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The Car Allowance Rebate System: Evaluation and Lessons for the Future

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The Car Allowance Rebate System (CARS), more commonly known as “Cash for Clunkers,” was a government program administered by the National Highway Transportation Safety Administration (NHTSA) that allowed consumers to trade in an older, less fuel-efficient vehicle for a voucher to be applied toward the purchase of a newer, more fuel-efficient vehicle.

Depending on the difference in fuel economy between the trade-in vehicle and the new vehicle, program participants received a voucher for either \$3,500 or \$4,500. After the “clunker” was traded in at the dealership, its engine was destroyed, ensuring its permanent removal from the U.S. vehicle fleet. Nearly 700,000 clunkers were traded in between July 1, 2009 and August 24, 2009 under the program. There were two motivations for the CARS program. The first was to provide temporary stimulus to counter the economic contraction that was occurring at that time. The other was to improve the fuel efficiency of the existing stock of vehicles, in order to reduce emissions.

Our evaluation of the evidence suggests that the \$2.85 billion in vouchers provided by the program had a small and short-lived impact on gross domestic product, essentially shifting roughly a few billion dollars forward from the subsequent two quarters following the program. The implied cost per job created due to the program was much higher than what was estimated for alternative fiscal stimulus programs. CARS program participants’ income was higher than consumers who purchased a new or used vehicle outside of the program, but lower than consumers who purchased a new vehicle outside of the CARS program over the same time period. The evidence suggests that consumers who participated in the CARS program did not decrease other measures of consumption to do so.

On the environmental side, the cost per ton of carbon dioxide reduced due to the program was higher than what would be achieved through a more cost-effective policy such as a carbon tax or cap-and-trade, but was comparable (or indeed lower) than what is achieved through some of the less cost-effective environmental policies, such as the tax subsidy for electric vehicles.

Background on the CARS Program

By summer 2008, the U.S. economy was struggling. In the third quarter of 2008, GDP growth declined 2 percent and dropped another 8.3 percent in the final quarter of the year. The unemployment rate was 5.8 percent in July and continued to rise over the next year, reaching a peak of 10.0 percent in October, 2009. The weakening economy led policymakers in search of ways to provide stimulus, which increased the political appeal of Cash for Clunkers.

Figure 1 shows a timeline for the program, starting with the introduction of the bill in the Senate on January 13, 2009. The House introduced a similar bill on March 17, 2009. The program was signed into law by President Obama on June 24, 2009, as the Consumer Assistance to Recycle and Save Program as Title XIII of the Supplemental Appropriations Act of 2009.¹

The program initially received \$1 billion in funding and was slated to run between July 1 and November 1, 2009. By July 30, 2009, the initial \$1 billion allocation was depleted because the take-up of the program far exceeded expectations. NHTSA assumed dealer requests for payment would average approximately 3,000 per day. However, in the first 10 days, NHTSA received an average of 22,400 requests per day—more than 7 times the expected participation. During the next week, both the House of Representative and the Senate approved \$2 billion in additional funds. On August 7, 2009, President Obama signed the additional funding into law, approving \$3 billion in total funding for the program. Even with the additional funding, the program ended on August 24, 2009, over two months before its anticipated November 1 end date.

The \$2.85 billion in government spending on the CARS program was only a small fraction of the total federal government stimulus spending in 2009. To put the cost into context, the American Recovery and Reinvestment Act of 2009 (ARRA), of which the CARS program was not a part, will increase budget deficits by approximately \$830 billion between 2009 and 2019 (Congressional Budget Office, 2013). In 2009 alone, the ARRA increased spending by \$108 billion and decreased tax revenues by approximately \$79 billion (Congressional Budget Office, 2009).

