reported the DID coefficient β_1 in different regressions. The values in each column represent a different dependent variable Y_{st}, as listed in the first row, while each panel represents a different definition of car seat laws and, thus, represents a distinct regression specification. In Panel A, we used a dummy variable to indicate whether the state had a car seat law. This regression applied only to VIUS data, which included the years that car seat laws were not enacted yet. In Panel B, we used the nominal age requirement to estimate the marginal effect of increasing the age requirement by one year and included the quadratic term of age requirement to allow for non-linear effects. In Panel C, we designate states that have an age requirement of younger than 4 years the reference group and generate a dummy variable equal to 1 if the age requirement is greater than or equal to 4 years. Similarly, in Panel D, we further separated the age requirement into four groups.

Next, using the same model specification from equation (1), we estimated the DID coefficients at the household level, using the NHTS and CEX databases,[10] where Y_{ist} is a dummy variable equals to 1 if household i owns any larger vehicle (Table 8). None of the results from the DID provides evidence that states with more restrictive car seat laws have a greater number of larger vehicles.[11]

A.3 The other way to set up DDD model

In equation (2), we included the full set of state×year fixed effect. The other way to set up the DDD model is to include the set of law dummies, which is I_{ast} in equation (2). Because the law information is based on state-year, we could not include both variables. In this subsection, we show that the choice of options did not affect our main results.

Using the households with two or three children and households with no children from the CEX data as an example,[12] Table 9 shows that the DDD coefficients were not significantly affected when comparing the two setups. Intuitively, the coefficients of the law dummies represented the average effect of the set of state×year fixed effect. The negative coefficients mean that households with no children are less likely to own larger vehicles in the states with more restrictive car seat laws, although the effects are not significant. One plausible reason for the scenario is that increased

10. We also aggregated the NHTS and CEX data to the state level, and the results were similar.

11. We also tried the new staggered DID methods proposed by Callaway and Sant'Anna (2020), Sun and Abraham (2020) and Roth and Sant'Anna (2021), and still didn't find significant results.

12. Similar results were found in the NHTS data and for households with one child.

Table 7: DID estimations at state level

	(1)	(2)	(3)	(4)
	$\ln(van + SW + SUV)$	$\ln(van + SW + SUV$ per capita)	$\ln(van + SUV)$	$\ln(van + SUV$ per capita)
	VIUS	VIUS	FHWA	FHWA
Panel A: dummy variable indicating if the state has car seat law				
has law	-0.007	-0.029		
	(0.045)	(0.045)		
Panel B: linear age requirement and quadratic term				
age req	-0.003	-0.019	0.019	0.021
	(0.022)	(0.021)	(0.027)	(0.024)
age req^2	0.001	0.003	-0.003	-0.003
	(0.003)	(0.003)	(0.002)	(0.002)
Panel C: dummy variable indicating if the state has age requirement >3				
age req 4–9	0.037	0.013	-0.009	0.001
	(0.034)	(0.033)	(0.026)	(0.022)
Panel D: set of dummy variables indicating the state has age requirement group				
age req 2–3	-0.057	-0.042	-0.073	-0.060
	(0.047)	(0.044)	(0.057)	(0.043)
age req 4–6	0.008	-0.013	-0.055	-0.035
	(0.044)	(0.043)	(0.055)	(0.043)
age req 7–9	-0.096	0.023	-0.122*	-0.100*
	(0.113)	(0.084)	(0.060)	(0.046)
Observations	305	305	1,275	1,275

Clustered standard errors at state level in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: The table shows the DID results as described in equation (1) using data from VIUS (1977–2002) in columns (1)–(2), and FHWA (1994–2018) in columns (3)–(4).

Table 8: DID estimations at household level

	(1) own van or truk CEX	(2) own van or SUV NHTS
	Panel A: dummy variable indicating if the state has car seat law	
has law	-0.001	
	(0.018)	
	Panel B: linear age requirement and quadratic term	
age req	-0.003	0.013
	(0.009)	(0.008)
age req^2	0.000	-0.001
	(0.001)	(0.001)
	Panel C: dummy variable indicating if the state has age requirement >3	
age req 4–9	0.001	0.002
	(0.013)	(0.009)
	Panel D: set of dummy variables indicating the state has age requirement group	
age req 2–3	-0.010	-0.005
	(0.010)	(0.010)
age req 4–6	-0.007	0.005
	(0.015)	(0.009)
age req 7–9	0.002	-0.013
	(0.012)	(0.009)
Observations	405,738	409,261

Clustered standard errors at state level in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: The table shows the DID results as described in equation (1) using data from CEX (1980–2020) in column (1), and NHTS (1990–2017) in column (3).

demand for larger vehicles in the states with restrictive car seat laws drives up the price or deters those who do not actually need larger vehicles. We do not have vehicle price data at the state level, however, to confirm this. Note that we still apply this negative but insignificant effect on households with no children when calculating the number of larger vehicles increased by car seat laws. Even though households with no children are in the majority, and they are purchasing fewer larger vehicles when affected by car seat laws, we still conclude that car seat laws cause people to buy an increasing number of larger vehicles.

