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Subsidizing Replacement of Motor Vehicles: An Analysis of “Cash for Clunkers” Programs

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Subsidizing Replacement of Motor Vehicles: An Analysis of “Cash for Clunkers” Programs

Some Members of Congress have suggested developing a rebate program either to address effects of the 2020 pandemic on the automotive industry, including the temporary closures of all U.S. vehicle manufacturing plants, or as part of a long-range effort to remove older internal-combustion vehicles with high greenhouse gas emissions from the roads. Rebates were offered previously under the Consumer Assistance to Recycle and Save (CARS) program, also known as “Cash for Clunkers,” established in the Supplemental Appropriations Act, 2009 (P.L. 111-32), as well as under programs created by several states and foreign countries.

Congress enacted the CARS program in the depths of the 2007-2009 recession to spur the domestic auto industry, preserve manufacturing jobs, and improve the fuel economy of vehicles on the road.

The program was very popular: within six weeks of authorizing a \$1 billion outlay, Congress appropriated an additional \$2 billion for rebates. Consumers who traded in older model vehicles and purchased new cars with higher fuel economy received cash rebates on the spot. More than 677,000 rebates were processed, prompting the National Highway Traffic Safety Administration (NHTSA), which administered the CARS program, to report shortly after the program ended that it increased U.S. GDP by a range of \$3.8 billion to \$6.8 billion; created or saved 60,000 jobs; reduced fuel consumption by 33 million gallons annually; and decreased emissions of carbon dioxide and related greenhouse gases by 9 million metric tons over 25 years. The CARS legislation included no requirements limiting rebates to vehicles produced in the United States or in North America; NHTSA found afterward that 49% of the rebates were used for U.S.-produced vehicles.

Subsequent studies by economists offered estimates of the program’s effects on vehicle sales and production, employment, and GDP that were more modest. Estimates of incremental vehicle sales prompted by CARS rebates vary from 125,000 to over 500,000, depending on how many of the sales are assumed to have been pulled forward from later in 2009 or 2010. Estimates of the number of jobs preserved or created range from 3,600 to 40,000, and a study by economists at the Federal Reserve Bank of New York concluded that GDP gains attributable to CARS were “negligible.” Studies generally agreed that CARS achieved one of its main objectives of improving fuel efficiency, but at a relatively high cost per gallon of fuel saved or ton of greenhouse gas emissions avoided. Some found that sales of more fuel-efficient vehicles dropped after the program ended.

The enacting legislation gave NHTSA 30 days to issue regulations and begin implementation of CARS, a timeline that caused administrative problems and eventually led to the hiring of 7,000 short-term contractors to keep up with the reimbursements to auto dealers. In addition, the Department of Transportation (DOT) Inspector General later identified issues with data collection and limitations of an information technology system that was not prepared for the volume of transactions.

Among the rebate programs offered in other countries, those in Japan and Germany recorded the highest transactions: 2.8 million and 1.9 million more efficient vehicles, respectively. After the CARS program ended, several states implemented similar programs focused on improving emissions of passenger car and truck fleets. The experience of two current California programs, where rebates are used to accelerate the replacement of older vehicles, may be informative should Congress seek to implement a vehicle rebate program again. The passenger car program offers rebates of up to \$7,000 for the purchase of new, zero-emission and hybrid electric vehicles; no trade-in of an older vehicle is required, and benefits are targeted to lower-income residents. More than 350,000 consumers have received rebates since 2010. The truck program seeks to replace diesel-powered trucks servicing the ports of Los Angeles and Long Beach with natural gas and electric trucks by 2035.

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Introduction

The recession and financial crisis of 2007-2009 led to sharp drops in light-vehicle production in many countries. In the United States, annual domestic production of cars and light trucks fell by 47% from 2007 to 2009, and sales dropped by 36% (**Table 1**). Production declines of similar magnitudes occurred over different time periods in Canada, Japan, Germany, France, and other countries.¹ In a number of countries, governments undertook emergency measures to assist their domestic auto industries.²

Table 1. U.S. Light Vehicle Production and Sales

2007-2009		
Year	Production	Sales
In millions of vehicles		
2009	5.6	10.6
2008	8.5	13.5
2007	10.5	16.5
Percent Change, 2007-2009	-47%	-36%

Source: Ward's Database.

Note: Light vehicles include passenger cars, sport utility vehicles (SUVs), and pickup trucks.

One widely used approach provided rebates to individuals who agreed to scrap an old, highly polluting vehicle in conjunction with the purchase of a new one. Congress enacted legislation to authorize such a program, generally known as "cash for clunkers," in the Consumer Assistance to Recycle and Save (CARS) Act,³ passed in 2009.

Some Members of Congress have suggested developing a similar rebate program either to address effects of the 2020 pandemic, including the temporary closures of all U.S. vehicle manufacturing plants, or as part of a long-range environmental plan to remove from the roads older vehicles with internal combustion engines that produce high greenhouse gas emissions. This report summarizes the 2009 rebate program, discusses studies analyzing the effects of the program, and considers issues stemming from CARS enactment and implementation similar programs under way in California. Summary information about vehicle-replacement programs in other countries is provided in **Table 4**.

¹ Organization for Economic Co-operation and Development, "Recent Developments in the Automobile Industry," *OECD Economics Policy Department Policy Notes*, No. 7 (2011).

² In the United States, federal support included utilization of the Troubled Asset Relief Program (TARP), established in the Emergency Economic Stabilization Act of 2008 (P.L. 110-343) during the George W. Bush and Obama Administrations to make loans to General Motors, Chrysler, and their auto financing companies; a new grant program to spur investment in electric vehicle and battery manufacturing in the American Recovery and Reinvestment Act of 2009 (P.L. 111-5); and the Advanced Technology Vehicles Manufacturing program at the Department of Energy, which provided Ford Motor Company, Nissan, Tesla, and other companies with loans for making more fuel-efficient vehicles.

³ The initial CARS program was Title XIII of the Supplemental Appropriations Act, 2009 (P.L. 111-32), <https://www.congress.gov/111/crpt/hrpt151/CRPT-111hrpt151.pdf>.

CARS Program of 2009

The CARS program provided rebates toward the purchase of new fuel-efficient vehicles. To receive a rebate, a consumer had to trade in an older vehicle that was to be scrapped by the auto dealer; the consumer could not receive a rebate to buy a new vehicle without an eligible trade-in vehicle.