Under the CARS program, the consumer received a \$3,500 or \$4,500 voucher by trading in an older, less fuel-efficient vehicle and purchasing a new, more fuel-efficient vehicle. Table 1 shows the minimum fuel economy required of the new vehicle and the minimum difference in fuel economy between the trade-in vehicle and the new vehicle. Eligible vehicle types included automobiles (passenger cars), category 1 trucks (sports utility vehicles, small trucks, and minivans weighing less than 6,000 pounds), category 2 trucks (vans and pick-up trucks weighing between 6,001 and 10,000 pounds), and category 3 trucks (large vans and trucks weighing between 10,001 and 14,000 pounds). Motorcycles were not eligible.

When the consumer brought a “clunker” into the dealership to trade-in, the dealer gave the consumer a voucher to be applied toward the purchase (or long-term lease) of a new vehicle. The

¹ The title of the program (Car Allowance Rebate System) and the title of the legislation that made that program law (Consumer Assistance to Recycle and Save) share the same acronym. Throughout the paper, the acronym “CARS” refers to the program.

dealer then disabled the engine of the trade-in vehicle and sent the disabled vehicle to either a salvage auction or a disposal facility. The dealer had to prove that the vehicle was successfully destroyed to the National Motor Vehicle Title Information System (NMVTIS) in order to be reimbursed for the \$3,500 or \$4,500 voucher by NHTSA. The program was not means tested, so anyone trading in an old vehicle could qualify for the voucher, subject to eligibility requirements described in Gayer and Parker (2013).

According to the U.S. General Accountability Office (2010), there were 677,842 vehicles traded in under the CARS program, resulting in \$2.85 billion in total value of rebates, or an average voucher amount of approximately \$4,200. NHTSA documents that the new vehicles purchased under the program averaged 24.9 miles per gallon, compared to the 15.8 miles per gallon averaged by the trade-in vehicles (Bolton, 2009).

The Market Impact of the CARS Program

An examination of aggregate market data suggests a short-term impact of the CARS program. Figure 2 shows monthly passenger car, light truck, and total passenger vehicle sales from January 2007 through August 2013. Throughout the recession that lasted from November 2007 to June 2009, sales of passenger vehicles dropped 38 percent. During the CARS program, vehicle sales increased 14 percent in July 2009 and increased another 28 percent in August 2009. Sales reverted to pre-program levels immediately after the expiration of the program in September. Only in recent months have sales reached the range seen prior to the recession, though they have yet to reach their pre-recession peak.

The impact of the CARS program is also evident in other indicators of the U.S. vehicle market. Figure 3 shows four charts: a quarterly time series of newly originated auto loans, a quarterly time series of personal expenditures on motor vehicles and parts, a monthly time series of the number of motor vehicle assemblies in the United States, and a monthly time series of the number of employees in auto manufacturing. Both new auto loans and real personal expenditures on vehicles and parts decreased to pre-program levels immediately after the expiration of the CARS program in September 2009; whereas, the number of motor vehicle assemblies and the number of manufacturing employees did not show a decline after the expiration of the program.

While the patterns of all these indicators suggest that the CARS program had an effect on the market, they cannot clearly indicate the magnitude or duration of the effect. Doing so requires a

credible estimate of the counterfactual of what would have happened in the vehicle market absent the CARS program.

Fiscal Stimulus from the CARS Program

There were nearly 700,000 participants in the 55 days of the program, which represents 31.4 percent of total vehicle sales during this period. However, the empirical challenge is to discern how many of these vehicle sales would have occurred in the absence of the program and the extent to which any additional sales incentivized by the program were borrowed from sales that would have occurred otherwise in the near future subsequent to the program.

Gayer and Parker (2013) review existing research to conclude that CARS program led to approximately 380,000 additional vehicle sales during the time of the program. This number represents the number of vehicles sales that would not have occurred during this time period without the CARS program. The existing evidence also suggests that these sales were pulled forward from sales that would have occurred otherwise in the future. Ten months after the end of the program, the cumulative purchases from July 2009 to June 2010 were nearly the same, showing little lasting effect (Mian and Sufi, 2012).

This pulling forward of sales led to a short-term boost in GDP and employment during the existence of the program. The increase in vehicle production during the program was less than half of the induced increase in vehicle sales and this additional production was shifted forward from the subsequent two quarters (Copeland and Kahn, 2013). The net result was a negligible increase in GDP, shifting roughly \$2 billion into the third quarter of 2009 from the subsequent two quarters.

