

# Comments on “Oil, Automobiles, and the US Economy; How Much Have Things Really Changed?”, by V. Ramey and D. Vine.

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This paper focuses on the following question. Have the impacts of oil shocks on the aggregate economy, and on the motor vehicle industry in particular, changed over time? The basic difference between this paper and past work on this topic is that the current authors use measures of oil-price shocks that include the effects on non-price rationing. Using these variables they conclude that “once the cost of queuing are added to the prices paid for gasoline, ...., real output has been as sensitive to oil price shocks since the mid 1980’s as it had been in the 1970’s...” and “the primary channels through which oil prices directly affect demand for motor vehicles have not weakened over time.”

I will comment on the different sections of the paper in turn. My comments are mostly questions designed to push the analysis further, together with a few caveats on the purview of their results.

**Initial vector autoregressions (VAR’s).** Their conclusions regarding the impacts of oil price shocks on the aggregate economy are based on comparing different VARs. They are all on monthly data with six lags and in-

clude, in addition to the price variable; the CPI, the GDP deflator, nominal wages of private production workers, industrial production, civilian hours, and the federal funds rate. For price one subset uses oil or gas price series taken from prior research, while the other uses either an adjusted price series (adjusted for the waiting time when there are price controls) or consumer sentiment data for oil and gas prices (explained in more detail below). The results that use the price series from previous research show differences in response of production and hours across the two periods. The results with their adjusted price series indicated that production and hours response to the new price variables are the same or larger now than they were in 70's and 80's. However the impact of the new price variables on the CPI is still smaller in the more recent period.

There is a statistical sense in which their new findings are not surprising. The production and hours variables used in their VAR's are essentially the same as those used in the prior analysis, but in the new price series the magnitude of the gas price change in the early period has increased due to their adjustments. As a result, the impact of the price change in the early period must decrease. As for the CPI, as I understand it the response of the monetary authorities to the price hike in 1973 was expansionary, while the response in the later years was not.

Are the economics puzzling? There is at least one sense in which they are. The early price changes were preceded by a long period of real oil price stability. The inflation adjusted oil prices in 1951 was \$23.13 per bbl. and in 1972 it was \$20.66. Moreover the lowest price in the intervening years was \$18.93 while the highest was \$24.20<sup>1</sup>. So prior to 1973 both consumers and producers probably expected low and very stable gas prices over the relevant future. 1973 clearly changed this perception. It became evident that gas price could increase sharply and that the increase need not be predictable from trends in the macro-economy (as OPEC demonstrated). Moreover by

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<sup>1</sup>See <http://inflationdata.com/inflation/inflationrate/historicaloilpricetable.asp>.

the mid 1980's it was obvious that the most dramatic change in the gas price series after 1973 was the *increase in the volatility*, not the increase in the level, of prices.

So perhaps the first question we should ask ourselves are what are the likely impacts of the changes in the perceptions of future prices and how are those impacts likely to feed through to the motor vehicle industry and the economy more generally? When perceptions (of the level and volatility) of future prices change, we might think there would be changes in investment policies; in the car companies, and in other energy intensive parts of the economy (airlines and aircraft production, electric utility generation, ....), and by consumers. The impacts of these investments would likely take several years (more if they required new research outcomes), but should eventually change the nature of responses to future price movements (both by firms and by consumers through their purchases of durable goods).

The six month limit to the lag structure explains why we don't see the effect of these investments in the earlier period. However, I would have expected to see the effects of a changed investment policy built into the way consumers and firms respond to oil price shocks by the later period, and they don't seem to find it in the aggregate data. Of course there are lots of factors that affect data at this level of aggregation, and the effects I am talking about might well have been countered by other processes.

**The Motor Vehicle Industry.** Next we have an analysis of the impact of oil and gas prices on the motor vehicle industry "which is considered the most important channel through which oil shocks effect the economy". They begin by noting that though the motor vehicle industry does account for a smaller fraction of measured output in the later period than in the early period, its share only falls 10 to 15% (depending on which measures one uses). I would argue that is not an insignificant fall, but the authors are clearly correct in thinking that the major changes in the automobile industry

over this time period are not in its contribution to output. Rather the major changes are in (i) the firms producing that output and in (ii) the type of product produced. Honda, Hyundai, Mazda, Mercedes, Nissan, Subaru, and Toyota all started manufacturing facilities in the US after 1970, some in alliance with one of the “big three” U.S. companies. This change in the company composition of output was accompanied by a change in the location of motor vehicle production, which in turn changed the lives of a large fraction of our workforce. I understand that this is not the focus of the paper, but the change in company composition of output has had important effects on the economy.