The National Highway Traffic Safety Administration (NHTSA) in the Department of Transportation (DOT) was given responsibility for issuing regulations within 30 days of enactment and for implementing the program. President Obama signed the legislation providing \$1 billion for the rebate program on June 24, 2009. NHTSA issued final rules governing the eligibility requirements, payment procedures, and other program details on July 23, 2009, and began accepting automobile dealer reimbursement requests on July 27. Consumers could take advantage of the program even before NHTSA's rules went into effect, as the CARS Act permitted reimbursements for cars purchased between July 1 and the program expiration on November 1, 2009. When the program proved popular and the available funding ran low after a week, Congress quickly enacted an additional \$2 billion.⁴

The CARS Act established two categories of rebates, depending on the fuel efficiency improvement resulting from each sale (**Table 2**). When a transaction satisfied the eligibility criteria, the purchaser received an immediate, on-the-spot rebate from the dealer, who was later reimbursed by NHTSA.

Table 2. 2009 CARS Program Rebates and Criteria

Rebate	Required Fuel Economy of Vehicle Purchased			
	Passenger Cars	Category 1 Truck	Category 2 Truck	Category 3 Truck
\$4,500	At least 10 mpg higher than scrapped vehicle and at least 22 mpg	At least 5 mpg higher than scrapped vehicle and at least 18 mpg	At least 2 mpg higher than scrapped vehicle and at least 15 mpg	Not eligible
\$3,500	At least 4 mpg higher than scrapped vehicle and at least 22 mpg	At least 2 mpg higher than scrapped vehicle and at least 18 mpg	At least 1 mpg higher than scrapped vehicle and at least 15 mpg	Truck to be scrapped was an MY2001 or older model and of similar size to or larger than the new vehicle

Source: NHTSA, *CARS Program: Most Transactions Met Program Requirements, But Program Completion Activities Continue*, MH-2010-054, April 29, 2010, <https://www.oig.dot.gov/sites/default/files/CARS%20FINAL%204.29.10%20508.pdf>.

Notes: Category 1 includes SUVs, smaller vans, and pickup trucks. Category 2 includes larger light-duty pickup trucks and vans. Category 3 includes medium-duty pickup trucks. MPG=miles per gallon, based on EPA's combined city/highway rating. MY=model year.

⁴ The additional funding for the CARS program, H.R. 3435, was introduced on July 31, 2009, and signed into law on August 7, 2009 (P.L. 111-47). The rebate program would have ended without the additional appropriation.

Several states also implemented variations of vehicle rebate programs during the recession, including California and Texas. These programs gave rebates to eligible purchasers in addition to those provided under the CARS Act.⁵

Observations About the 2009 CARS Act

Analyses of the CARS program's efficacy in meeting its objectives differ. The primary legislative objectives of the CARS program were to stimulate the economy during the recession and promote sales of new, more fuel-efficient vehicles.⁶ NHTSA's report to Congress⁷ following the program's conclusion stated that these objectives were met. It stated that "the nation's economy benefited immediately from this stimulus program, which caused a distinct upward movement in GDP and created or saved tens of thousands of jobs."⁸ According to NHTSA, the program resulted in

- the sale of more than 677,000 new vehicles, including 401,274 passenger cars, 274,602 light trucks, and 1,966 medium-duty trucks, with 346,000 of those sales pulled forward from later in 2009 and 2010;⁹
- improved fuel economy, with an average combined Environmental Protection Agency (EPA) rating for the new vehicles of 24.9 miles per gallon compared to an average rating of 15.8 miles per gallon for traded-in vehicles;
- an increase in 2009 GDP by a range of \$3.8 billion to \$6.8 billion;¹⁰
- 60,000 jobs created or saved;
- an annual reduction of 33 million gallons of fuel consumed; and
- a reduction in emissions of carbon dioxide and related greenhouse gases of 9 million metric tons over 25 years.¹¹

In a voluntary consumer survey¹² that NHTSA conducted of purchasers throughout the CARS program, 20% of respondents indicated they were planning to buy a new car in the following six months; NHTSA assumed in its analysis that vehicle sales through CARS would encourage purchasers who otherwise would have waited up to two years to buy new vehicles.¹³

⁵ David Herszenhorn and Clifford Krauss, "Enthusiasm Builds for Helping Shift to Fuel-Efficient Cars," *New York Times*, March 30, 2009, at <https://www.nytimes.com/2009/03/31/business/31clunkers.html>.

⁶ NHTSA, *CARS Program: Most Transactions Met Program Requirements, But Program Completion Activities Continue*, MH-2010-054, April 29, 2010, p. 1.

⁷ Section 1302(g) of the original CARS statute required NHTSA to report the program results to Congress within 60 days of the end of the program.

⁸ NHTSA, *Consumer Assistance to Recycle and Save Act of 2009*, December 2009, p. 2, at <https://web.archive.org/web/20100808074852/http://www.cars.gov/files/official-information/CARS-Report-to-Congress.pdf>.

⁹ *Ibid.*, p. 36.

¹⁰ According to U.S. Bureau of Economic Analysis, National Income and Product Accounts, Table 1.1.5, nominal Gross Domestic Product in 2009 was \$14.4 trillion. The NHTSA estimate therefore implies that CARS increased GDP by well below one-tenth of 1%.

¹¹ *Ibid.*, p. 2.

¹² The official title was the "Survey of Consumer Response to CARS Initiative." *Ibid.*, Appendix A.

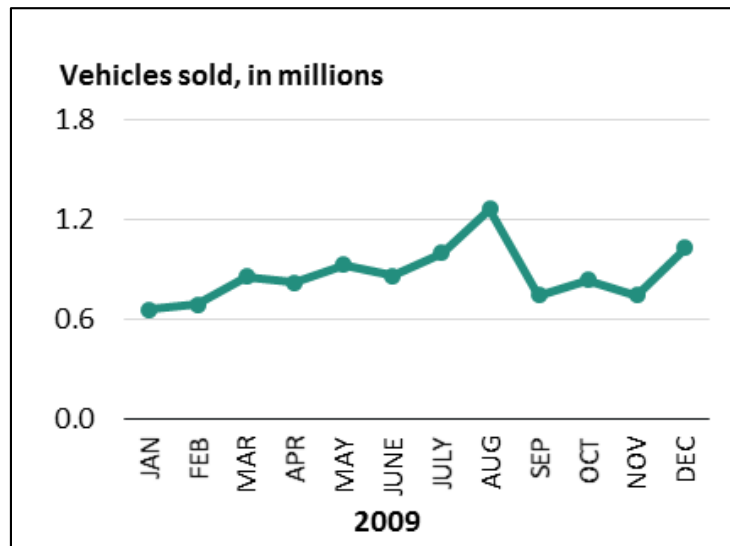
¹³ *Ibid.*, p. 36.

Short-Term Sales Gains

Later studies by independent organizations had access to more complete data than that used by NHTSA, which was required to submit a report to Congress soon after the CARS program ended. Many studies disagreed with NHTSA's analysis or found that the Cash for Clunkers program led to significantly fewer new-vehicle sales than NHTSA estimated.