The program led to a minimal increase in employment of roughly 2,050 additional job-years from June 2009 through May 2010 (Li, Linn, and Spiller, 2012). Figure 4 shows cost per job created by the CARS program compared to a number of other policy options evaluated by the Congressional Budget Office (2010). The CARS program created 0.7 jobs for each million dollars of program cost, resulting in a cost of \$1.4 million per job created. This suggests that the CARS program was far less cost effective at creating jobs than other fiscal stimulus programs, such as increasing unemployment aid, reducing payroll taxes, providing an additional social security payment, or allowing the expensing of investment costs.

Gayer and Parker (2013) use the public-use microdata from the consumer expenditure survey to compare the demographics and consumption habits of likely CARS program participants to

other survey participants. Likely CARS participants include those households that purchased a new vehicle in July or August 2009, received either \$3,500 or \$4,500 trade-in value for their old vehicle, and purchased a new vehicle that costs less than \$45,000.

In the third quarter of 2009, the participants in the CARS program spent a similar proportion of their before-tax income on non-auto consumption as did all non-participants in the program, non-participants who purchased a new vehicle, and non-participants who purchased a new or used vehicle, suggesting that participants in the CARS program were not liquidity constrained. While the program incentivized purchasing a vehicle slightly earlier than otherwise would have occurred, there was no change in other consumption patterns.

Distributional Effects of the CARS Program

Additionally, Gayer and Parker (2013) compare the socio-demographic characteristics of households who were likely participants in the CARS program to other households who participated in the survey. Compared to households that purchased a new vehicle in 2009 but likely did not receive the CARS voucher, program participants had a lower level of income, were less likely to be a homeowner, more likely to have a high school degree, more likely to be white, and more likely to be older. Compared both to households that purchased a new or used vehicle in 2009 but likely did not receive the CARS voucher and to all other households in the consumer expenditure survey (other than the ones who received the CARS voucher), program participants had a higher before-tax income, were older, more likely to be white, more likely to own a home, and more likely to have a high-school and a college degree.

Environmental Impact of the CARS Program

In addition to providing economic stimulus, one of the intentions of the CARS program was to reduce carbon emissions by replacing older, less fuel-efficient vehicles with newer more fuel-efficient vehicles. The small savings in fuel economy and reduction in emissions accrue from the program's incentives to purchase a more fuel-efficient vehicle for a relatively small number of vehicles.

The program resulted in a reduction of carbon dioxide emissions of 8.58 to 28.28 million tons, which amounts to a cost per ton of carbon dioxide of \$91 to \$301 stemming from the program (Li, Linn, and Spiller, 2012). For comparison, Figure 5 shows estimates of the cost per ton of carbon dioxide reduced for a handful of alternative environmental policies. It also includes the estimated social cost of carbon, which is meant to capture the total external cost of a ton of

carbon dioxide emitted, and is used by the administration in regulatory impact assessments or proposed regulations.

The cost per ton of carbon dioxide reduced by the CARS program far exceeds the estimated social cost of carbon, suggesting it is an inefficient approach to reducing emissions. It is also far higher than the cost per ton of carbon dioxide that would have occurred under the cap-and-trade bill that passed the House of Representatives in 2009. However, it is comparable to the cost per ton of carbon dioxide under the \$3,400 hybrid vehicle tax credit and is more cost effective than the electric vehicle tax subsidy, the excise tax credit for ethanol, and the renewable fuel standard.

Conclusion and Policy Lessons

The primary motivation for the CARS program was to provide temporary stimulus to counter the economic contraction that was occurring at that time, while also reducing fuel consumption and thus emissions. The evidence suggests that the program did indeed incentivize the sale of more fuel efficient vehicles by pulling sales forward from the near-term future. This resulted in a small and short-lived increase on production, GDP, and job creation. However, the implied cost per job created was much higher than alternative fiscal stimulus policies.

