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# RECENT REDUCTIONS IN CARBON DIOXIDE EMISSIONS FROM NEW VEHICLES

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FROM NEW VEHICLES

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16. Abstract <p>This study examined the effects of recent changes in the fuel economy of purchased new vehicles and the amount of driving on carbon dioxide emissions in the U.S. The analysis used monthly data from October 2007 through April 2009. The data are presented normalized to the situation in October 2007. The results indicate that, as a consequence of the improved fuel economy of purchased new vehicles and the decrease in distance driven, the carbon dioxide emissions per driver from purchased new vehicles were lower in each month when compared to October 2007. The greatest reduction in emissions—12%—occurred in July 2008. The reduction in April 2009 (the latest month examined) was 8%.</p>					
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## Introduction

Recent economic upheavals have influenced the fuel economy of new vehicles that Americans purchase (Sivak and Schoettle, 2009) and how much they drive (Federal Highway Administration, 2009). This study was designed to examine the combined effect of these two trends on carbon dioxide emissions from new vehicles.

The calculations of the changes in emissions per driver were performed for purchased new vehicles only. Furthermore, it was assumed that the known overall changes in the amount of driving were equally applicable to the subset of drivers that purchased new vehicles.

The analysis used monthly data from October 2007 (the conventional starting month of the 2008 model year) through April 2009 (the latest month for which the data are available). The data are presented normalized to the situation in October 2007.

### Fuel economy of purchased new vehicles

In a previous study (Sivak and Schoettle, 2009), we calculated the sales-weighted average fuel economy of purchased new vehicles for individual months. This average was derived from the monthly sales of individual models (Automotive News, 2009) and the EPA combined fuel-economy ratings for the respective models (Environmental Protection Agency, 2008; 2009). All vehicles purchased in October 2007 through September 2008 were assumed to be model year 2008, while all those purchased in October 2008 through April 2009 were assumed to be model year 2009. (The fuel-economy ratings were available for 99.8% of vehicles purchased.)

The trend of the inverse of fuel economy of purchased new vehicles, normalized to October 2007, is shown in Figure 1. Beginning in January 2008, fuel economy in each month was better than in the comparison month of October 2007, reaching the best level (a 7% improvement) in May 2008. The fuel economy in April 2009 (the latest month examined) showed an improvement of 5%.