In late 2008 and 2009, light-vehicle sales deteriorated, with January and February 2009 sales of well under 700,000 units per month, compared with sales of over 1.2 million vehicles a month the same period in 2008. However, sales began to rise in March 2009, and in May more than 900,000 new vehicles were sold (Figure 1), ironically just as General Motors and Chrysler filed for bankruptcy.¹⁴ In July, as the CARS program took effect, sales hit nearly 1 million units, and in August, 1.3 million vehicles were sold, the high point for the year. Sales retreated in September, October, and November, however, not returning to a million vehicles until December.¹⁵

Figure 1. U.S. Light Vehicle Sales
Monthly data, 2009



Source: Ward's Database.

Note: Light vehicles include passenger cars, SUVs, and pickup trucks.

Economists Adam Copeland and James Kahn of the Federal Reserve Bank of New York found that the "CARS program had only a transitory cumulative effect on sales." While the authors estimated that it may have spurred 450,000 vehicle sales, they found that they were mostly shifted from the fourth quarter of 2009 into the third quarter. The authors concluded "that by January 2010, the cumulative effect of the CARS program on auto sales was essentially zero."¹⁶

¹⁴ Chrysler filed for bankruptcy on April 30, 2009; General Motors on June 1, 2009. New companies exited the bankruptcy court in July 2009.

¹⁵ January and February 2010 light vehicle sales dropped (to 696,000 and 778,000 units per month, respectively). It was not until March 2010 that a more sustained recovery in vehicle sales was reached (1.1 million units), with near 1 million for almost every subsequent month of that year. Ward's Database, 2010 Light Vehicle Sales.

¹⁶ Adam Copeland and James Kahn, *The Production Impact of "Cash for Clunkers": Implications for Stabilization Policy*, Federal Reserve Bank of New York, Staff Report no. 503, July 2011, https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr503.html.273.

Economists Atif Mian, then at the University of California, Berkeley, and Amir Sufi of the University of Chicago reached similar conclusions, estimating that CARS stimulated the sale of an additional 360,000 vehicles, mostly pulled forward from following months, with the salutary effect of CARS “almost completely reversed by as early as March 2010.”¹⁷

The Government Accountability Office (GAO) issued a report in April 2010, based on interviews with a cross section of industry and government officials and a review of studies by industry experts and academics. With regard to boosting sales, GAO identified limitations in the NHTSA survey of CARS purchasers and noted that “a portion of the sales would have likely occurred even if the program had not been implemented.”¹⁸ GAO evaluated other studies’ estimates of the incremental vehicle sales that occurred because of the program, which ranged from 542,000¹⁹ down to 125,000.²⁰ GAO also cited an estimate by the President’s Council of Economic Advisers (CEA)²¹ that 64% (440,000) were incremental. A separate study by the Center for Automotive Research, a Michigan nonprofit research organization supported by some major automakers, estimated 395,000 incremental sales were enabled by the program.²²

Although its overall effect on vehicle sales seems to have been relatively small, in the range of 3% of the 16 million light vehicles sold in 2007, the timing of the sales attributable to the CARS program may have been important to auto dealers. Many auto dealers were struggling in the summer of 2009, when Cash for Clunkers seems to have had its greatest effect on sales. In the absence of the CARS program, it is possible that some of them might have not remained solvent into the fourth quarter of 2009.²³

Limited Effects on Production

Subsequent to the end of the CARS program, the Business Cycle Dating Committee of the National Bureau of Economic Research determined that the U.S. recession that began in December 2007 ended in June 2009, just before the program took effect. At the time of enactment, Congress could not have known that the worst of the downturn was past, and stimulating a major manufacturing industry and preserving factory jobs were among its main goals.

The New York Fed study gave particular attention to this effect of CARS, arguing that “the program had a very modest and short-lived effect on production,” shifting about 100,000 units from late 2009 and early 2010 into the third quarter of 2009.²⁴ The vehicle production pattern

¹⁷ Atif Mian and Amir Sufi, “The Effects of Fiscal Stimulus: Evidence from the 2009 ‘Cash for Clunkers’ Program,” *Quarterly Journal of Economics*, Vol. 127, No. 3 (2012), at <https://academic.oup.com/qje/article-abstract/127/3/1107/1924374?redirectedFrom=fulltext>.

¹⁸ U.S. Government Accountability Office, *Lessons Learned from Cash for Clunkers Program*, AO-10-486, April 2010, p. 13, at <https://www.gao.gov/assets/310/303722.pdf>.

¹⁹ Study by Maritz Automotive Research Group cited in GAO report. *Ibid.*, p. 15.

²⁰ Study by Edmunds.com cited in GAO report. *Ibid.*, p. 14.

²¹ Council of Economic Advisers, *Economic Analysis of the Car Allowance Rebate System*, September 10, 2009, p. 4, at <https://permanent.fdlp.gov/lps119620/LPS119620.pdf>.

²² Adam Cooper, Yen Chen, and Sean McAlinden, *The Economic and Fiscal Contributions of the “Cash for Clunkers” Program—National and State Effects*, Center for Automotive Research, January 14, 2010, p. 1, at https://www.cargroup.org/wp-content/uploads/2017/02/The-Economic-and-Fiscal-Contributions-of-the-Cash-for-Clunkers-Program_National-and-State-Effect.pdf.

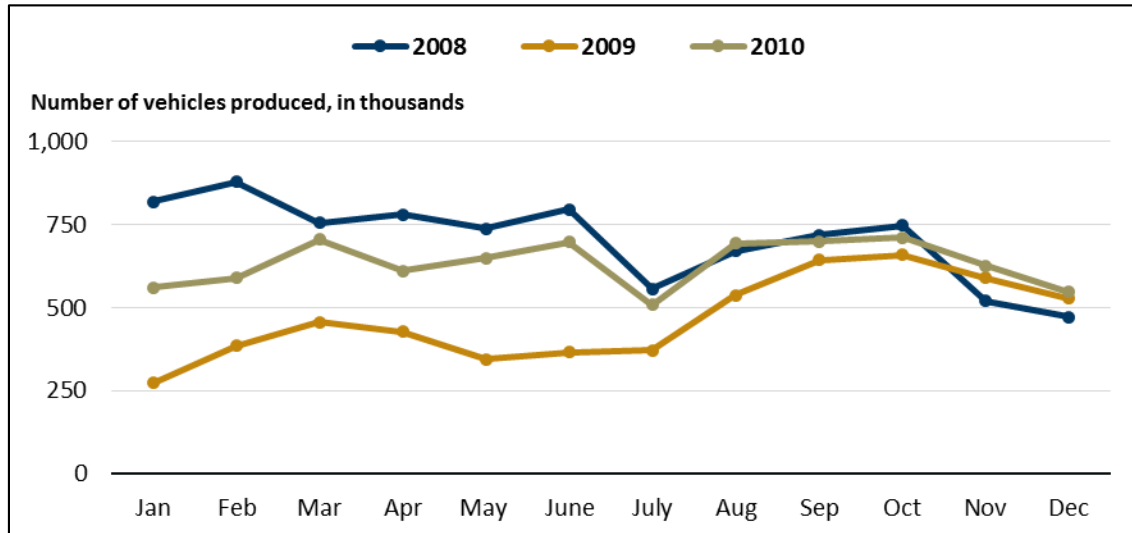
²³ Adam Copeland and James Kahn, *The Production Impact of “Cash for Clunkers”: Implications for Stabilization Policy*, Federal Reserve Bank of New York, Staff Report no. 503, July 2011, p. 18.