The CARS program was not means-tested, and evidence from the consumer expenditure survey suggests that participants' income was higher than consumers who purchased a new or used vehicle, but lower than consumers who purchased a new vehicle outside of the CARS program over the same time period. Consumers who participated in the CARS program did not decrease other measures of consumption to do so.

The CARS program led to a slight improvement in fuel economy and some reduction in carbon emissions. The cost per ton of carbon dioxide reduced from the program suggests that the program was not a cost-effective way to reduce emissions, although it was more cost effective than certain other environmental policies, such as the tax subsidy for electric vehicles or the tax credit for ethanol.

In the event of a future economic recession, we would not recommend repeating the CARS program. While the program did accomplish both of its goals of stimulating the automobile market and decreasing carbon emissions, there are more cost effective policy proposals to achieve these objectives.

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Table 1: CARS Voucher Matrix

Trade-in Vehicle Type	New Vehicle Type	Minimum MPG of New Vehicle	Difference Between New Vehicle MPG and Trade-in Vehicle MPG	Voucher Rebate
Automobile	Automobile	22 mpg	4-9 mpg	\$3,500
			≥10 mpg	\$4,500
	Category 1 Truck	18 mpg	2-4 mpg	\$3,500
			≥5 mpg	\$4,500
Category 1 Truck	Automobile	22 mpg	4-9 mpg	\$3,500
			≥10 mpg	\$4,500
	Category 1 Truck	18 mpg	2-4 mpg	\$3,500
			≥5 mpg	\$4,500
Category 2 Truck	Automobile	22 mpg	4-9 mpg	\$3,500
			≥10 mpg	\$4,500
	Category 1 Truck	18 mpg	2-4 mpg	\$3,500
			≥5 mpg	\$4,500
	Category 2 Truck	15 mpg	1 mpg	\$3,500
			≥2 mpg	\$4,500
Category 3 Truck	Automobile	22 mpg	4-9 mpg	\$3,500
			≥10 mpg	\$4,500
	Category 1 Truck	18 mpg	2-4 mpg	\$3,500
			≥5 mpg	\$4,500
	Category 2 Truck	15 mpg	n/a	\$3,500
	Category 3 Truck	n/a	n/a	\$3,500

