

The Federal Role in Supporting Auto Sector Innovation

By Thomas Klier and Christopher Sands¹

Innovation is essential to the ability of U.S. automakers and their suppliers to build and sell their products in a highly competitive and global industry, especially at a time of heightened technological uncertainty. Innovation is also critical to the long-term health of the auto sector and the many Great Lakes communities it supports. Given the limitations of industry-supported research and development, federal policies and investments are needed to help inspire creative advancements that will ensure American cars and trucks are cleaner, more fuel efficient, and globally competitive in the decades to come.

America's Challenge

Innovation in the U.S. auto industry generally arises from one of four sources: (1) automotive assemblers (such as General Motors, Ford, and Toyota); (2) firms that supply the automotive industry with components and subsystems; (3) universities; and (4) public-private research consortiums, which aim to accelerate the development of technology to provide public benefits, often leveraging research conducted by U.S. national laboratories or the military.

Each of these routes to innovation has strengths and limitations. For example, firms in the industry tend to focus on the immediate needs of the market, i.e. how to build appealing and innovative vehicles that will sell in profitable quantities at a particular price point. This limits their propensity to invest in potentially game-changing technologies, which may or may not ultimately be successful.

At the same time, innovation activity undertaken in the private sector of the auto industry extends far beyond the automaker itself, as nearly three-fourths of the value of a vehicle is added by companies other than the automaker. This makes clear the need to coordinate efforts across a producer's supply chain. In fact, the innovative capability of a carmaker's supply chain has come to represent a crucial factor for success in the marketplace. This is especially important in light of the wide range of engine and transmission (also referred to as powertrain) technologies that are currently being pursued in the industry. Approaches range from improvements to the conventional internal combustion engine (powered by gasoline or diesel) all the way to complete electrification of vehicles.

Federal Policy Limitations

Government policies can help overcome some of the externalities associated with private sector innovation in the auto industry, and in the process realize public benefits, such as improved fuel efficiency, that are vital to national

competitiveness. But current federal policy and programs in several ways limit the ability to push technology innovations forward.

Policies to drive consumer demand for fuel-efficient vehicles are weak.

During the summer of 2008, U.S. gasoline prices peaked at just over \$4 per gallon nationally, capping a rising trend that started at the turn of the millennium—and making fuel efficiency a national concern. Similar trends have occurred numerous times during the past several decades. As gas prices fall, however, so too does demand for more fuel-efficient cars. While raising the gas tax, particularly when the economy is weak, is controversial, without such price signals consumers are unlikely to push car companies to consistently improve fuel efficiency.

New federal fuel efficiency standards may not be strict enough to spur the innovation needed to stay globally competitive.

In 2007 Congress passed the Energy Independence and Security Act, which mandated a substantial increase in fuel efficiency requirements for new vehicles. When fully implemented, the new requirements will represent a 40 percent increase in fuel efficiency from previous fuel economy standards.² That narrows, but doesn't close, the gap with fuel economy regulation by our major competitors, such as Western Europe and Japan.

The federal government has committed major resources towards improving the fuel efficiency of newly produced cars, but the scope of such funding is limited.

The Department of Energy is administering a \$25 billion Advanced Technology Vehicle Manufacturing Loan Program as well as \$2.8 billion of stimulus money directed to electrification and next generation battery programs.³ While substantial, this approach to raise fuel efficiency is targeting a specific technology, electrification, rather than casting a wider net.

Federally-funded programs don't sufficiently target the R&D capability of the supply base.

The U.S. Council for Automotive Research (USCAR) is an example of a public-private research partnership consortium. It was established in 1992 to promote long-term R&D collaboration by the Big Three automakers. USCAR provides a basic platform for several specific research collaborations and partnerships, including the U.S. Advanced Battery Consortium and U.S. Automotive Materials Partnership, among others. However, the supplier community plays only a subsidiary role in USCAR, as access to the latest federally-funded innovation often does not reach the supply base.

Federally-funded research consortia don't drive cutting-edge innovations.

Consortia such as USCAR can act as a drag on innovation, as risk-averse manufacturers tend to introduce innovation in production vehicles only if they can sell profitably.

A New Federal Approach

The federal government has played a role in shaping the auto industry for some time, beginning with vehicle safety and emission-control regulations during the 1960s, and the first CAFE (corporate average fuel economy) rules in the late 1970s.⁴ Together these policy efforts forced technological innovations on the industry, such as widespread application of seat belts, the introduction of the catalytic converter, and more fuel efficient engines.