²⁴ *Ibid.*, p. 2.

during the summer months of this period (2008-2010) was similar each year (**Figure 2**). The spike in 2009 CARS-related vehicle sales did not change the general summer season production pattern, but it appears to have boosted the lagging production of the first six months of 2009 into normal territory.²⁵

The decline in vehicle sales during the recession resulted in larger inventories on dealers' lots from mid-2008 to early 2009. The New York Fed found that these inventories dropped during spring 2009 and had returned to a normal level by June 2009; the CARS program further reduced inventories to the lowest level in more than a decade, relative to sales.²⁶ Automakers traditionally shift production from one model year to the next over the summer; that was the case in 2009, so dealer inventories²⁷ at the time CARS took effect were mainly 2009 vehicles. As a result, more than 75% of CARS rebates were for such vehicles.²⁸ The inventory of new model year 2010 vehicles was low during the summer of 2009, as the model year commenced only in September, so relatively few 2010 models were sold during CARS, most from new production.²⁹

Figure 2. U.S. Monthly Light Vehicle Production 2008-2010



Source: Ward's Database.

Note: Light vehicles include passenger cars, SUVs, and pickup trucks.

The output of the automotive sector is an important contributor to GDP. GAO found that CARS helped stimulate the economy, but “the extent of the program’s stimulative effect on the economy is uncertain.”³⁰ It pointed out two limitations in assessing an accurate GDP impact: a lack of consensus on how many incremental sales were made and ambiguity about whether those sales resulted in new manufacturing activity or only reduced inventory of vehicles already on dealers’

²⁵ August 2009 production was 167,000 units higher than July 2009.

²⁶ Adam Copeland and James Kahn, *The Production Impact of “Cash for Clunkers”: Implications for Stabilization Policy*, Federal Reserve Bank of New York, Staff Report no. 503, July 2011, p. 7.

²⁷ Auto dealers normally maintain at least a two-month inventory of new vehicles on their lots.

²⁸ Adam Copeland and James Kahn, *The Production Impact of “Cash for Clunkers”: Implications for Stabilization Policy*, Federal Reserve Bank of New York, Staff Report no. 503, July 2011, p. 6.

²⁹ Ibid.

³⁰ U.S. Government Accountability Office, *Lessons Learned from Cash for Clunkers Program*, AO-10-486, April 2010, p. 12, at <https://www.gao.gov/assets/310/303722.pdf>.

lots.³¹ The New York Fed report reached a similar conclusion, saying CARS had a “negligible direct effect on GDP,” shifting some GDP from late 2009 and early 2010 into the third quarter of 2009.³²

Employment Effects Disputed

Employment gains from CARS were hard to substantiate because of lack of consensus on the number of sales attributable to the program and its effect on vehicle manufacturing. GAO pointed out that estimates of job creation by NHTSA and CEA were based on different methodologies for estimating how many vehicles an average autoworker could produce per year tied to estimates of incremental sales. Because the CARS program was temporary, GAO noted, “the permanency of any employment impact is more difficult to gauge”; in addition, it pointed out that “CEA acknowledged that its employment impact estimates were more uncertain than its Gross Domestic Product estimates.”³³ Higher vehicle sales by themselves do not mean that GDP and employment are also higher when large inventories absorb the sales instead of spurring new production. Other studies came to very different conclusions about employment using different econometric models:

- A review of CARS analyses by three economists at the Brookings Institution reported that the program was estimated to have added 3,676 jobs in vehicle parts and assembly in the second half of 2009, at a cost of \$1.4 million per job created.³⁴
- The Center for Automotive Research reported that over 40,000 jobs were created, estimating a government subsidization rate of \$71,000 per new job. The authors stated that CARS was more efficient than stabilization programs enacted as part of the American Recovery and Reinvestment Act of 2009, with a subsidization rate of \$92,000 per new job, calling CARS “one of the most successful economic stimulus plans in 2009.”³⁵

Fuel Economy Was the Main Environmental Goal

There is general agreement among studies evaluating the CARS program that it achieved its objective of putting more fuel-efficient vehicles on the road. However, the effect may have been overestimated by NHTSA. CARS capped the manufacturer’s suggested retail price of purchased vehicles at \$45,000, and some consumers might have purchased vehicles with even higher fuel efficiency priced above the cap in the absence of the rebate program. One study compared the fuel economy of vehicles purchased in the CARS program with the average fuel economy of model year 2009 vehicles and found that CARS purchases increased average fuel economy of all

³¹ GAO’s interviews with major automakers showed that six of eight companies reported that CARS lowered vehicle inventories, while nearly the same number of companies said the program increased production. *Ibid.*, pp. 16 and 23.

³² Adam Copeland and James Kahn, *The Production Impact of “Cash for Clunkers,”* p. 2.

³³ U.S. Government Accountability Office, *Lessons Learned from Cash for Clunkers Program*, AO-10-486, April 2010, p. 17.

³⁴ The CARS program was compared to other stimulus programs such as increasing unemployment assistance and reducing payroll taxes, concluding that it was less effective at creating jobs than the others they evaluated. Ted Gayer, Emily Parker, and Karen Dynan, *Cash for Clunkers: An Evaluation of the Car Allowance Rebate System*, Brookings Institution, October 30, 2013, at <https://www.brookings.edu/research/cash-for-clunkers-an-evaluation-of-the-car-allowance-rebate-system>.

³⁵ Adam Cooper, Yen Chen, and Sean McAlinden, *The Economic and Fiscal Contributions of the “Cash for Clunkers” Program—National and State Effects*, Center for Automotive Research, January 14, 2010, pp. 1, 6, and 13.

model year 2009 vehicles sold by 0.1 miles per gallon.³⁶ Reducing emissions from motor vehicles was another CARS goal, but there were no goals for reduction of specific pollutants.