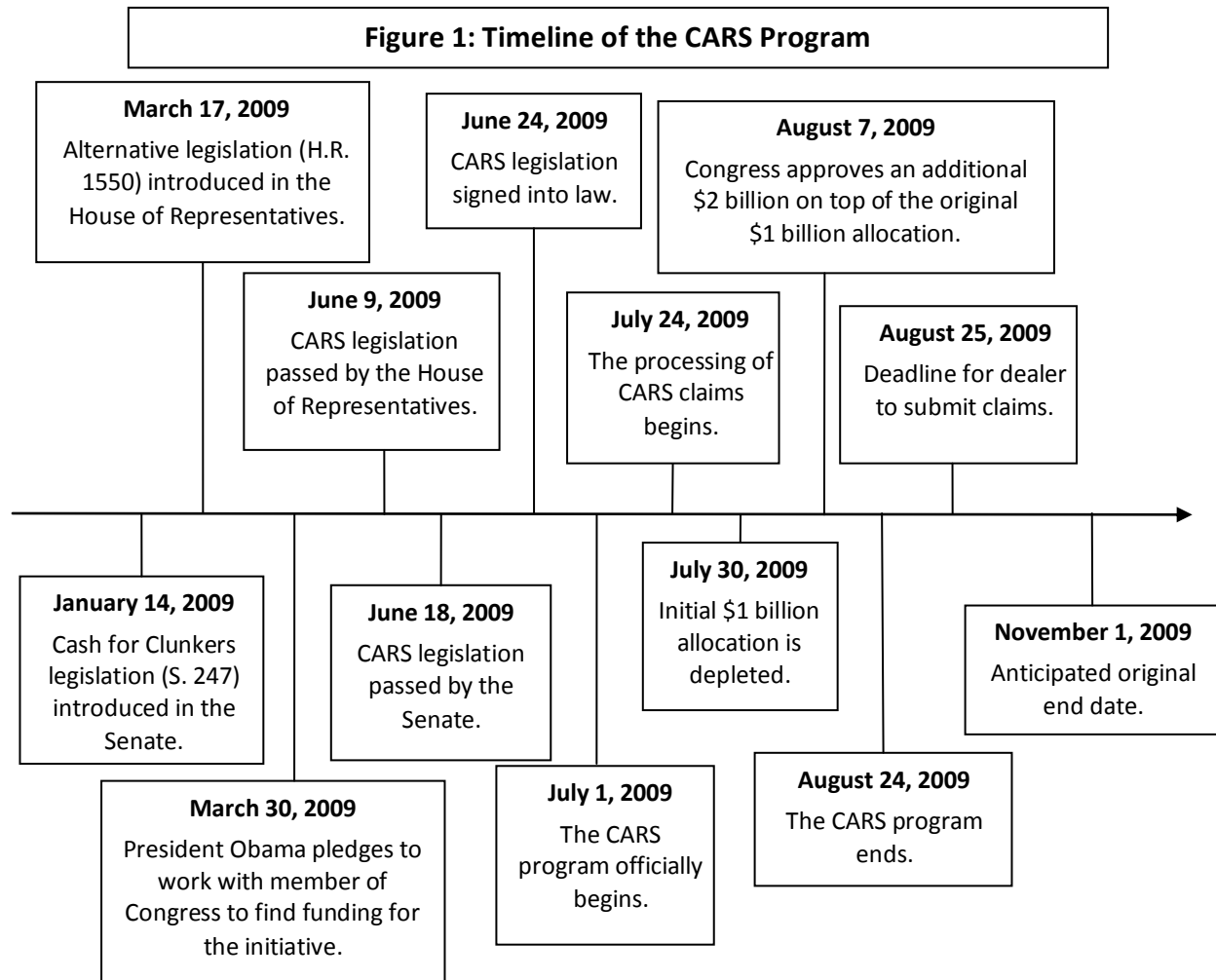
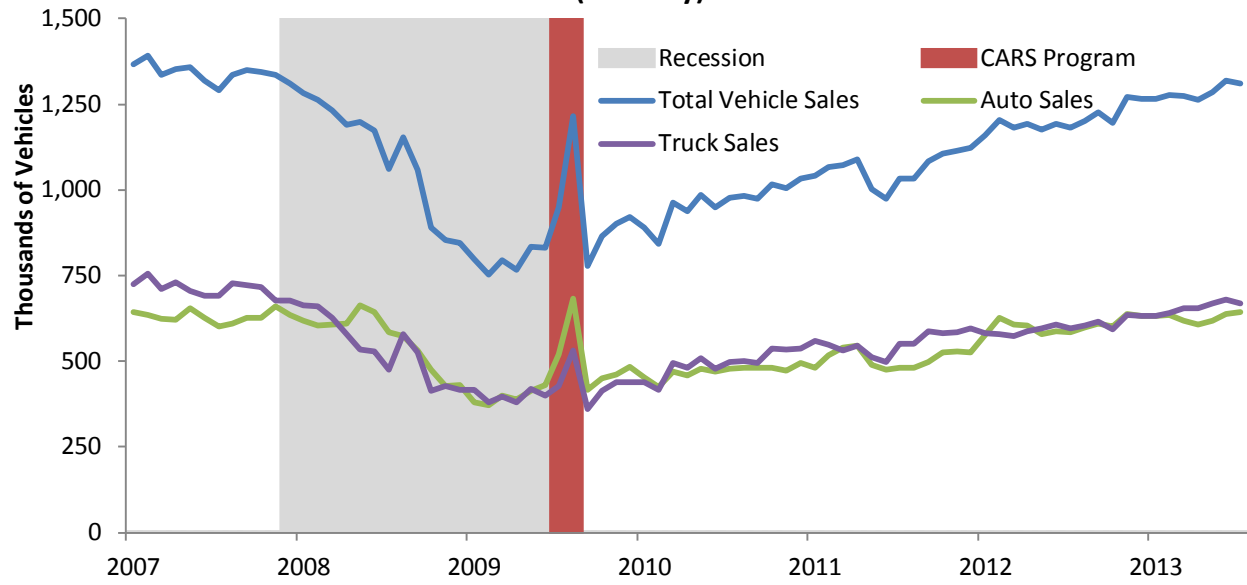
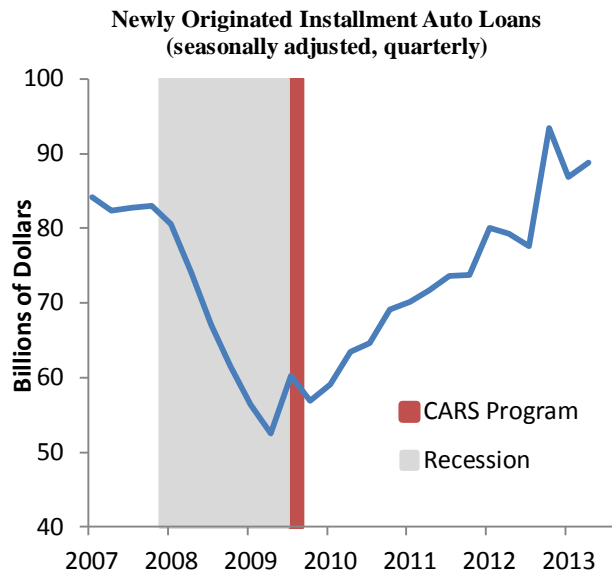