The paper looks at the response of consumer’s investments in motor vehicles to the gas price increases. An increase in the price of gas should have (interrelated) impacts on (i) the quantity of vehicles purchased (ii) the types of vehicles purchased, and on (iii) the amount of driving done with the current fleet. They provide a series of graphs which are informative in these respects, and I will go over (and add a bit to) a few of their results.

As they note, we might expect the price of gas to be more directly related to “car driving” than “car buying” conditions. Figure 4 graphs vehicle distance traveled per household over time. It falls after 1973 and again after 1978. The surprise is the continual upward trend in driving thereafter (despite the fluctuations in gas prices). In 2007 the real price of gas is 10-20% higher than it was in 1980, yet the miles driven are almost 50% higher. So gas prices are not terrifically successful in predicting miles driven, and even if they were the relationship of miles driven to economy wide production is not obvious.

More closely related to the impact of the motor vehicle industry on the rest of the economy is motor vehicle purchases. In particular I want to look at how the interaction between consumer and producer investment incentives affected the types of cars purchased. To do so I look at how the fuel efficiency of the new car sales responded to the gas price changes<sup>2</sup>.

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<sup>2</sup>The authors do look at the fuel efficiency of the stock of vehicles. However, the response of the stock of

The average miles per gallon (mpg) of the new car fleet actually *fell* after the gas price increase in 1973; from 16.2 mpg in 1972 to 15.7 mpg in 1974. The average mpg of the new car fleet did begin to rise thereafter, but that did not start happening until 1976. Real gas prices were falling between 1974 and 1976, but were still higher in 1976 than in 1972.

We now move to 1978. The response of the average mpg of the new car fleet to the 1978 gas price shock was *dramatically different*. The average mpg of the new car fleet in 1977 was 19.5 but by 1981 it had increased by over 20%, to 23.7. It then goes up slowly until just over 27 in 1990. This despite the fact that the real price of gas fell rather dramatically during those ten years. The average mpg does fall slightly between 1990 and 2000 and then rise slightly after 2005, but none of the changes post 1990 are nearly as dramatic as those between 1972 and 1982.

There are at least two ways consumers can modify their auto purchasing behavior when either the gas price rises, or there is a perception that future gas prices are more volatile. One is to delay purchasing. The other is to purchase a car with higher mpg. The car models available in 1973 were limited in their mpg rating; the consumer who wanted a family car simply did not have the option of purchasing one with a high mpg. So if you did buy a family car you bought a low mpg car. The only real response to the gas price possible was to not buy a car, and this response was primarily chosen by low income people who bought smaller cars with higher mpg. Hence, the fall in the average mpg of the new car fleet.

In the years between 1973 and 1978 both (i) U.S. producers invested in high mpg models, and (ii) foreign producers invested in the infrastructure investments required to market their high mpg cars in the U.S. (dealerships, repair facilities,...). These two processes resulted in significant changes in the range of mpg available for different types of cars, and by 1978 the choice set

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vehicles will lag the response of the new car fleet, and it is new car sales that have the biggest direct effect on the economy.

facing consumers had changed rather dramatically. When the 1978 price rise occurred the very low income people continued to substitute out, but now the somewhat higher income people could purchase family cars with higher mpg, and they did. This also explains part of the continual increase in miles driven in the face of rising gas prices; the cost of driving the extra miles was smaller in the later period.

Conditions in the car market did change over time in a way that changed how consumers purchasing decisions responded to gas price changes, and in a way that helps explain the relationship of driving behavior to gas prices. There is a question of precisely how the impacts of those investments filter through to aggregate data as the investments and their payoffs take time. It is clear, however, that the change did have significant impacts in the way we might analyze other policy scenarios (think carbon taxes and carbon emissions).

My guess is similar responses happened in other industries. That is the increments in capital stock should have been designed in a way which paid more attention to energy prices; in particular given the volatility in energy prices, it should have been designed to accommodate variance in energy prices. If I had to guess where I would see this change in response most clearly, I would expect to see it in productivity figures.

