International Journal of Research
Available at https://edupediapublications.org/journals
p-ISSN: 2348-6848
e-ISSN: 2348-795X
Volume 03 Issue 18
December 2016

Impact of Oil rates fluctuation on sales of automobile industry

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Abstract:
This study looks over the ways in which the transport of goods is influenced by significant variations in oil prices and focuses on carrier's responses in the different transport sectors. It investigates the relations between oil prices and the Automobile sector, by taking into account the evidence of the impact of recent price hikes on transport businesses and their response. Indeed, the spike in oil prices in the first half has been taken as an opportunity to carry out an evidence-based analysis of the transport sectors' reactions.

Introduction:

Transport is not only a major consumer of energy; it is in particular a consumer of fossil fuels. This reflects the lack of real alternatives to oil-based energy in the transport sector, because: (i) biofuels are currently used in the road sector mainly, and in Europe they are still characterised by high production cost and need significant availability of arable land to be produced at large scale; (ii) plug-in electric options are still facing technological barriers in terms of the size and cost of the batteries; (iii) hydrogen technologies are expected to enter the transport market only in the long term.

It is widely believed that one of the key channels by which unanticipated energy price changes affect real economic activity is through the effect on the demand for energy-intensive durable goods such as automobiles. Indeed, casual evidence suggests a strong negative association between both the quantity and fuel economy of automobiles sold and the price of gasoline. The existence of a causal link from fuel prices to automobile demand is central to theoretical models of the impact of oil price °uctuations on the real economy. The chief propagation mechanism in the model is that changes in the price of oil affect the demand for energy-intensive durable goods such as automobiles. Any change in the demand for such goods necessitates a reallocation of labor across sectors. To the extent to which labor is imperfectly mobile, changes in the price of energy can result in sustained unemployment and low real activity if the dollar share of products whose use depends critically on energy is large and the effect of changes in energy prices on demand for such goods is strong. Notwithstanding the importance of this link for theoretical models, with the exception of some preliminary evidence by Kahn (1986), there has been no systematic empirical investigation of the quantitative importance of this link at the micro level.

In this paper, we will employ a unique data set to characterize the quantitative effects of unanticipated changes in the real price of gasoline on used automobile prices. Under the assumption that the market quantity of used automobile services is fixed and that the forces underlying demand for new and used automobiles are sufficiently similar, our empirical results on the extent of price adjustment of used cars will provide an upper bound on the strength of the effect of changes in the real price of gasoline on the demand for automobiles in general. We postulate a structural equilibrium model that treats automobiles as assets whose prices must adjust in response to unanticipated shocks so as to equate rates of return. Unexpected changes in the real price of gasoline alter expected service flows from owning a car in the model, thus necessitating a change in automobile prices. The model predicts that positive shocks to the price of gasoline should depress the price of an automobile proportionately to the change in expected lifetime operating expenses resulting from the increased cost of gasoline. This implies that the relative price of fuel efficient cars to gas guzzlers" should increase following a positive fuel price shock. The model also implies that demand for automobiles will fall across the board, causing a reallocation of resources across sectors, as in Hamilton (1988). The objective of our paper is the quantify these effects.

The oil is a product the prices of which will impact almost all sectors and industries. It has been noticed that oil prices have positive, as well as negative relation with some industries. The automotive industry is the industry that is always in the direct effect of the oil prices. The automobile industry is a term that covers a wide range of companies and organizations involved in the design, development, manufacture, marketing, and selling of motor vehicles, towed

vehicles, motorcycles and mopeds. It is one of the world's most important economic sectors by revenue.