Figure 2: Automotive Retail Sales (monthly)

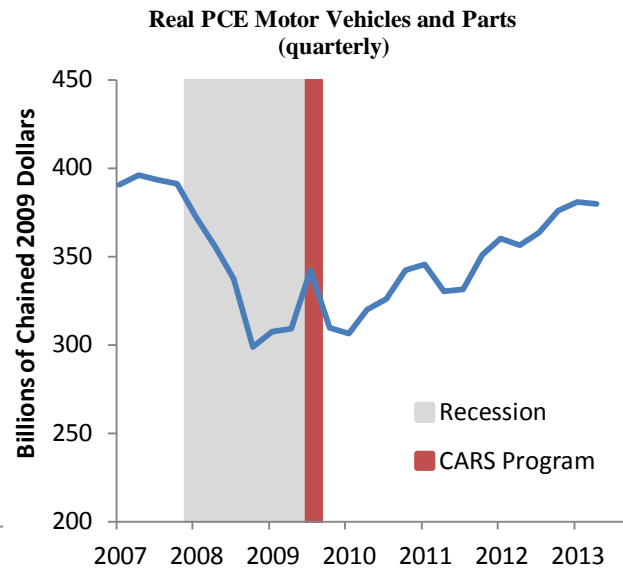


Source: Bureau of Economic Analysis/Haver Analytics.

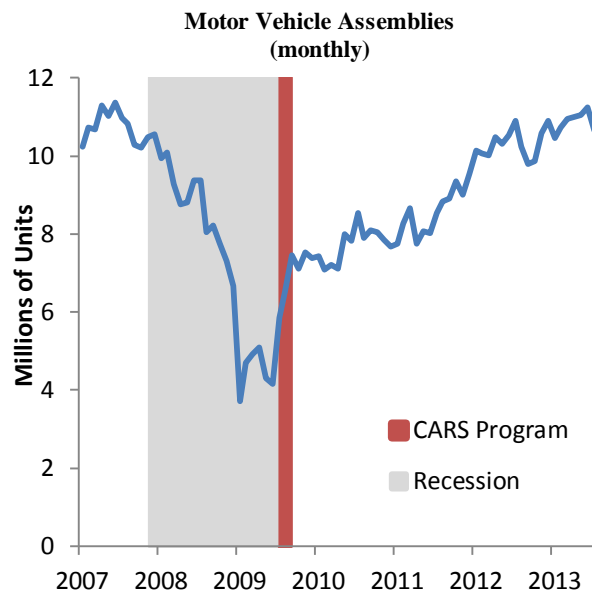
Figure 3: U.S. Vehicle Market Economic Indicators



