

# **The Effects of Fiscal Stimulus: Evidence from the 2009 ‘Cash for Clunkers’ Program**

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## **Appendix**

### **1. Examining Estimates of the Effect of CARS from CEA (2009) and NHSTA (2009)**

The Council of Economic Advisors (2009) forms a counter-factual estimate of the initial impact of the program with two critical assumptions. First, they assume that the aggregate car sales in the months prior to the program would have continued at the same pace in the absence of the program. It is difficult to ascertain the credibility of this assumption. As Figure 1 shows, there was a rebound in auto purchases underway in the spring of 2009 which may have continued through the summer in the absence of the program. In general, the volatility of auto purchases throughout the sample makes it difficult to confidently assert the pattern in aggregate sales going forward.

The second assumption is that the owners of qualifying clunkers were only half as likely as other car owners to trade-in their car and purchase a new one in the absence of the program. The CEA (2009) authors provide no statistical evidence or citations to support this assumption. Under these two assumptions, the CEA (2009) concludes that 440,000 to 490,000 cars were purchased under the program that would have otherwise not been purchased in July and August 2009.

The more difficult challenge facing the CEA (2009) analysis is estimating how much of the cars purchased under the program would have otherwise been purchased in the near future in the absence of the program, what we call “program reversal.” The CEA (2009) examines two alternative episodes to estimate reversal: car incentives in the aftermath of the terrorist attacks of

September 2001 and employee pricing incentives given in the summer of 2005. They use estimates of the aggregate reversal after these two events to assess how many of the purchases under the program were borrowed from near future purchases. An obvious worry is that the economic environment in the summer of 2009 was vastly different than the alternative episodes. It is hard to know what we learn from incentive programs in 2001 and 2005 compared to the aftermath of the most severe recession in decades. The authors acknowledge this difficulty by noting: “the clearest conclusion that can be reached from a careful examination of these data is that they do not provide much reliable evidence on the key question we want to address: the timing and magnitude of the payback effect.”

The NHSTA (2009) estimates the initial impact of the program using consumer surveys. These surveys were given to consumers that purchased a car under the CARS program. Only 27% of purchases returned surveys, and “the rejection rate is unknown since it appears not all dealers consistently offered the survey to consumers” (NHSTA (2009), p. 27).

The initial question asked: “If you were not offered the CARS program trade-in incentive, would you still have traded in your current vehicle to purchase a new or used vehicle this month?” If the answer to this question was “no” a follow-on question asked: “If no, when were you planning to trade-in, sell, or dispose of your vehicle?” The second question asked: “If you were not offered the CARS program trade-in incentive, when you disposed of this vehicle, would you have purchased another vehicle?”

The authors use the answers to these questions to assert that “88% indicated that the main incentive for purchasing a vehicle in the current month was the CARS program.” This translates into 597,950 autos. The authors do not discuss how they arrive at this number based on answers to the survey questions above. Our best guess is that 88% of the individuals answered the second

question “no”, which means that, in the absence of CARS, they would not have purchased another vehicle *when they disposed of the current vehicle*. Obviously, they may have purchased another vehicle even in the absence of CARS without disposing of their current vehicle. In our view, the survey questions cannot determine how many people bought cars under the program that would have otherwise not bought cars.

The authors also estimate that among those individuals that would have traded in their vehicle at a later date, the average time until trade-in would have been 2.87 years. The survey did not ask a direct question on program reversal. In other words, it did not ask buyers when they would have purchased a new vehicle in the absence of the CARS program. People may have bought cars in the near future without trading in their old car, so the 2.87 years cannot be applied to when they would have bought a new vehicle.

The authors do not discuss any potential biases in survey response. However, there is reason to believe that the respondents were biased toward those that were more likely to be affected by the program. If we take the authors estimate at face value, they argue that 88% of the respondents said they would otherwise not have purchased a car without the program. If we apply this fraction to all vehicle sales under the program and subtract from total July and August sales, this would imply a counterfactual level of sales in for July and August of 2009 in the absence of the program of  $(2.08M - 0.6M) = 1.48M$  sales, which would be a full 300,000 fewer cars sold than during May and June 2009 and a full 200,000 fewer cars than during March and April 2009. Indeed, the NHSTA (2009) estimate of 600,000 incremental sales is much higher than any other estimate, including the one found here.