A.4 Vehicle make/model adjustment and correction of CEX 1980–2003

The CEX data include make and model in their expansion file of vehicle information from 1980 to 2003. In the dataset, 803,879 out of 1,682,052 vehicles (47.79 percent) have make/model information. Of these vehicles, 790 different makes/models were recorded, with 500 as having misplacement errors, meaning that they had the same make/model code but were put into different vehicle types (auto, van or truck, and others). We first corrected the type of vehicle to auto (van or truck) if more than 80 percent of that make/model were reported as auto (van or truck). This corrected most of the misplaced vehicles (709,673 out of 803,879, 88.28 percent). We left as is those in between (most were a make/model, such as Chevrolet or Ford, without further information). Next, we excluded pickups from the category of van or truck. There were 41,163 pickups out of 224,930 van or trucks (18.3 percent). After the correction and adjustment, about 10 percent of the household ownership of larger vehicles was revised. We then ran the DDD regressions as equation (2) with the corrected vehicle information, using CEX data from 1980 to 2003. We also ran the regressions using the original vehicle information but only the matching years in CEX and 1990 to 2001 in NHTS as comparisons.

In Table 10, a comparison of Columns (1) and (2) shows that the DDD coefficients increased after correction and the removal of pickups, as expected. A comparison of Columns (1) and (3) shows that the differences in coefficients also decreased as compared to the to the main results reported in Table 4.1. Finally, a comparison of Columns (3) and (4) shows that the DDD coefficients also decreased when we limit

Table 9: DDD results: CEX, HH23 vs HH0, 1980–2020

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ownvantruck	ownvantruck	ownvantruck	ownvantruck	ownvantruck	ownvantruck	ownvantruck	ownvantruck
has law × HH23	0.096***	0.095***						
	(0.012)	(0.012)						
has law		-0.030						
		(0.020)						
age req × HH23			0.027***	0.026***				
			(0.005)	(0.005)				
age req^2× HH23			-0.001*	-0.001*				
			(0.001)	(0.001)				
age req				-0.010				
				(0.008)				
age req^2				0.001				
				(0.001)				
age req 4–9 × HH23					0.070***	0.069***		
					(0.010)	(0.010)		
age req 4–9						-0.020		
						(0.012)		
age req 2–3 × HH23							0.030**	0.029**
							(0.009)	(0.010)
age req 4–6 × HH23							0.075***	0.074***
							(0.011)	(0.012)
age req 7–9 × HH23							0.115***	0.114***
							(0.014)	(0.014)
age req 2–3								-0.015
								(0.011)
age req 4–6								-0.026
								(0.015)
age req 7–9								-0.034*
								(0.014)
Household controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Urban F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × year F.E.	Yes	No	Yes	No	Yes	No	Yes	No
Observations	272,229	272,229	272,229	272,229	272,229	272,229	272,229	272,229

Clustered standard errors at state level in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: The table shows the DDD results as described in equation (2) using data from CEX (1980–2020). State × year fixed effects are included in columns (1), (3), (5), (7). Law dummies are included in columns (2), (4), (6), (8). Samples included are households with 2–3 children and households without children.

the sample in the NHTS data to urban only.

A.5 Newly purchased vehicle as an approximation of flow variable

We identified whether the vehicle was newly purchased in both the NHTS and CEX datasets. In the NHTS dataset, a vehicle would be defined as newly purchased if it was obtained within 12 months of when the household was surveyed. In the CEX dataset, a vehicle would be defined as newly purchased if the reported vehicle purchase year was the same as the year that the household was surveyed (Table 11).

We then aggregated the newly purchased vehicle information into the state-year level as an approximation of new vehicle sales, using either the weight in each survey or the raw data. Again, we did not find any evidence to suggest that the car seat laws cause households to buy a new vehicle or a new van/truck/SUV at the state or household level, using DID models. We still found some evidence, however, that the car seat laws caused households with children to buy new, larger vehicles.