NHTSA's analysis did not include a broader life-cycle evaluation that would have considered energy consumption and greenhouse gas emissions generated by disposal (through scrappage) of the older vehicles that were traded in and in manufacturing new vehicles. GAO's review led it to conclude that consideration of those factors "may offset some of the program's effect on emission reductions."³⁷

The CARS program's emphasis on fuel economy—with a larger rebate for purchasing a more fuel-efficient vehicle and no rebate for purchasing some types of vehicles with low fuel economy—was found by some studies to have shifted consumer demand to more fuel-efficient vehicles and away from ineligible vehicles.³⁸ The authors of a report by Resources for the Future, an environmental research organization, concluded that the increase in sales of more fuel-efficient vehicles during CARS was offset at least partially in later months, when sales of such vehicles were reduced. They also reached this conclusion about the CARS program: "[I]f the program were to be judged as an environmental program, the implied costs of reducing gasoline consumption and CO₂ emissions are quite high: the best-case scenario suggests a cost of over \$91 in government expenditures for each ton of CO₂ avoided and almost 90 cents for each gallon of reduced gasoline consumption."³⁹

Eligibility Standards and Purchaser Profile

The CARS program did not have income eligibility requirements. The study by Brookings Institution economists estimated that those car buyers most likely to have participated "had a median-before tax income of about \$69,000"⁴⁰ and "a higher before-tax income, were older, more likely to own a home, and more likely to have a high-school and a college degree."⁴¹ Participation was across the country and "reflected the U.S. population distribution."⁴² Some state rebate programs included both income limits and lower vehicle price eligibility standards.⁴³

³⁶ The average fuel economy of CARS purchases was 23.8 miles per gallon (mpg); the average miles per gallon for all model year 2009 vehicles was 21.4 mpg. The authors noted that the difference of 2.4 mpg amounted to a 0.1 mpg fuel economy improvement for all vehicles sold that year. Ben Foster and Therese Langer, *Cash for Clunkers: A Missed Opportunity for Fuel Economy Gains*, American Council for an Energy-Efficient Economy, Report Number T 112, September 2011, p. 6, at <https://www.aceee.org/sites/default/files/publications/researchreports/t112.pdf>.

³⁷ U.S. Government Accountability Office, *Lessons Learned from Cash for Clunkers Program*, AO-10-486, April 2010, p. 19.

³⁸ Shanjun Li, Joshua Linn, and Eishaba Spiller, *Evaluating "Cash for Clunkers": Program Effects on Auto Sales and the Environment*, Resources for the Future, October 2011, p. 5, at <https://media.rff.org/archive/files/sharepoint/WorkImages/Download/RFF-DP-10-39-REV.pdf>.

³⁹ *Ibid.*, p. 23.

⁴⁰ Real median household income in the United States was \$50,221 in 2009. Amanda Noss, *Household Income for States: 2008 and 2009*, U.S. Census Bureau, American Community Survey Briefs, ACSBR/09-2, September 2010, at <https://www.census.gov/library/publications/2010/acs/acsbr09-2.html>.

⁴¹ Ted Gayer, Emily Parker, and Karen Dynan, *Cash for Clunkers: An Evaluation of the Car Allowance Rebate System*, Brookings Institution, October 30, 2013, pp. 9-10.

⁴² U.S. Government Accountability Office, *Lessons Learned from Cash for Clunkers Program*, AO-10-486, April 2010, p. 20.

⁴³ For example, the Texas Drive a Clean Machine rebate program capped the sale price of new vehicles at \$25,000 and limited participation to lower-income purchasers. In the Texas program, a purchaser in a household with four people would have been eligible to receive a rebate only if the household's income was no more than \$66,000 in 2009. U.S. Government Accountability Office, *Lessons Learned from Cash for Clunkers Program*, AO-10-486, April 2010, p. 29.

Many of the CARS purchasers would have purchased a new vehicle even without CARS, according to some studies; one study estimated that as many as 60% of the consumers who bought vehicles with CARS rebates would have bought them without the rebate.⁴⁴ In addition, the authors found that many consumers bought lower-priced vehicles than what they would have bought without CARS. The fuel efficiency restrictions of the program “induced households to buy smaller and less expensive vehicles,” ironically lowering total new-vehicle spending by \$5,000 per subsidy.⁴⁵

One concern raised in 2009 was that destruction of large numbers of used vehicles might reduce the number of used cars available for lower-income consumers, driving up their prices. Several studies concluded that this was not an outcome of the CARS program because (1) the scrapping of nearly 700,000 vehicles represented a small change in the universe of potential used cars, given the more than 250 million light vehicles in use in the United States; and (2) the average age of vehicles traded in during CARS was 16 years, so the interaction between new-car sales and CARS trade-in vehicles was “minimal.”⁴⁶

Unusually Brief 30-Day Implementation Time Frame Led to Administrative Issues

Despite the popularity of rebate programs in Europe that preceded the U.S. CARS program and surveys by the National Automobile Dealers Association that found that \$1 billion would be committed in less than a week,⁴⁷ the strong public response was not anticipated. The enacting legislation gave NHTSA 30 days to develop the regulations, publicize the program, develop a website to inform potential vehicle purchasers, and set up the internal systems to process dealer reimbursements.⁴⁸ The volume of transactions rose quickly. According to NHTSA, demand for rebates “outstripp[ed] the transaction review capacity NHTSA had created to deal with the much lower volume envisioned by the original legislation.”⁴⁹ As the program administration challenges continued, NHTSA added more than 7,000 people by September—mostly short-term contractors—to process dealer reimbursements.

⁴⁴ Mark Hoekstra, Steven Puller, and Jeremy West, *Cash for Corollas: When Stimulus Reduces Spending*, American Economic Journal: Applied Economics, Vol. 9, No. 3, July 2017, at <https://www.aeaweb.org/articles?id=10.1257/app.20150172>.

⁴⁵ Ibid.

⁴⁶ Adam Copeland and James Kahn, *The Production Impact of “Cash for Clunkers”: Implications for Stabilization Policy*, Federal Reserve Bank of New York, Staff Report no. 503, July 2011, p. 16, and Meghan Busse, Christopher Knittel, and Jorge Silva-Risso et al., *Did “Cash for Clunkers” Deliver? The Consumer Effects of the Car Allowance rebate System*, MIT Center for Energy and Environmental Policy Research, CEEPR WP 2-13-009, November 2012, p. 3, at <http://ceep.mit.edu/files/papers/2013-009.pdf>.

⁴⁷ Ryan Beene, “NADA rushed to make cash for clunkers work,” January 22, 2017, at <https://www.autonews.com/article/20170122/NADA100/301239945/nada-rushed-to-make-cash-for-clunkers-work>.

⁴⁸ GAO auditors found that DOT officials told them they had limited time to develop the survey and that the Office of Management and Budget (OMB) approved abbreviated survey design and implementation. U.S. Government Accountability Office, *Lessons Learned from Cash for Clunkers Program*, AO-10-486, April 2010, p. 30.

⁴⁹ NHTSA, *Consumer Assistance to Recycle and Save Act of 2009*, December 2009, p. 1.

