The Uneasy Case for Subsidizing Energy Efficiency

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“Cash for Clunkers,” formally, the Car Allowance Rebate System (CARS), proved to be an idea politicians couldn’t refuse. And not just in the United States: nearly all major auto-manufacturing countries (and some minor ones, including Romania, Serbia and Slovakia), invested in similar programs to retire old vehicles by subsidizing purchases of new ones.

The appeal was plain. The financial incentive to consumers (supported by $3 billion in subsidies) served as a shot in the arm for the deeply distressed automakers. Meanwhile, modernizing the fleet of vehicles on the road offered the prospect of reducing
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tailpipe emissions. “This is a win for the economy, a win for the environment and a win for American consumers,” Transportation Secretary Ray LaHood said.

But a closer look – one in which the costs to taxpayers (present and future) are weighed against the benefits to auto buyers, industry stakeholders and the environment – casts serious doubt on that conclusion. Indeed, by conventional measures, CARS yielded net societal losses averaging more than $1,000 per clunker traded in.

Why rehash the program now? Because it illustrates the problematic consequences of making economic and environmental policy without first making a best effort to weigh the costs and benefits – an error now being repeated in the current incentive program to induce consumers to buy energy-efficient home appliances.

CLUNKERNOMICS

In cost-benefit studies, the goal is to obtain a measure of the net gain or loss in welfare to society – in effect, to measure whether a program makes the total economic pie bigger or smaller. With CARS, we identified a variety of costs and benefits. Consumers who traded in clunkers suffered losses equal to the remaining value of the vehicles (to them), while taxpayers were burdened with losses equal to the budgetary cost of the program. On the other side of the ledger, consumers got new cars at lower prices and industry stakeholders earned more on car sales; everybody presumably benefitted from lower emissions as clunkers were removed from the road.

Look first at the cost side. We estimate that the vehicles traded in, and then destroyed, under the program had an average value of $1,000. This loss was borne by the new car buyers – who, of course, voluntarily made the sacrifice in return for the discount on their purchases. For their part, taxpayers lost $4,200 per vehicle – the average subsidy on clunker trade-ins. Finally, it cost money to process new car sales and to scrap the clunkers according to government regulations. We estimate these costs at $250. The full cost then is about $5,450 per vehicle.

Now, look at the benefit side. First, there is the value of the subsidy to car buyers. Two types of buyers participated in the program: those who would have traded in a clunker, whether or not the program had been introduced, and those who would not have traded without the program but were enticed to do so by the subsidy. The consumers in the first group valued the subsidy at its full $4,200. This is like cash in their pockets, since they planned to sell their clunker for a new car anyway.

For those in the second group, the subsidy was worth less than $4,200. To see this, consider what would have happened if buyers had been given an option to sell the clunkers for $4,200 in cash, rather than apply the rebate to the purchase of new automobiles. Surely some of the buyers would have opted for the cash to buy something other than a new vehicle, which the clunker program required. We estimate that this lack of the option of selling their clunkers to Uncle Sam with no strings attached effectively reduced the average value of the subsidy to our second group of consumers to $2,600.

Put in terms of what economists call “consumer surplus,” it is the difference between what buyers are willing to pay for the new car and what they actually have to pay, averaged
across our buyers. For some, this will be close to $4,200 (those close to buying a new car anyway) and for others is will be close to $1,000 (those for whom the $4,200 is just enough to bring them into the new car market and an amount sufficient to cover the value of their lost clunkers).

Note that if dealers had been able to raise car prices, they would have collected a portion of the $4,200 from the first group and a portion of the $2,600 from second group and thereby increased their margins during the clunker frenzy. There is anecdotal evidence that this actually happened. It does not change the final value of the subsidy, though; it merely divides it differently among buyer and sellers of new cars.

There is, of course, one other obvious benefit from CARS: the gain to the environment (and thus society as a whole) from replacing air-polluting gas guzzlers with cleaner burning, fuel-efficient new cars. We estimate that clunkers averaging 15.8 miles per gallon were replaced by new cars averaging 25 miles per gallon, which means that the average driver logging 12,000 miles annually will henceforth burn 280 gallons less fuel each year. We expect that the trade-in program removed clunkers from the road about three years earlier than they would otherwise have been scrapped, implying that the total fuel saving per trade-in was 840 gallons.