Table 12 presents the results of DDD models, as set up in equation (2). The dependent variable was changed to a dummy variable that indicated whether the household purchased any new van or SUV, shown in Columns (1) and (2), or any new van or truck, shown in Columns (3) and (4). The difference between Columns (1) and (2) was that we included only households that had purchased any new vehicles in Column (2), and the case was the same for Columns (3) and (4). Conditional on the household as deciding to purchase a new vehicle, we found that the car seat laws caused more households with children to choose a larger vehicle. We do not have a solid explanation for why the effect was strengthened in the CEX data but weakened in the NHTS data. This exercise showed that, even though we did not obtain new vehicle sales data at the state-year level, an approximation was conducted, and the results were parallel to our main results, using the stock variable.

Table 10: Corrected DDD estimations

	(1)	(2)	(3)	(4)
	correted own larger vehicle	original own van or truck	own van or SUV	own vanr or SUV
	CEX	CEX	NHTS	NHTS
	Panel A: dummy variable indicating if the state has car seat law			
has law × HH23	0.078***	0.065***		
	(0.010)	(0.012)		
	Panel B: linear age requirement and quadratic term			
age req × HH23	0.014*	0.011	0.043	0.048
	(0.006)	(0.006)	(0.023)	(0.028)
age req^2× HH23	0.002	0.001	-0.003	-0.004
	(0.001)	(0.001)	(0.003)	(0.003)
	Panel C: dummy variable indicating if the state has age requirement >3			
age req 4–9 × HH23	0.058***	0.048***	0.062**	0.059*
	(0.013)	(0.011)	(0.020)	(0.025)
	Panel D: set of dummy variables indicating the state has age requirement group			
age req 2–3 × HH23	0.047***	0.033***	0.053	0.068
	(0.009)	(0.009)	(0.041)	(0.055)
age req 4–6 × HH23	0.081***	0.064***	0.100*	0.109
	(0.013)	(0.011)	(0.040)	(0.054)
age req 7–9 × HH23	0.214***	0.137***	0.155***	0.155**
	(0.009)	(0.008)	(0.038)	(0.052)
Household controls	Yes	Yes	Yes	Yes
Urban F.E.	Yes	Yes	Yes	No
State × year F.E.	Yes	Yes	Yes	Yes
urban sample only	No	No	No	Yes
Observations	127,638	127,638	91,825	64,988

Clustered standard errors at state level in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: The table shows the DDD resulsts as described in equation (2) using data from CEX (1980–2003) in columns (1)–(2), and NHTS (1990–2001) in columns (3)–(4). Samples included are households with 2–3 children and households without children.

Table 11: Newly purchased vehicles

	NHTS		CEX	
	Number	Proportion	Number	Proportion
Newly purchased larger vehicle	35,892	0.044	27,955	0.031
Newly purchased vehicle	129,517	0.158	89,099	0.100
Larger vehicle proportion	0.277		0.314	
Total number of vehicles	821,055		894,660	

Notes: The table shows the proportion of households purchased larger vehicle and purchased vehicle from NHTS and CEX.

Table 12: Newly purchased vehicles, DDD estimations

	(1)	(2)	(3)	(4)
	purchased new van/truck	purchased new van/truck	purchased new van/SUV	purchased new van/SUV
	CEX	CEX	NHTS	NHTS
Panel A: dummy variable indicating if the state has car seat law				
has law × HH23	0.020***	0.090***		
	(0.003)	(0.019)		
Panel B: dummy variable indicating if the state has age requirement >3				
age req 4–9 × HH23	0.010**	0.057**	0.038***	-0.006
	(0.003)	(0.018)	(0.009)	(0.013)
Household controls	Yes	Yes	Yes	Yes
Urban F.E.	Yes	Yes	Yes	Yes
State × year F.E.	Yes	Yes	Yes	Yes
HHs purchased new veh	No	Yes	No	Yes
Observations	272,229	26,581	325,852	84,087

Clustered standard errors at state level in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: The table shows the DDD resulsts as described in equation (2) using data from CEX (1980–2020) in columns (1)–(2), and NHTS (1990–2017) in columns (3)–(4). Samples included are households with 2–3 children and households without children.

Table 13: DDD results: CEX NHTS, HH23 vs HH0, young

	(1) CEX	(2) CEX	(3) CEX	(4) CEX	(5) NHTS	(6) NHTS	(7) NHTS
has law × HH23	0.093***						
	(0.016)						
age req × HH23		0.026***			0.066***		
		(0.006)			(0.018)		
age req^2× HH23		-0.002*			-0.005**		
		(0.001)			(0.002)		
age req 4–9 × HH23			0.053***			0.093***	
			(0.011)			(0.024)	
age req 2–3 × HH23				0.040*			0.067
				(0.020)			(0.046)
age req 4–6 × HH23				0.068***			0.138**
				(0.017)			(0.042)
age req 7–9 × HH23				0.094***			0.145**
				(0.021)			(0.042)
Household controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Urban F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	224,900	224,900	224,900	224,900	297,324	297,324	297,324

Clustered standard errors at state level in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: The table shows the DDD results as described in equation (2) using data from CEX (1980–2020) in columns (1)–(4), and NHTS (1990–2017) in columns (5)–(7). Regressions only include households with 2–3 children and at least one of them is age 0–4 in NHTS, and 0–1 in CEX and households without children.