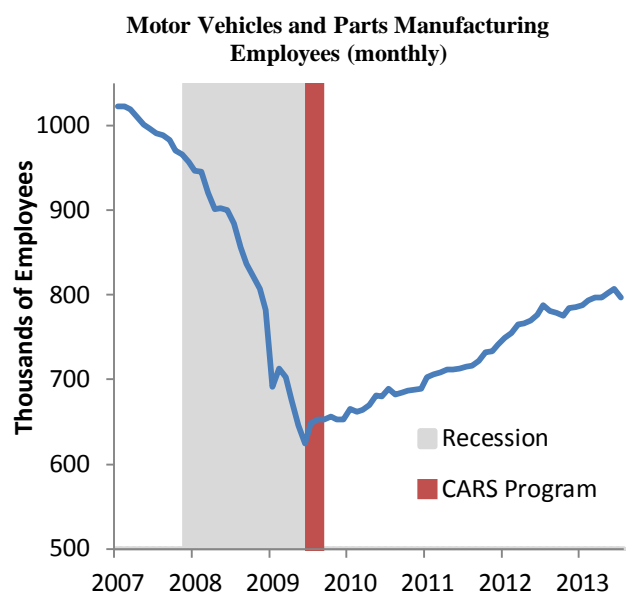
Source: FRBNY Consumer Credit Panel/Haver Analytics.



Source: Bureau of Economic Analysis/Haver Analytics.