Jason Hill, an economist at the University of Minnesota, and a number of colleagues recently estimated that the environmental cost of burning a gallon of gasoline is 71 cents – 37 cents in global warming and 34 cents in health-related pollution. So saving 840 gallons of fuel reduces environmental damage by approximately $600.

Now, let’s put it all together. For the first group of buyers, the benefits include the $4,200 per vehicle subsidy, divided between buyer and seller in some way, plus the $600 per vehicle for society in reduced environmental damages. The costs include the $4,200 subsidy paid by taxpayers (in these terms, the subsidy payment is just a transfer of wealth from taxpayers to buyers and sellers) plus the...
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loss value of the clunker at $1,000 per vehicle plus the cost of running the program at $250. The net cost then is $650 per vehicle for our first group. Since these are transactions that would have taken place anyway, we see that the loss is simply the value of the destroyed clunker plus the cost of administering that destruction less the environmental gain.

In effect, we shrank the economic pie to improve the conditions of some workers and perhaps some sectors other than labor.

For the second group of buyers, each trade-in generated $2,600 per vehicle in benefits, instead of $4,200. For this group then, with benefits lower by $1,600, the societal loss is larger, at $2,250 per vehicle.

Let’s say the program increased sales that involved clunker trade-ins by one-third. That would be generous, but not out of the realm of possibility. If so, the average loss per vehicle was about $1,180. Since $3 billion was spent through CARS to get some 700,000 clunkers of the road, the total net loss from the program was $825 million.

ON FURTHER CONSIDERATION...

Obviously, some guesswork went into that calculation. It’s possible, for example, that the scrapped clunkers were worth considerably more than $1,000, implying that the net losses from denying consumers ongoing use of the vehicles were higher. On the other hand, the guessestimate that clunkers would otherwise have been used for just three more years may have been conservative. If they had lasted longer, the environmental benefits of scrapping them early were larger. No matter how you slice and dice this one, though, it is hard to come up with a plausible set of numbers for environmental benefits, net consumer and dealer benefits and taxpayer costs that yield a net gain to society. So by this measure, CARS was an economic loser.

But what about job creation? Our assessment of CARS deliberately neglected the macroeconomic benefits of added government spending on new vehicles – the impact on employment and GDP. No real surprise there: cost-benefit analysis assumes that market prices reflect the opportunity costs of capital, labor and resources used in production. In circumstances in which unemployment exists, there is still some opportunity cost to using the unemployed labor (forgone leisure, job search and other household outputs), and it is undoubtedly lower than during times of full employment. But product markets (cars, in our case) still capture this effect. This is not to say that newly created jobs provide no benefits to workers. They do, and clunkers may have provided such help, at least for a month or so. But it is important to understand – from an economic standpoint – if our calculations are correct, that it has done so in a program that is a poor investment for society. The value of resources used exceeded the value of resources created. In effect, we shrank the economic pie to improve the conditions of some workers and perhaps some sectors other than labor.

But why not pick good investments to achieve these results? Why not look for programs that both increase the pie and employ workers? Indeed, if the analysis is done correctly, labor-intensive projects will look more favorable in times and places of high unemployment, because the opportunity cost of labor will be lower.

There are other pragmatic reasons not to include employment effects directly in the
analysis. For one thing, to do otherwise is to open the door to all sorts of special pleading. If, for example, the widget factory in Congressman Smith’s district is unprofitable and in danger of closing, and if few of the employees have much hope of finding other jobs anytime soon, doesn’t it pay to spend taxpayer money to keep it open? For another, programs that can only be justified as macro-economic stimulus in a period of underemployment have a way of outliving the rationale. Think, for example, about farm subsidies instituted during the Depression to keep rural America afloat.

Another factor neglected in our analysis of CARS is the apparent failure of the private market for financing auto sales in the wake of the collapse of Wall Street. If interest rates on auto loans went up by more than risk considerations warranted, or if credit were simply not available, encouraging car purchases with government subsidies might well offset the resulting economic inefficiency.