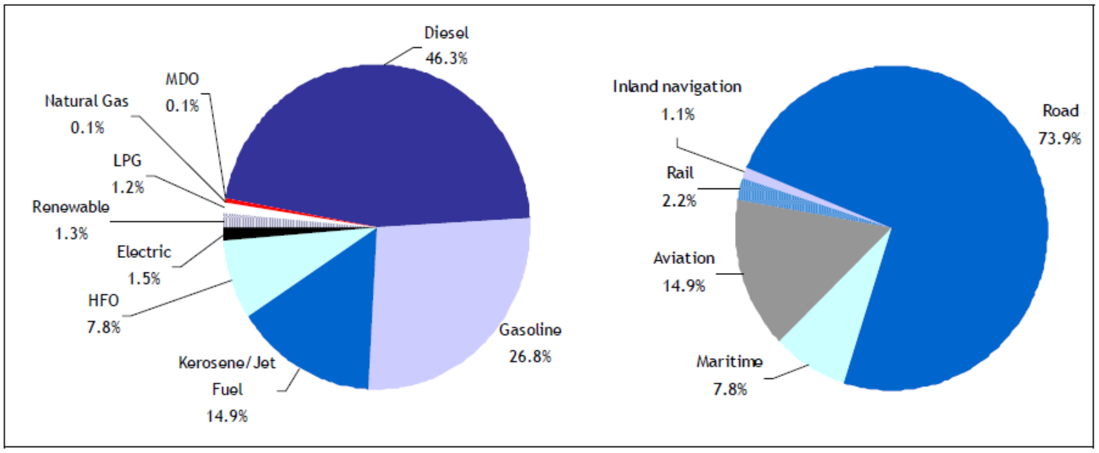

Figure 1: Transport energy demand by source

In the baseline specification of the structural equilibrium model, we postulate that agents treat the most recent value of the price of fuel as the best predictor of the future. Estimation results for the baseline regression specification are grossly inconsistent with this assumption. In particular, we find striking evidence that car prices are unresponsive to unanticipated fuel price changes, with no evidence of sizeable relative price adjustments between fuel efficient and \gas guzzling" autos. This finding is extremely robust to alternative assumptions concerning the life expectancy of autos, discounting of the future, expected total usage, and alternative linear models of expectations formation.

Energy efficiency

Transport energy consumption is driven by the size of transport activities, the market shares of transport modes and their energy efficiency. Energy use and transport demand figures are here combined so to calculate the energy intensity of each mode of transport (e.g. consumption per unit of traffic performed). In transport activity data collected in pkm and tkm are transformed in one single traffic unit to present the change in activity since 1990 and the relative contribution from each mode to the total activity performed. Apart from the transport of goods, transport on inland waterways and lakes also includes the transport of passengers. Passenger transport data (i.e. pkm) are not available from the Member States, so that a consistent single traffic unit to be compared with total energy consumption cannot be derived. Consistently, it does not include calculations of energy efficiency for transport on inland waterways. Since 1990, road transport has increased transport activity by 61% but, in parallel, energy consumption has only grown by 29%. Consequently, burned fuel per single traffic unit passed from 0.145 kilograms of oil equivalent (kgoe) in 1990 to 0.116 kgoe. This means that road transport has improved its efficiency by 20%, as a result of technological development and the voluntary agreement within the car industry to reduce CO2 emissions from new passenger cars. Only minor improvements may be attributed to road freight transport.

Comparable progress has been made by aviation, partially thanks to both the renewal of the fleet and higher occupancy factors, significantly influenced by the entrance of new carriers in the market. Given the substantial amount of noise likely present in the monthly series for gasoline prices, perhaps it is not surprising that a simple random walk model of gasoline price expectations pro-duces counter-intuitive results. A natural conjecture is that agents intentionally ignore some of the most recent information concerning gasoline prices when forming expectations of the future as a means of filtering signal from noise, a notion consistent with work by Bernanke (1983).

As such, we allow for several deviations from the baseline specification in which agents fail to continuously update their information concerning gasoline prices. This may take the form of a delayed adjustment or of using averages of past gasoline prices to form expectations of the future. While such specifications do lead to estimated response coefficients larger in magnitude than in the baseline case, the response is still far smaller than that predicted by the theoretical model. An alternative hypothesis is that positive fuel prices changes have a stronger effect on auto-mobile prices than do decreases. This asymmetry hypothesis appeals to the psychological notion that individuals may be acutely aware of events (such as increases in fuel prices) which adversely affect them. The study find broad empirical support for asymmetric specifications. In particular, the responses of automobile prices to positive changes in the real price of fuel are far greater in magnitude than in the baseline case, whereas decreases in the price of fuel have little or no effect on prices.

The study thus conclude that the effect of changes in the real price of gasoline on the demand for automobiles is highly asymmetric, with increases in gasoline prices mattering a great deal more than decreases. That the effect of higher gasoline prices on the demand for automobiles appears asymmetric is also consistent with evidence that the reduced form relationship between crude oil prices and real economic activity may be non-linear.

Problem Statement:

The study will cover the fluctuation in the oil prices and also simantanously will see the changes in the automobile industry. The study will be limited to OPEC and some selected automobile industries data.

Oil price trends

The price of crude oil is set by the supply and demand conditions in the global market overall, and, more particularly, in the main refining centres: Singapore, Northwest Europe, and the US Gulf Coast. On a pre-tax level, crude oil prices are the most important determinant of petroleum product prices, and are often the most important factor in price changes as well. After four years of a rising trend, oil prices reached a peak in July 2015 and then fell below 50 US$/barrel by the end of 2015. This is mainly due to the world financial crises and economic stagnation, which have contributed to pushing down energy consumption, as well as to short-term market speculative movements. Nevertheless, the low oil price might be short-lived as affirmed by many analysts including the International Energy Agency (IEA), which, in its World Energy Outlook, expects oil to trade at an average of more than 100 US$ per barrel between now and 2015 as supply shortages become a reality. The scarcity of energy supplies and the concept of a peak in oil production is being widely accepted by governments and organisations, such that even the IEA has stated in its World Energy Outlook 2015: "*While market imbalances could temporarily cause prices to fall back, it is becoming increasingly apparent that the era of cheap oil is over*". The oil price increase recorded between 2010 and July 2015 has reflected the boosting of demand from fast-growing economies like China and India, as well as supply shortages originating from geopolitical tensions and short-term market speculative movements.