A key part of the CARS program was the NHTSA survey of consumers who purchased vehicles with CARS rebates. The survey was developed in a short period of time—with no pretesting beforehand—leading GAO to later comment that “it did not follow some generally accepted survey design and implementation practices, thereby posing potential risk to the reliability of the agency’s survey-based estimate of reduced fuel consumption.”⁵⁰ Because not all CARS purchasers were required to complete the survey, the CARS survey had a response rate of 27%, instead of the expected 75%; when incomplete, duplicate, and invalid surveys were factored in, the response rate was reduced to 21%. In addition, NHTSA did not follow up with nonrespondents to increase the response rate, a procedure recommended by Office of Management and Budget guidelines. In response to GAO’s finding, NHTSA asserted that the tight schedule for making its CARS report to Congress—another deadline mandated in the enacting legislation—made such follow-up “impractical.”⁵¹

The congressional recess timetable also had a potential impact on program expectations. As interest surged during its first week in late July—shortly before a planned early August congressional recess—the disbursement of the initial appropriation led dealers to be concerned that they could be left with millions of dollars of discounts paid out to consumers, with no chance of reimbursement until fall when Congress returned and no assurance that Congress would then appropriate additional funds.⁵² Dealers faced a potential choice of refusing CARS-related rebates just as consumers were taking an interest or providing rebates for which they might not receive reimbursement.

Mixed Results on Program Metrics

The statute establishing CARS required both GAO and the DOT Office of Inspector General (OIG) evaluations after the program terminated.⁵³ The OIG report, issued in April 2010, examined NHTSA’s controls to ensure CARS met federal requirements and discussed challenges NHTSA faced during implementation and program closing. The OIG reported that 97% of CARS transactions met basic eligibility requirements pertaining to mandated fuel efficiency and ownership requirements because NHTSA established “transaction controls, including a two-level manual review and approval of each payment and automated checks to prevent duplicate payments,” and “required dealers to certify that they would disable trade-in vehicle engines to prevent resale.”⁵⁴

The OIG found challenges to implementation of the CARS program, including the following:

- **Accurate disposal information.** NHTSA’s main controls to ensure that traded-in vehicles were disposed of correctly initially utilized the Department of Justice’s National Motor Vehicle Title Information System (NMVTIS),⁵⁵ which only 15

⁵⁰ U.S. Government Accountability Office, *Lessons Learned from Cash for Clunkers Program*, AO-10-486, April 2010, p. 18.

⁵¹ *Ibid.*, p. 35.

⁵² Ryan Beene, “NADA rushed to make cash for clunkers work,” January 22, 2017.

⁵³ GAO’s observations are included in the previous section of this report, generally tied to the legislatively mandated timetable for issuing regulations and informing Congress of the program results.

⁵⁴ Joseph Com , Assistant Inspector General for Surface and Maritime Program Audits, DOT Office of the Inspector General, Consumer Assistance to Recycle and Save Program: Most Transactions Met Program Requirements, But Program Completion Activities Continue, MH-2010-054, April 29, 2010, p. 2, at <https://www.oig.dot.gov/sites/default/files/CARS%20FINAL%204.29.10%20508.pdf>.

⁵⁵ NMVTIS was established to assist motor vehicle administrators, law enforcement officials, and consumers with an electronic means to verify vehicle title and other data, primarily to prevent vehicle theft and fraud.

states fully used in 2009. To compensate, NHTSA developed work-around procedures so consumers could determine titling and avoid purchasing used vehicles that were supposed to have been scrapped. Nevertheless, the OIG found that some disposal facilities did not comply with vehicle trade-in rules, thus limiting NHTSA's ability to confirm that vehicles were crushed or shredded within 270 days of trade-in.

- **Inadequate transaction controls.** NHTSA used a contractor to estimate future dealer requests for payment, based on surveys of vehicle sales. This data lagged substantially, however, and when its first report was made to NHTSA, dealers had completed \$1.38 billion in CARS transactions, \$380 million over the then-appropriated amount. Had Congress not added \$2 billion to the program, "NHTSA risked having to deny an estimated \$380 million in potentially eligible claims."⁵⁶

OIG also noted that NHTSA did not validate Vehicle Identification Numbers (VINs) before paying dealers, and did not encrypt personally identifiable information stored in the CARS database.

- **Underestimated demand.** NHTSA assumed dealer requests for payment would be a steady 3,000 per day, but then received 224,000 requests in the first 10 days. The CARS statute set the eligibility period for rebates starting on July 1, 2009, nearly a month before NHTSA had the program regulations in place, resulting in a backlog of 51,000 transactions on the first day of program reimbursements. NHTSA was behind before it even started processing rebates.

The contractor hired to make payments to dealers was Citibank, but the surge in CARS transactions overwhelmed its ability to handle dealer transactions, so NHTSA resorted to emergency contracting to supplement the Citibank operations. The temporary workforce used 7,000 federal employees from the Federal Aviation Administration, other DOT agencies, and the Internal Revenue Service.

- **Overestimated compliance.** NHTSA assumed most payment requests would have all the correct data, but most were rejected because they were incomplete, requiring dealers to resubmit them and delaying payments to dealers.
- **Information technology (IT) system weaknesses.** The high volume exposed IT weaknesses that had not been anticipated. NHTSA did not have time to conduct risk assessments dealing with software needs and system testing. The OIG stated that should future programs like CARS be developed, NHTSA should have in place design guidelines "that incorporate risk mitigation and contingency plans for transaction processing, IT systems, and activity monitoring and reporting."⁵⁷

⁵⁶ Joseph Com e, Assistant Inspector General for Surface and Maritime Program Audits, DOT Office of the Inspector General, *Consumer Assistance to Recycle and Save Program: Most Transactions Met Program Requirements, But Program Completion Activities Continue*, MH-2010-054, April 29, 2010, p. 6.

⁵⁷ *Ibid.*, p. 17.

World Trade Rules Affected the Program Design and Results

Among the legislative proposals in 2009 to establish a rebate system were two bills that addressed the manufacturing location of the vehicle being purchased. H.R. 1550, introduced by Representative Sutton, would have limited rebates to vehicles produced in either the United States or North America (Section 3(b)). S. 247, introduced by Senator Feinstein, would have permitted rebates for vehicles regardless of their country of origin. The provision limiting rebates by country of origin became controversial as the House debated the first rebate legislation, amid concerns that restricting rebates to U.S.-made vehicles could violate U.S. commitments to the World Trade Organization, provoking challenges from European and Asian countries and delaying implementation of the rebate system.⁵⁸ The European Union ambassador to the United States reportedly wrote to members of Congress alleging that the legislation introduced by Representative Sutton would violate international agreements.⁵⁹ The bill providing \$4 billion for rebates that passed the House on June 9, 2009 (H.R. 2751), did not include a country-of-origin limitation.

