



THE ENERGY PARADOX AND THE ADOPTION OF ENERGY-SAVING TECHNOLOGIES IN THE TRUCKING INDUSTRY

The Environmental Protection Agency (EPA) and the National Highway Transportation Safety Administration (NHTSA) recently proposed a rule mandating the adoption of energy-efficiency devices on heavy-duty trucks in order to reduce greenhouse gas emissions. The benefit-cost analyses supporting this proposed rule report an energy paradox among firms in competitive markets: the firms would supposedly benefit from mandates to increase the use of energy-saving technologies because they are failing to adopt technologies that would earn them high returns on the investments. This paradox is not consistent with how neoclassical economic theory models the way private firms operate in competitive markets. The EPA suggests several possible explanations for why owners of trailers pulled by tractors belonging to others would underinvest in energy-saving technologies. It relies in particular on the hypothesis that trailer owners incur the costs of these technologies while tractor owners take home the benefits.

A new study for the Mercatus Center at George Mason University tests this hypothesis. The study finds data consistent with the predictions of conventional economic models: there is no evidence that different ownership of tractors and trailers is associated with reduced use of energy-saving technologies on trailers.

To read the study in its entirety and learn more about its authors, Art Fraas, Randall Lutter, Zachary Porter, and Alexander Wallace, see [“The Energy Paradox and the Adoption of Energy-Saving Technologies in the Trucking Industry.”](#)

ENERGY-SAVING TECHNOLOGIES AND THE “REGULATORY PROBLEM”

There are two main types of energy-efficient technologies that can be implemented on tractor-trailers:

- **Aerodynamic devices** reduce drag around and behind trailers, which accounts for a significant portion of energy losses at higher speeds. For example, side skirts reduce the

For more information, contact
Kate De Lanoy, 703-993-9677, kdelanoy@mercatus.gmu.edu
Mercatus Center at George Mason University
3434 Washington Boulevard, 4th Floor, Arlington, VA 22201

open area between the floor of the trailer and the road, and are the most widely adopted aerodynamic device for trailers. Estimates of fuel savings range from 3 to 7 percent at highway speed, while the price of the skirts ranges from \$700 to \$1,100.

- **Low rolling resistance (LRR) tires** have lower internal friction than standard tires. (This friction contributes to more than 40 percent of total tire-related energy loss for tractor-trailers.) Agencies estimate that the use of LRR tires will yield a 1 to 3 percent reduction in fuel consumption at 65 mph, while there is little cost difference between LRR tires and conventional tires. However, some in the industry question the effectiveness and lifespan of LRR tires compared to conventional tires.

The EPA and the NHTSA report that while saving fuel costs should be a priority for for-profit businesses that use tractor-trailers, adoption of fuel-efficient technologies will be substantially lower without mandates from the government. The agencies argue that this is owing to imperfect information in the market, uncertainty regarding fuel cost savings, transaction costs, and principal-agent split incentives.

In particular, regarding principal-agent issues, the agencies conjecture that tractor owners (trucking firms) that pull trailers owned by other businesses (shippers) would reap the benefits of fuel savings while trailer owners would incur the costs of adopting the new technologies without reaping any of the benefits.

DATA AND EMPIRICAL METHODOLOGY

Data on heavy-duty trucks are used to test assumptions underlying the EPA and the NHTSA's claim that for-profit trucking firms are failing to adopt energy-saving technologies that would save them money. The data were collected from roadside observations of trucks operating on the highway as well as photographs and notes at interstate rest stops along three routes. The collected data are compared to data from a similar 2013 study by the National Research Council.

KEY FINDINGS

A statistical analysis of the use of energy-saving devices on heavy-duty truck trailers indicates patterns of use consistent with conventional cost-minimizing behavior and provides no evidence of departures from that behavior, as claimed by the EPA and the NHTSA.

Trailer Skirts

A survey of I-81 in Pennsylvania, West Virginia, and Virginia and I-95 in Virginia shows that the incidence of trailer skirts on long-distance routes has increased in the two years since the National Research Council study was conducted.

- The use of trailer skirts has jumped from 25.7 percent to 40 percent over two years—a statistically significant change. The increase in the use of trailer skirts is highest on the long-distance routes where the benefits are likely to be greatest.

- Long-haul, interstate trucking companies seem to be more likely to purchase trailer skirts than regional companies, and trucking firms are more likely to dispatch trailers with skirts on long-haul routes. This is consistent with cost-minimizing industry behavior.

Low Rolling Resistance Tires

Based on data collected about the two outboard tires visible from one side of the vehicle for 71 heavy-duty trailers, many trucks are not using LRR trailer tires for their trailer axles.

- Instead, nearly half of the trailers observed were using some combination of LRR tires certified for the tractor (but not for the trailer) and conventional tires.
- 10 percent of the trailers had two LRR tractor tires, and 40 percent had one LRR tractor tire and also either a conventional tire or an LRR trailer tire.

Use of Energy-Saving Technologies on Trailers

The use of an energy-saving device represents a firm's decision to economize on fuel costs. Empirical tests determine whether a difference in the ownership of the tractor and the trailer is correlated with a reduction in the use of skirts, taking into consideration a variety of other factors that are likely to affect skirt use.

- These factors include the size of the trucking firm's fleet and intensity with which the trucks are used, the proximity of the firm's headquarters to California, and regulatory infractions the firm has committed relating to hours of service and vehicle maintenance.
- There is no evidence that different incentives for tractor owners and trailer owners reduces the use of skirts.

CONCLUSION

Federal regulatory agencies are issuing new regulations claiming that they help competitive industries, based on assumptions that appear incompatible with neoclassical economic analysis and have little or no empirical support. The validity of these assumptions should be tested. Regulatory agencies' claims of large benefits to private firms from requirements that they adopt certain technologies should receive special scrutiny. The EPA and the NHTSA should collect data to estimate the actual effectiveness of energy-saving technologies during commercial operations.