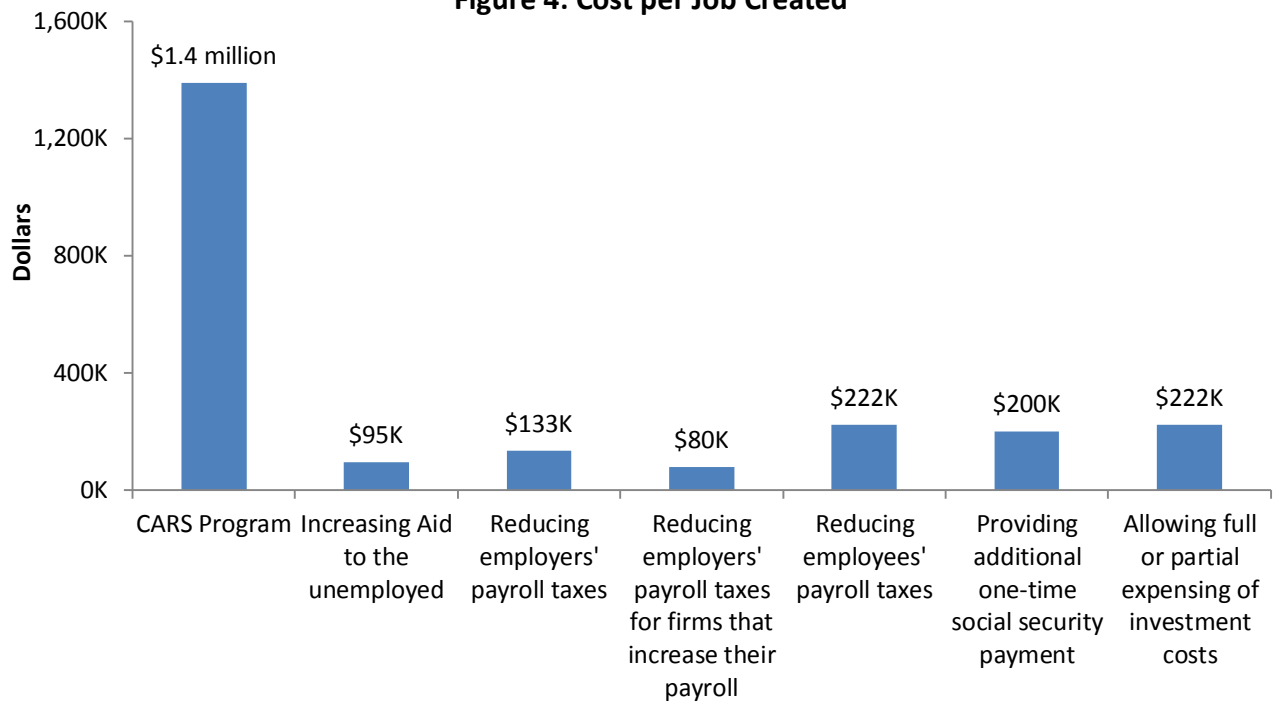


Source: Federal Reserve Board/Haver Analytics.



Source: Bureau of Labor Statistics/Haver Analytics.

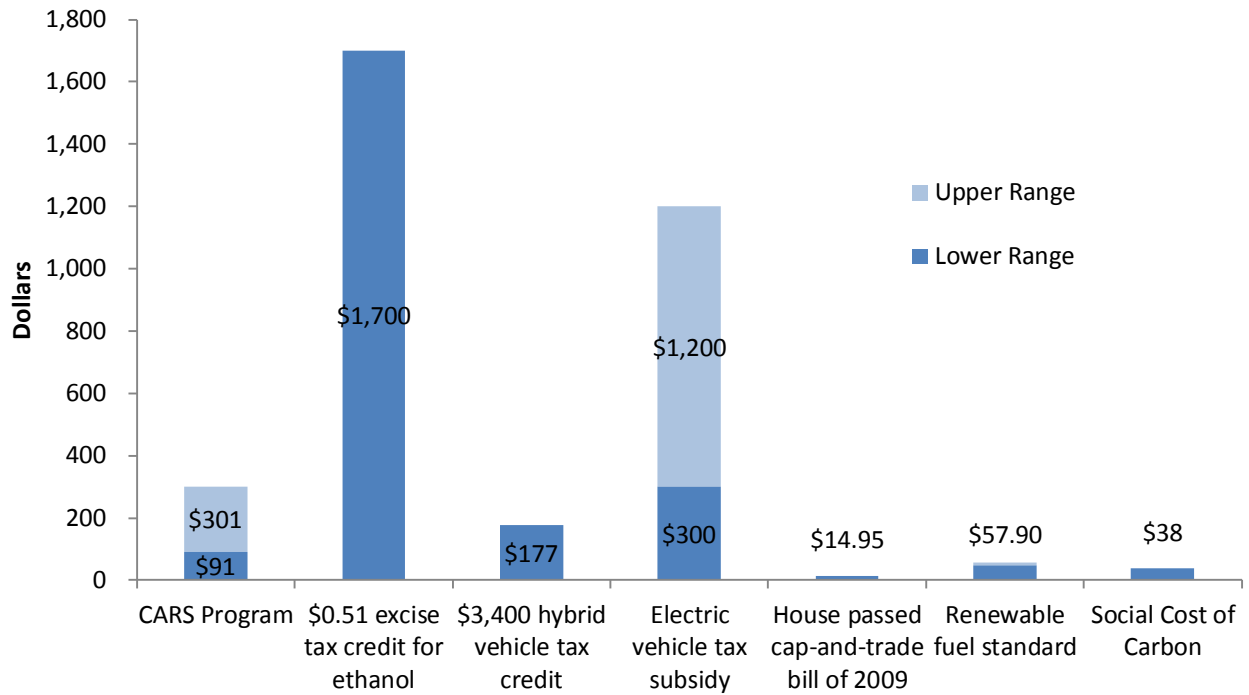
Figure 4: Cost per Job Created



Source: Congressional Budget Office (2010).

Note: The estimates for alternative policies are an average of the high and low estimates provided by Congressional Budget Office (2010).

Figure 5: Cost Per Ton of Carbon Dioxide Reduced



Sources: Li, Linn, Spiller (2012), Congressional Budget Office (2012), Holland, et al (2011), Knittel (2012), and the Interagency Working Group on Social Cost of Carbon (2013)