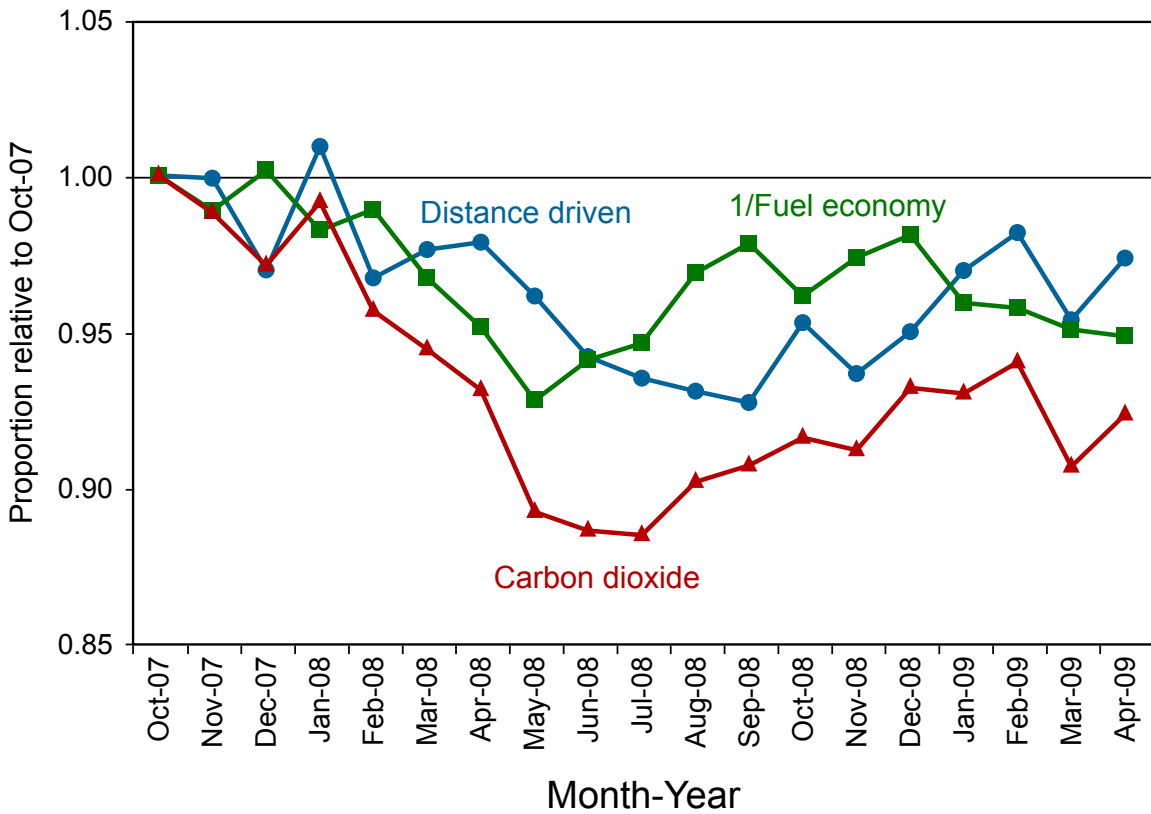


Figure 1. Inverse of fuel economy of purchased new vehicles, distance driven, and carbon dioxide emissions relative to those in October 2007.

## Distance driven

The monthly raw distances driven (Federal Highway Administration, 2009) were adjusted to take into account the seasonal variations in driving (e.g., in the U.S., more driving is done in the summer than in the winter), the varying number of days in a month, and the increasing number of drivers during the period examined (due to population growth). The seasonal variations and the number of days in the month were adjusted by using a trend in distance driven that was calculated for this study using monthly data for a 13-year period from 1994 through 2006 (Federal Highway Administration, 2009). The increasing number of drivers was adjusted by using a monthly compound increase of 0.091%, equivalent to the current annual increase of 1.1% in the number of licensed drivers (Federal Highway Administration, 2008).

The adjusted distances driven, normalized to October 2007, are included in Figure 1. Beginning in February 2008, the distance driven in each month was lower than in the comparison month of October 2007, reaching the lowest level (a 7% reduction) in September 2008. The distance driven in April 2009 showed a reduction of 3%.

## Carbon dioxide emissions

Normalized changes in carbon dioxide emissions (equivalent to normalized changes in fuel consumed) were derived by cross-multiplying the changes in the inverse of fuel economy and distance driven. The results (included in Figure 1) show that, compared to October 2007, the emissions decreased every month. The greatest reduction—12%—was achieved in July 2008. The reduction in April 2009 was 8%.



## Conclusions

American drivers have recently decreased their amount of driving and purchased vehicles with better fuel economy. By itself, the decrease in the amount of driving for the entire fleet of vehicles has resulted in a 3% reduction in carbon dioxide emissions per driver in April 2009 (the latest month examined) when compared to October 2007. Furthermore, because buyers of new vehicles have tended to purchase more fuel-efficient vehicles, their contribution to the decrease in carbon dioxide emissions was even greater. For example, in April 2009, the proportional reduction in emissions for these drivers was 8% when compared to October 2007.

## References

- Automotive News. (2009). *Automotive News data center*. Retrieved June 22, 2009 from <http://www.autonews.com/section/DATA>.
- Environmental Protection Agency. (2008). *EPA fuel economy datafile, 2008*. Retrieved May 20, 2009 from <http://www.fueleconomy.gov/feg/epadata/08data.zip>.
- Environmental Protection Agency. (2009). *EPA fuel economy datafile, 2009*. Retrieved May 20, 2009 from <http://www.fueleconomy.gov/feg/epadata/09data.zip>.
- Federal Highway Administration. (2008) *Highway statistics 2006*. Retrieved June 20, 2009 from <http://www.fhwa.dot.gov/policy/ohim/hs06/index.htm>.
- Federal Highway Administration. (2009). *Traffic volume trends*. Retrieved June 20, 2009 from <http://www.fhwa.dot.gov/ohim/tvtw/tvtpage.cfm>.
- Sivak, M. and Schoettle, B. (2009). *Economic indicators as predictors of the number and fuel economy of purchased new vehicles* (Technical Report No. UMTRI-2009-27). Ann Arbor: The University of Michigan Transportation Research Institute.