We have mixed feelings about the argument. The case is plausible on its face. But it is hard to estimate the level of subsidy that would appropriately offset the impact of failure in the credit market. And in any event, a price subsidy to purchase a good seems a blunt instrument to deal with failure in an ancillary credit market: should potential buyers with widely varying access to credit receive the same subsidy? If not, how should the subsidies be parceled out? These are questions without easy answers – imponderables that, once again, make us wary of relaxing the criteria by which special subsidies to specific industries ought to be judged.

**Clunkernomics Part II**

The popularity of the CARS program has spawned a similar program for home appliances. Like CARS, the clunker appliance program is financed with money from the federal stimulus program. But it differs from CARS in important respects. First, individual states are to run their own programs within flexible guidelines created by Washington; money
will be allocated to the states in proportion by population. Second, there is no requirement to destroy old appliances to qualify for rebates on new ones. Buyers must merely purchase appliances that qualify under the Energy Department’s Energy Star program, and the rebates are theirs. Third, at $300 million, the appliance program is much smaller than CARS – though Congress always has the discretion to add cash later. That, after all, is what happened with CARS.

The state programs are scheduled to be up and running this winter. Rebates will range from $50 to $200 and (at the discretion of the states) may cover a host of appliances, including dishwashers, air conditioners, water heaters, refrigerators and even furnaces.

Different appliances may fare differently in an analysis of costs and benefits. We focus here on refrigerators, because they use a lot of energy. And since modern units use much less electricity than earlier-generation models, there is considerable potential for increasing energy efficiency.

In our analysis, we distinguish among three groups of buyers. Start with those who planned to buy Energy Star refrigerators soon anyway. For them, the subsidy will be a windfall, a simple transfer of wealth from taxpayers that doesn’t change the number or average efficiency of refrigerators in use.

The analysis is more interesting for the other two groups – those who accelerate planned purchases of Energy Star units or are lured by rebates and buy Energy Star refrigerators instead of less efficient ones.

Assume the subsidy is $100 per refrigerator – a plausible number, though one that will likely vary from state to state. Then the value of the subsidy will be nearly $100 for those who were close to making Energy Star purchases even without the subsidy, and close to zero for those who are just nudged into purchases by the subsidy. Based on the past mix of sales and the Energy Department’s estimate of the elasticity of demand with respect to price for refrigerators, we expect that the average value of the $100 subsidy will be $85. We estimate that 70 percent of buyers would have purchased the Energy Star refrigerators even in the absence of the program, and therefore value the $100 price subsidy at $100. We estimate that the remaining 30 percent of buyers value the $100 subsidy at $50 on average.

The high average value of the subsidy for the two groups is good news in the sense that there is relatively little distortion in the efficiency of the market – most of the $100 transfer from the taxpayers is pure windfall to Energy Star buyers. But it is bad news in the sense that taxpayers are shelling out a lot to induce relatively little change in consumer behavior. The big question, though, is how the subsidy stacks up when the external environmental benefit is included in the calculation.

**COLORING REFRIGERATORS GREEN**

On average, a new Energy Star refrigerator uses about 425 kilowatt-hours of electricity a year. The typical refrigerator made between 1993 and 2000 used about 700 kilowatt-hours, while new ones that don’t meet the Energy Star standard use about 525 kilowatt-hours. So going greener saves between 100 and 275 kilowatt-hours per year. We assume that all retired units are of this older vintage, and that refrigerators have a useful life of 15 years.

Energy Star refrigerators sold to our first group of buyers – the ones who planned to buy energy-efficient refrigerators anyway – shouldn’t be counted as a benefit from the program.

Energy Star refrigerators sold to our second group of buyers – those who planned to buy efficient units later, but accelerated their
purchases to get the subsidy – reduce electricity consumption by 275 kilowatt-hours of electricity annually, provided they actually scrap the older units. If, however, they just move them to the basement and use them for extra capacity, they increase electricity consumption by 425 kilowatt-hours per year. The related total energy saving, of course, turns on how much sooner the purchases are made. We assume that the subsidy induces this group to buy two years sooner and that 44 percent of the older units remain in use during the two-year period, at which time they are junked. The 44 percent figure is based on recent studies in Vermont and California of what happens to old refrigerators when consumers move up to Energy Star units.