Table 14: DDD results: CEX NHTS, HH1 vs HH0, young

	(1) CEX	(2) CEX	(3) CEX	(4) CEX	(5) NHTS	(6) NHTS	(7) NHTS
has law × HH1	-0.036						
	(0.021)						
age req × HH1		-0.009			0.043**		
		(0.010)			(0.013)		
age req^2× HH1		0.001			-0.003**		
		(0.001)			(0.001)		
age req 4–9 × HH1			-0.010			0.051*	
			(0.013)			(0.022)	
age req 2–3 × HH1				-0.001			0.047
				(0.024)			(0.030)
age req 4–6 × HH1				-0.013			0.083***
				(0.020)			(0.018)
age req 7–9 × HH1				-0.002			0.085***
				(0.024)			(0.022)
Household controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Urban F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	220,977	220,977	220,977	220,977	288,414	288,414	288,414

Clustered standard errors at state level in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: The table shows the DDD results as described in equation (2) using data from CEX (1980–2020) in columns (1)–(4), and NHTS (1990–2017) in columns (5)–(7). Regressions include households with 1 child age 0–4 in NHTS, and 0–1 in CEX and households without children.

Table 15: DDD results: CEX NHTS, HH23 vs HH0, old

	(1) CEX	(2) CEX	(3) CEX	(4) CEX	(5) NHTS	(6) NHTS	(7) NHTS
has law × HH23	0.030						
	(0.068)						
age req × HH23		-0.039			-0.250***		
		(0.029)			(0.067)		
age req^2× HH23		0.006			0.021***		
		(0.003)			(0.006)		
age req 4–9 × HH23			0.011			-0.243*	
			(0.056)			(0.113)	
age req 2–3 × HH23				-0.153*			-0.287
				(0.065)			(0.145)
age req 4–6 × HH23				-0.096			-0.473***
				(0.067)			(0.034)
age req 7–9 × HH23				0.006			-0.466***
				(0.085)			(0.032)
Household controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Urban F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	213,494	213,494	213,494	213,494	275,930	275,930	275,930

Clustered standard errors at state level in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: The table shows the DDD results as described in equation (2) using data from CEX (1980–2020) in columns (1)–(4), and NHTS (1990–2017) in columns (5)–(7). Regressions include households with 2–3 children and all of them are age 16–17 and households without children.

Table 16: DDD results: CEX NHTS, HH1 vs HH0, old

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	CEX	CEX	CEX	CEX	NHTS	NHTS	NHTS
has law × HH1	0.054**						
	(0.019)						
age req × HH1		0.004			0.039*		
		(0.008)			(0.018)		
age req^2× HH1		0.000			-0.003		
		(0.001)			(0.002)		
age req 4–9 × HH1			0.019			0.072***	
			(0.014)			(0.021)	
age req 2–3 × HH1				0.026			0.027
				(0.020)			(0.052)
age req 4–6 × HH1				0.022			0.086
				(0.017)			(0.050)
age req 7–9 × HH1				0.059**			0.101
				(0.021)			(0.052)
Household controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Urban F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
State × year F.E.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	221,504	221,504	221,504	221,504	283,737	283,737	283,737

Clustered standard errors at state level in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: The table shows the DDD results as described in equation (2) using data from CEX (1980–2020) in columns (1)–(4), and NHTS (1990–2017) in columns (5)–(7). Regressions include households with 1 child age 16–17 and households without children.

Table 17: DID results: CEX NHTS, heterogeneous law effects on different household types

	(1)	(2)
	CEX	NHTS
age req 4–9 × HH1	0.014*	0.051**
	(0.007)	(0.015)
age req 4–9 × HH23	0.069***	0.079***
	(0.010)	(0.019)
age req 4–9 × HH4+	0.116***	0.087*
	(0.017)	(0.034)
age req 4–9 × HH0	-0.022	-0.023**
	(0.012)	(0.008)
Household controls	Yes	Yes
Urban F.E.	Yes	Yes
State × year F.E.	No	No
Observations	328,235	372,542

Clustered standard errors at state level in parentheses.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes: The table shows the DID results as described in equation (2) using data from CEX (1980–2020) in columns (1), and NHTS (1990–2017) in columns (2).