New ideas are constantly needed to improve vehicle performance, passenger safety, fuel efficiency, and comfort. Such innovations draw upon dozens of industrial sectors, from steel and aluminum to glass, plastics, computer chips, software, telecommunications, and more. These improvements in federal policy suggested below are designed to strengthen the technology base of the auto industry and encourage R&D that is directed at commercial products and processes.

(1) The federal government should provide a better balance between supply and demand side policies. Technology-forcing programs can be characterized as supply side policies. To achieve widespread acceptance of fuel-saving technologies, there need to be incentives for the consumer to choose such technologies. Absent price signals that favor the use of fuel-efficient cars, applying supply-side policies by themselves runs the risk of ignoring consumer preferences.⁵ Yet a very large increase in the gasoline tax would be needed to increase overall fuel efficiency through consumer changes alone. Offering cash or tax incentives to consumers who purchase more fuel-efficient vehicles could complement changes to the gasoline tax.

(2) The federal government should support new research in fuel efficient technologies. Such research can be initiated through direct grants as well as collaborative efforts with the National Labs and federal agencies.⁶ However, the federal government shouldn't "pick" winning technologies. Rather, programs need to fund a variety of competing technologies by setting technology-neutral performance standards.

(3) The federal government should tap into the R&D capabilities of the industry's supply base. Unlike 30 years ago, when car producers were highly vertically integrated, it is now common practice for car companies to rely on their suppliers for technological innovations. In order to be successful, innovation policy needs to recognize such linkages by including the technological capability present in the industry's supply base.

(4) U.S. DOT should pre-test vehicle technologies at the prototype stage. To solve the problem of unknown regulatory risk that discourages manufacturers from introducing innovations in production vehicles, the U.S. Department of Transportation's (USDOT's) Research and Innovative Technology Administration (RITA) should host a vehicle research and testing facility for automotive

technologies, including subsystems, which are submitted by carmakers and suppliers at the prototype stage. Results would provide manufacturers and regulators with an early indication of the potential of new technologies, and accelerate the introduction of innovations in production vehicles.⁷

Conclusion

Automobiles are rather complex products. The challenge for innovation policy is to combine basic research with private sector innovation activity. Private sector efforts encompass a carmaker's entire supply chain. From the consumer perspective, most of the innovation affects technologies that are "hidden from view." Yet, due to the continued importance of individual transportation as well as the fact that automobiles tend to be produced near where they are sold, the auto sector represents an important "target" for innovation policy.

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² The standards will be phased in beginning with model year 2011 vehicles; they must be met by end of model year 2016. The Obama administration also instructed USEPA to regulate automobile emissions of greenhouse gases. See Taft Foster and Thomas Klier, "Raising automotive fuel efficiency" Chicago Fed Letter (266), September, 2009. Compliance with the new requirement will raise the price of vehicles due to additional costs incurred.

³ The Recovery Act money has all been awarded. Of the \$25 billion Advanced Technology Vehicle loan program just under \$9 billion have been awarded to date. Only one supplier-based program has been funded.

⁴ Tom McCarthy, *Auto Mania – Cars, Consumers, and the Environment* (New Haven: Yale University Press, 2007).

⁵ The initial impact of the first CAFE requirements from 1975, such as a substantial reduction in engine power, was quickly reversed once the price of gasoline fell back below 1975 levels (in real terms), starting in the mid-80s. See Thomas Klier and Joshua Linn, "The price of gasoline and new vehicle fuel economy: evidence from monthly sales data" (Forthcoming); AEJ-Policy and U.S. Environmental Protection Agency, "Light-duty automotive technology and fuel economy trends: 1975 through 2007," report No. EPA420-R-07-008 (2007). Regulation of motor vehicle fuel efficiency by the European and Japanese governments is generally considered to be quite effective. Yet, due to sizeable taxation of fuel, it plays out against a substantially higher retail price of gasoline.

⁶ Note that the existing USCAR program represents a transfer between federal agencies and national labs to the Detroit-based carmakers. In addition, the USDOE's Oak Ridge National Laboratory and Michigan's MEDC have recently launched a collaborative effort. The lab will open an office in Michigan and serve as a local resource for companies and the state. See Amy Lane, "Capitol Briefings: Science and energy lab to collaborate with MEDC" *Crain's Detroit Business*, February 7, 2010.

⁷ The Federal Highway Administration (FHWA) and the National Highway Traffic Safety Administration (NHTSA) as well as the U.S. Department of Transportation's University Transportation Centers (UTCs) network could participate in prototype testing.