One other study carried out by Edmunds.com examined the *types* of cars purchased during the program window to assess how many cars were incrementally purchased

(Edmunds.com (2009)). They estimate that only 125,000 of the cars purchased under the program were incremental. They do not provide an estimate of program reversal. The Edmunds.com original research is not publicly available, so it is difficult to assess their methodology in detail.

## **2. Classification of Clunkers**

Perhaps the easiest way to describe how we classify clunkers using the R.L. Polk data is an example. One of the broad vehicle groups from R.L. Polk is sport utility light duty trucks. This group includes all years for the following 65 models: ACURA MDX, ACURA RDX, AUDI Q5, AUDI Q7, BMW X5, BMW X6, BUICK ENCLAVE, CADILLAC CTX, CHEVROLET TRAVERSE, CHEVROLET EQUINOX, CHEVROLET HHR, CHEVROLET TRAIL BLAZER, CHRYSLER PACIFICA, DODGE DURANGO, DODGE JOURNEY, DODGE MAGNUM, DODGE NITRO, FORD EDGE, FORD EXPLORER, FORD FLEX, FORD SPORT TRAC, FORD TAURUS X, GMC ACADIA, GMC ENVOY / DENALI, HONDA PILOT, HYUNDAI PORTICO, HYUNDAI VERACRUZ, INFINITI EX, INFINITI FX, INFINITI QX, ISUZU ASCENDER, JEEP COMPASS, JEEP GRAND CHEROKEE, JEEP LIBERTY, JEEP PATRIOT, JEEP COMMANDER, KIA BORREGO, KIA SORENTO, KIA SOUL, LAND ROVER LR3, LEXUS JX, LEXUS RX, LINCOLN AVIATOR, LINCOLN MKX, LINCOLN MKT, MAZDA CX-9, MERCEDES-BENZ M-CLASS, MERCURY MOUNTAINEER, MITSUBISHI ENDEAVOR, MITSUBISHI MONTERO, NISSAN ARMADA, NISSAN MURANO, NISSAN PATHFINDER, NISSAN ROUGE, PORSCHE CAYENNE, SAAB 9-4X, SAAB 9-7X, SATURN OUTLOOK, SATURN VUE, SUZUKI XL7,

TOYOTA 4 RUNNER, TOYOTA HIGHLANDER, VOLKSWAGEN TOUAREG,  
VOLKSWAGEN TIGUAN, VOLVO XC90.

The data set we have from R.L. Polk contains the total number of vehicles in this category by year, and the list from Edmunds.com tells us the actual model-years which qualify for clunkers. The basic problem is that we know how many cars are in each broad category-year, but we do not know the number of cars by model-year. There are two potential approaches to classifying clunkers given this problem. The first is to count as clunkers all of a given category-year if any model-year within the broader category qualifies as a clunker. For example, the 2004 Ford Explorer was a qualifying clunker that was one of the most common trade-ins. Given that the Ford Explorer fits within the broader sports utility light duty trucks category, we count the entire category for 2004 as “clunkers.” This is the approach we take in the study.

The second approach would be to calculate the number of clunkers in a category-year by taking the fraction of all model-years in the broader category that count as a clunker. The sports utility category above illustrates why this will underestimate the number of clunkers. Suppose Ford Explorers were the only model that qualified as a clunker. Then we would count as clunkers only 1/65 of this category. However, if there are a larger number of Ford Explorers on the road than many of the other models in the sports utility light truck category, this will dramatically understate clunkers. In examining this methodology, we found that it underestimated the number of sports utility vehicles that were actually traded in clunkers.

### **3. Figure 5 Robustness**

In the Appendix Figure below, we present coefficients from five alternative specifications of equation (3) in the text. These specifications include: (a) specifications that are equally

weighted instead of population weighted, (b) specifications where the left hand side variable is scaled by 2004 purchases instead of the year prior to CARS, (c) specifications using clunkers per capita as the measure of CARS exposure, (d) specifications where CARS exposure is measured with the more narrow definition of clunkers (see footnote 10), and (e) specifications that include all controls except for house price growth which allows for the use of the full sample of 957 cities.

**Appendix Figure**  
**CARS Program Impact Coefficients**  
**Figure 5 Robustness Checks**