Of course productivity also varies with the business cycle, and the two impacts might be hard to separate out in post 1972 data. But there were at least two recessions between 1950 and 1972 that had nothing to do with energy prices, and it would be interesting to compare the responses of the auto industry, and other energy intensive industries, to those recessions and to their responses to the recessions that came after the gas price hikes. Another comparison that might help here is a comparison of the effect of gas prices on auto demand, and on general demand, in the U.S. to those effects in Great Britain. Presumably gas prices went up worldwide. However, Great Britain was an exporter of gas by the mid 70's, so the increase in the price of gas

should have been associated with improved economic conditions there (or at least not a noticeable decline). Thus the comparison might throw light on whether the effect of gas prices on auto demand is through a decrease in real income, or through an increase in the relative price of driving. It also might let us see whether the effect of auto demand on macro economic activity comes primarily through autos per se, or through the effects of a contemporaneous increase of gas prices on “consumer anxiety”, a topic I now turn to.

**The use of consumer sentiment data.** The authors show that recent increases in gasoline prices seem to have caused just as much “anxiety” in consumers now as we observed 30 years ago. The data here is very interesting. Not only does the anxiety variable track the gas price increases amazingly well, it also registers increases in the later period of equal magnitude to those in the earlier period (and the earlier period was accompanied by lines at the gas stations and a war in the mid-east). Moreover “the relationships between consumer perceptions ... and real activity, appear more precisely estimated than the relationship between published fuel prices and real activity”.

The anxiety variable is from the Michigan Survey of Consumer Attitudes, and it tracks the portion of respondents who cite the price of gasoline or fuel shortages as the reason car buying conditions are poor. An additional question asked is whether the next twelve months is a good time or a bad time to buy a car. I would have liked to have seen the two questions analyzed together, as that would give us a direct link between “anxiety” about gas prices and consumer car purchasing decisions. Indeed it would have been interesting to put the anxiety question together with other questions about consumer purchasing behavior, as that would have been a fairly direct link between anxiety about gas prices and consumer purchasing patterns more generally.

**Volatility in Gas Prices and Its Effects on Autos.** The volatility in the share of motor vehicle output and the way it tracks recessions and gas price increases is striking (despite the fact that shares have not changed much). The paper uses the variance in days supply across motor vehicle segments to measure mismatches across segments between capacity and demand. The argument is that much of the variance in days supply is caused by (presumably unexpected) movements to segment demand, and that is caused by (presumably unexpected) shifts in gas prices.

Figure 11, which provides the cross segment variance in days supply, illustrates two facts:

- there was a marked increase in the variance in days supply in periods when the gas price is rising,
- there was no increase in the variance of days supply when gas price is falling (even when it fell rather sharply).

If missed segment demand predictions due to unexpected changes in gas prices was causing the variance in days supply, we should probably expect the variance in days supply to respond to unexpected movements in price in either direction. One could argue that the 1973 and 1978 oil price shocks were caused by unpredictable political factors, and that the fall in prices thereafter was predictable. However the increase in gas and oil prices in the later period was largely a result of a continual steady growth in demand from India and China, so if seemingly predictable growth resulted in no increase in variance when prices were falling, should it not also have resulted in no increase in the variance in days supply in the later period when prices were known to be rising (and the variance did increase in the later period)?

Of course optimal days supply could respond differently to upward and downward shocks, or it could change with levels of demand for segments, or it could vary by segment for a given level of demand. The lesson is probably that before we use this variable too intensively we might want to look more

deeply into what determines its value. I think it is clear that the series of adjustments that must be made to accommodate segment demand changes are costly (I am sure you would see that in profits) and can cause changes in capacity utilization. So I don't doubt that there is an element of truth in the argument put forward here. However to determine the timing and magnitude of the effect we have to separate out perceptions from realizations and consider all the options for changing output available to management.

**Conclusion.** I think there is lots left to be done here. The response of the economy, and in particular of the motor vehicle industry, to gas price changes is not only important for understanding the behavior of macro aggregates, it is also important to understanding the likely implications of various policy scenarios (the carbon tax, exchange rate and tariff changes) and the political economy determining which of the possible policy issues will be implemented. What I have tried to make clear is that to answer such questions we need a deeper look into the institutional details of the important energy using industries and the opportunities available to them for responding to energy price changes.