In discussing the legislation when it was debated in the House, Representative Sutton stated, "And though our fleet modernization program is open to vehicles, regardless of where they are made, I encourage everyone who participates in this program to think about the families who depend upon cars made in the United States and ask you to purchase a fuel efficient vehicle assembled right here at home to help shore up jobs and help our environment."⁶⁰

The Senate did not vote on a separate rebate bill. CARS was established when a \$1 billion rebate program was inserted into a supplemental appropriations bill in a conference committee. That bill contained no country-of-origin provision.⁶¹ After the CARS program concluded, NHTSA reported that 49% of the vehicles that received rebates were produced in the United States⁶² (**Table 3**).

⁵⁸ Economists at the Peterson Institute for International Economics reviewed the role of various forms of possible aid to the U.S. auto industry in a February 2009 analysis. The authors noted that a U.S. cash for clunker program with no country of origin requirements "would not qualify as actionable subsidies under ... the WTO ASCM [Agreement on Subsidies and Countervailing Measures] ..." because it "does not mandate that the voucher be spent on domestically produced cars." Claire Brunel and Gary Clyde Hufbauer, *Money for the Auto Industry: Consistent with WTO Rules?*, Peterson Institute for International Economics, Number PB09-4, February 2009, <https://www.piie.com/sites/default/files/publications/pb/pb09-4.pdf>. A similar conclusion was reached by other economists. See Kamala Dawar, "The U.S. 'Cash for Clunkers' Scheme," in *The Legality of Bailouts and Buy Nationals: International Trade Law in a Crisis* (Oxford and Portland, Oregon: Hart Publishing, 2017), pp. 127-129.

⁵⁹ "EU/US: Commission Tries to Kill Discriminatory Car Scrappage Bill," *European Report*, April 29, 2009, at http://www.library.coleurop.pl/intranet/documents/ep/2009/ep3743_29apr09.pdf.

⁶⁰ Representative Sutton, House remarks on consideration of Consumer Assistance to Recycle and Save Act, *Congressional Record*, June 9, 2009, p. H6347.

⁶¹ The House-passed bill was never voted on in the Senate. Instead, a revised version of the House legislation, with \$1 billion for the rebate program and no country-of-origin limitations, was added as Title XIII during the conference committee to a supplemental appropriations bill (H.R. 2346), becoming law on June 24, 2009 (P.L. 111-32).

⁶² NHTSA, *Consumer Assistance to Recycle and Save Act of 2009*, December 2009, p. 25.

Table 3. Country of Origin of New Vehicles in CARS Program

Country of Origin	Percentage of CARS Rebates
United States	49%
Japan	17%
Mexico	12%
South Korea	11%
Canada	10%
Germany	2%

Source: NHTSA, *Consumer Assistance to Recycle and Save Act of 2009*, December 2009, p. 25.

Note: Total is more than 100% due to rounding.

A study by the Center for Automotive Research later argued that the economic stimulus from the CARS program would have been greater had the program been limited to vehicles manufactured in the United States or North America. The center's econometric model showed that a rebate program limited to vehicles produced in North America could have added nearly another 16,000 U.S. jobs to the 40,200 that it estimated were created by the CARS Act. The study contended that "other nations developed regulations that severely restricted the program eligibility of imported vehicles as trade-ins for higher fuel economy vehicles, or excluded imports from receiving tax advantages or subsidies."⁶³

Programs in Major Foreign Markets Differed

Major industrial countries implemented cash-for-clunkers-like programs in late 2008 and early 2009 as the recession resulted in a decline in motor vehicle sales and production in most markets; some incentives lasted until 2010. The German rebate program was seen as especially successful, and congressional advocates for a similar program in the United States often cited it.⁶⁴ The programs varied: not all were run by the government and some did not tie new-car sales to improved emissions or better fuel economy. Some countries supplemented their scrappage program with vehicle-related tax reductions.

⁶³ Adam Cooper, Yen Chen, and Sean McAlinden, *The Economic and Fiscal Contributions of the "Cash for Clunkers" Program—National and State Effects*, Center for Automotive Research, January 14, 2010, p. 14.

⁶⁴ See press release from the Office of Representative Sutton in this article: Jeremy Korzeniewski, "CARS Act revives 'Cash for Clunkers' scrapping plan in U.S.," *Autoblog*, March 18, 2009, at <https://www.autoblog.com/2009/03/18/cars-act-revives-cash-for-clunkers-scrapping-plan-in-u-s/>.

Table 4. Fleet Modernization Programs in Selected Countries
2009

Country	Program Summary
Canada	"Retire Your Ride" offered Canadians C\$300 (U.S. \$285) to scrap vehicles produced before 1996. It was administered by the Clean Air Foundation (a nonprofit organization), and motorists could choose a transit pass or cash in lieu of a rebate. The government did not enact a U.S.-style rebate program because a large share of Canadian vehicles are made elsewhere, and it was thought a rebate program would not stimulate the economy.
France	A subsidy of €1,000 (\$1,400) and a tax rebate of up to €5,000 were available when vehicles more than 10 years old were scrapped for vehicles emitting less carbon dioxide per kilometer. The 2009 program supported the purchase of about 600,000 vehicles.
Germany	The "Environmental Bonus" program's dual goals were to stimulate vehicle sales and reduce emissions. Vehicles scrapped that were at least nine years old received a €2,500 (\$3,500) subsidy, and new cars had to meet Euro 4 emissions standards (set in 2005). It supported the sale of 1.9 million cars.
United Kingdom	Vehicles at least 10 years old could be traded in for new vehicles, receiving a £2,000 (\$3,300) subsidy. The UK auto industry funded half of each car subsidy, which was not tied to buying a more efficient vehicle. Sales of 400,000 new vehicles were generated.
Japan	The Eco-Car program provided a ¥250,000 (\$2,600) subsidy for new vehicles if the trade-in was at least 13 years old; new cars had to meet fuel efficiency and emission standards set to take effect in 2010. Consumers could also buy new cars with the subsidy without a trade-in, but the fuel economy of the new car had to be higher than Japan's 2010 standard and the emissions had to be 75% below the country's 2005 standards. Taxes were also reduced on some cleaner emission vehicles; the rebate and tax reduction could be combined. The 2009-2010 program subsidized the purchase of 2.8 million vehicles.
China	Sales taxes were cut in half for smaller cars (under 1.6 liters), and rebates of 3,000 RMB to 6,000 RMB (\$490-\$980) were available for newer vehicles with improved emissions. Initially, consumers did not respond to the program, so subsidies were raised at the end of 2009 to 6,000 RMB to 18,000 RMB (\$980-\$2,940). About 460,000 vehicles were replaced in the 2010 portion of the program.
South Korea	A tax incentive program that provided a partial exemption from the consumption, car acquisition, and registration taxes was instituted for trade-ins manufactured before 1999, providing a ₩ 2.5 million (\$2,000) subsidy.

Source: CRS.

While some European auto industry executives and government officials expressed an interest in stimulating sales of vehicles made their home countries, none of the European scrappage programs included country-of-origin requirements. A news article about the program in the European Union noted that "although 13 EU member states have similar car scrappage schemes, the [European] Commission has given them the green light because they do not require the replacement vehicle to be made in a specific country or region."