Our third group consists of buyers who opt for new Energy Star units instead of new, somewhat-less-efficient standard refrigerators. Within this group, those who do not change the timing of their purchases reduce energy use by a net 100 kilowatt-hours per year for 15 years. Those who do buy sooner (we assume two years sooner) and scrap their old units remove 275 kilowatt-hours per year for the first two years and 100 kilowatt-hours for the remaining 13 years. Those who keep their old refrigerators instead of junking them increase consumption by 425 kilowatt-hours for two years. (We assume that households do not replace their backup refrigerators with new units when the old ones die.)

Using the findings from a recent National Academy of Sciences report, we estimate that the monetary value of the environmental harm associated with one kilowatt-hour of electricity consumed averages about 4 cents. This includes damage from both local air pollutants and greenhouse gases. Since the measure of damage from conventional pollutants in the academy report excludes upstream (fuel production and distribution) effects, we have adjusted the costs upward by a penny per kilowatt-hour.

To estimate the average environmental benefit per subsidized refrigerator, we also need to know the proportion of households that come from each of our buyer groups. In the absence of a better number, we assume an equal share of purchases from each group whose purchase decisions are affected by the availability of the subsidy. These groups comprise 30 percent of total purchases under the program; the other 70 percent of purchases come from buyers who were planning to buy Energy Star refrigerators even without the subsidy offer. All told, then, we estimate that each $100 in subsidies yields $9 in net environmental benefits.

Our calculations, you will recall, suggest
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that the average economic loss – the difference between the cost of the subsidy to taxpayers and the subsidy’s value to buyers – is $15 per refrigerator. And since society gains $9 per refrigerator in benefits from reduced use of electricity, the net loss is $6 per refrigerator.

Now, compared to the CARS program, a societal loss of $6 on every $100 spent by Uncle Sam isn’t half-bad. But it should be no comfort to proponents of energy-efficiency subsidies. In essence, the taxpayers – really, future taxpayers because increases in federal spending are financed through borrowing – are putting $100 into the pot on behalf of society as a whole. Society gets back $9 in environmental benefits. People who buy refrigerators, on average, get $85 in value from the cash transfer. The other $6 is lost to everyone.

There are other factors to consider here. The environmental benefits are constant per refrigerator, but the loss to society varies with the size of the subsidy. Larger subsidies create larger losses per refrigerator because they induce consumers who value the new appliances less to buy them. Indeed, at a subsidy of just $30, we estimate that society would break even.

THE BIG PICTURE

Economists acknowledge that “externalities” – here, the environmental costs of burning fossil fuels – distort market outcomes, and that, in such cases, government intervention may increase the size of the economic pie. They acknowledge that during a recession, subsidies can stimulate total demand and increase economic output even if externalities are not the issue. But they also understand that these rationales for public spending invite abuse.

Start with the second issue, the use of subsidies as a means of stimulating total output. Incentives to buy specific products may increase aggregate demand (and output), but at the cost of distorting relative prices and reducing the total productive capacity of the economy. That’s why most economists much prefer to increase demand by easing credit or by handing out cash or through broad-based tax cuts. Note, too, that subsidies originally justified in macroeconomic terms have a way of outlasting the rationale. If CARS was so popular last year, why not try it again the next time Detroit feels the pinch of falling profits and demand?

By the same token, market externalities offer a rationale for intervention that is too often too hard to resist. Think, for example, of the large and growing list of subsidies and mandates for alternative fuels rationalized by concerns about greenhouse emission from fossil fuels. Few of these subsidies could survive an objective comparison of costs and benefits. And even when they are exposed as virtually without environmental value – as in the case of subsidies for corn-based ethanol production – the interests that profit from their existence keep them going and going and going. That’s why economists are open to the argument that government intervention in markets is sometimes needed to “get the prices right,” but are inclined to use taxes rather than subsidies to get the job done.

Subsidies in the name of virtue – reducing pollution, putting the unemployed back to work – are easy to sell in times of economic crisis. And maybe – just maybe – they can be justified in the name of creating jobs or offsetting market distortions. But the very fact that Washington never bothered with that analysis before committing funds to the CARS and Energy Star initiatives suggests how problematic they are. This way lies a future of markets run by politicians and political influence rather than consumers and their preferences – and a future of receding prospects for economic efficiency and growth.