Japan's rebate program, which initially excluded most U.S.-origin vehicles, led to objections from the United States. Under a long-standing U.S.-Japan agreement, a limited number of U.S. vehicles can be exported to Japan annually without meeting that country's emissions and fuel economy standards. U.S. vehicles imported through this Preferential Handling Procedure (PHP) did not generally meet the Japanese government's cash for clunkers emissions and fuel economy standards for new vehicles. Some Members of Congress and the U.S. Chamber of Commerce objected to the exclusion of PHP vehicles.⁶⁵ After the U.S. Trade Representative raised this issue,

⁶⁵ Ian Swanson, "Chamber, lawmakers pressure Japan on clunker program," *The Hill*, January 6, 2010, at

in late January 2010 Japan modified its program to permit rebates on sales of U.S.-made vehicles imported through the PHP program.⁶⁶

A retrospective study of vehicle rebate and subsidy programs in 2009 and 2010 by the International Council on Clean Transportation (ICCT) evaluated CARS-type programs in major industrial countries, including the United States. It found that these programs achieved “relatively low GHG emission and air pollutant savings ... at high cost”⁶⁷ and that GHG emissions were curtailed mainly in countries like France that set a CO₂ threshold for new vehicles. ICCT recommended that should countries implement similar subsidy programs in the future, countries should limit them only to battery electric vehicles to achieve the largest environmental benefit; the authors also recommend pairing such a subsidy program with higher taxes on the purchase of high-emission vehicles.⁶⁸

Beyond CARS: Vehicle Rebate Programs in California

Around the time of the CARS program, the State of California initiated several similar programs that use rebates to accelerate the replacement of older passenger vehicles and trucks. These programs, which are ongoing, were designed to remove vehicles with high emissions from roadways and ports; the transportation sector is responsible for 40% of the state’s greenhouse gas emissions and 80% of its emissions of nitrogen oxides, which contribute to smog. Preservation of jobs in auto manufacturing is not among the goals of the programs, which are overseen by the California Air Resources Board (CARB).

Passenger Vehicles. The Clean Vehicle Rebate Program (CVRP), which is administered by the Center for Sustainable Energy on behalf of CARB, offers up to \$7,000 in rebates for the purchase of new, eligible zero-emission electric and hybrid vehicles. Launched in 2010, CVRP has provided rebates for an estimated 350,000 vehicles, with state funding of nearly \$775 million. The purchaser is not required to trade in an older vehicle to obtain a rebate on a new vehicle.⁶⁹ Rebates vary depending on the type of vehicle purchased; examples include \$4,500 for a Honda or Toyota fuel-cell vehicle; \$2,000 for a plug-in electric vehicle such as a Chevrolet Bolt or Nissan Leaf; and \$1,000 for hybrids such as Chevrolet Volt and Hyundai Sonata plug-in hybrid.⁷⁰ In addition to individuals, rental and car-share fleets may also utilize the program, limited to 20 rebates per calendar year.

<https://thehill.com/homenews/news/74639-chamber-lawmaker-pressure-japan-on-clunker-program>.

⁶⁶ United States Trade Representative, “Kirk Comments On Changes To Japan’s Cash-For-Clunkers Program,” press release, January 19, 2010, at <https://ustr.gov/about-us/policy-offices/press-office/press-releases/2010/january/kirk-comments-changes-japan%E2%80%99s-cash-clunkers-progra>.

⁶⁷ Georg Bieker and Peter Mock, Green vehicle replacement programs as a response to the COVID-19 crisis: Lessons learned from past programs and guidelines for the future, International Council on Clean Transportation, May 2020, p. 18, at <https://theicct.org/sites/default/files/publications/Vehicle-replacement-programs-COVID-Jun2020.pdf>.

⁶⁸ Ibid.

⁶⁹ Suhauna Hussain, “California pulls back clean-vehicle rebates to point them at lower-income buyers,” *Los Angeles Times*, November 13, 2019, at <https://www.latimes.com/business/autos/story/2019-11-13/california-pulls-back-clean-vehicle-rebates-to-point-them-at-lower-income-buyers>.

⁷⁰ Rebates from the CVRP website, viewed September 2, 2020; <https://cleanvehiclerebate.org>.

In December 2019, CARB added new restrictions to orient the program to lower-income residents:

- vehicles priced at more than \$60,000 are no longer eligible for rebates;
- an income cap⁷¹ has been instituted; and
- rebates for eligible low-income residents are higher than for other participants: \$7,000 for a fuel cell vehicle, \$4,500 for an electric vehicle, and \$3,500 for plug-in hybrids.⁷²

Trucks. A state priority is to replace diesel-powered trucks that service the ports of Los Angeles and Long Beach, which are the largest North American container gateways. The Hybrid and Zero-Emission Truck and Bus Voucher Incentive Projects program, launched in 2009, provides a voucher incentive at truck dealerships at the time of a new truck purchase; incentives for trucks range from \$20,000 to \$175,000 depending on the size of the truck and the type of power source, with higher subsidies for more expensive electric vehicles.⁷³ A Clean Air Action Plan calls for zero-emission truck fleets in the ports of the two cities by 2035.

To partially fund the replacement of trucks serving the ports with newer, natural-gas-powered vehicles, the ports plan to begin levying by the end of 2020 a “clean truck fund rate” on incoming shipments. It would raise as much as \$90 million in the first year, to partially subsidize truckers who purchase new vehicles that can cost nearly twice as much as a diesel-powered truck.⁷⁴ The clean truck mandate and cargo fee have been controversial, with concerns that cargo shipments could be diverted to other ports and independent truckers could be priced out of the market with more expensive vehicle requirements.⁷⁵

⁷¹ The income cap that limits rebates is \$150,000 for single filers, \$204,000 for head-of-household filers, and \$300,000 for joint filers, at <https://cleanvehiclerebate.org/eng/income-eligibility>.

⁷² Suhauna Hussain, “California pulls back clean-vehicle rebates to point them at lower-income buyers,” *Los Angeles Times*, November 13, 2019.

⁷³ California Hybrid and Zero-Emission Truck and Bus Voucher Incentive Project (HVIP), viewed September 2, 2020, at <https://www.californiahvip.org>.

⁷⁴ The ports have determined that subsidies of \$100,000 per truck will be needed in the short term, with larger subsidies when zero-emission, electric trucks are required a decade from now. Bill Mongelluzzo, “LA-LB ports pledge to mitigate clean truck fee impact,” *Journal of Commerce*, March 11, 2020, at https://www.joc.com/port-news/us-ports/la-lb-ports-attempt-balance-environmental-commercial-goals_20200311.html#:~:text=The%20ports%20of%20LA%20DLB,by%20the%20end%20of%202020.

⁷⁵ *Ibid.*

Appendix. For Additional Reading

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