Besides this, the reduction of oil production from OECD countries, associated with political instability in the Gulf Region, Nigeria, and Venezuela have contributed to higher oil prices too. Furthermore, major oil exporting countries have experienced strong economic growth, and at the same time they have subsidised their local oil demand to such an extent that the available oil exported to the world market has been reduced by the growth of domestic demand. All these developments have strongly driven up oil prices since 2010. The prices for natural gas have followed, owing to the price adjustment clauses (e.g. indexation to the oil price) that are part of long-term supply contracts for natural gas.

Research Methodology:

The secondary data source will be used for the study from Jan 1st 2010 to December 31st, 2015. The data for oil prices will be taken from OPEC and the

The following methodology will be used for calculation purposes:

- Arithmetic mean (X_1, X_2+…..X_n are the given N observations arithmetic mean, then X= X_1+X_2+….X_n/N)
- Return: (Current Price-Previous Price/Previous Price)100
- Variance
- Standard Deviation
- Correlation

Microsoft Excel will be used to facilitate calculations and also drawing of graphs.

The study will help in understanding the relation between changes in the oil price and the sales of automobile industry.

IMPACT OF LOWER FUEL RATES:

The fall in oil prices comes at a good time for the automotive industry. Global light vehicle sales recovered nicely from the 2010 recession with China's fast growing market providing much of the growth. However, global sales show little improvement over the last year due to a moderating China vehicle market, a weak European recovery, and economic troubles in Eastern Europe and South America. In this environment, lower oil prices will help drive vehicle sales through stronger economic growth for most countries, and by lowering operating costs, making personal transportation more affordable for all consumers.

The light vehicle market already had a strong growth outlook with IHS Automotive forecasting over 760 million sales between 2014 and 2021, a 33% increase over the previous eight year period, and lower oil prices will contribute to even more upside potential. The direct impact of low oil prices alone on vehicle purchases is difficult to quantify, but IHS Automotive estimates sales could rise an additional 5-7 million units over the forecast horizon. The largest beneficiaries will likely be the US market where lower gas prices will improve consumer confidence quickly, and developing markets like India and ASEAN where lower ownership costs will bring new buyers. However, low oil prices may also lead to government changes in fuel subsidy and tax policies in many countries, so cost savings may not reach consumers fully.

The largest impact from low oil will likely be on the types of vehicles purchased, and the automotive industry may need adjust accordingly. In recent years, many countries have implemented policies to direct consumers toward more fuel efficient vehicles in order to address pollution concerns and reduce dependence on imported oil. Manufacturers, assuming stronger demand for improved fuel efficiency as a result of these policies, invested heavily in engine and transmission technologies, and have created many product options, offered at a price premium, that improve fuel economy and lower carbon emissions. The expectation was that consumers would invest in these technologies because the higher fuel economy would result in lower operating costs. However, lower gasoline prices change the return on investment calculation for consumers dramatically, and with oil prices now falling, demand for these technologies will likely fall as well. Lower fuel prices raise the consumer's payback period – the time needed to earn back the investment in the fuel saving technology – and many consumers will determine the added cost is not worth it. As an example, the total annual operating cost as gasoline prices change for a typical mid-sized car, with 24 miles per gallon fuel economy, being driven 12,000 and 20,000 miles per year. As gas prices fall, annual operating costs also fall. Car buyers, who are assumed to be "rational", will calculate their own usage/cost relationship to determine whether a technology investment is warranted.

The prospective car buyer's investment calculation will be based on many factors, but expected length of ownership will be critical. A consumer could purchase a midsize car with a hybrid engine, rather than the usual gasoline only engine, for $3,000 more and improve their fuel economy 25%. The chart on the right reveals the payback period in years for this investment. For a consumer driving 12,000 miles per year, and gas prices at $3.50 per gallon, it will take 8.7 years to pay back this investment from fuel savings, already a substantial amount of time for most car buyers. At gas prices of $1.00 lower, the payback period increases to over 12 years – far too long for all but the most high-mileage drivers.

The more miles driven each year, the shorter the payback period, but even for these high use consumers the investment choice becomes "less rational" as gas prices fall. For countries with higher priced gasoline such as Europe or Japan, the change in the payback period from falling prices is less dramatic, but still negatively impacts the return on investment. So, we can expect far fewer consumers willing to pay for fuel efficient technologies. Electric vehicle sales, which are generally the most expensive technology/fuel efficiency investment relative to basic gasoline engine options, will likely suffer the most. Vehicle size will likely be impacted as well. In a lower oil price environment, more consumers will choose larger sized vehicles over smaller sizes. Knowing this oil price/vehicle size relationship, there may be some trouble on the horizon for the industry. Besides investments in improved fuel economy, the industry has also been focused on building smaller sized vehicles in many markets in order to meet expected consumer demand and government regulations for fuel efficiency and lower emissions. The expectation was for oil prices to continue to rise leading consumers in most mature markets to demand smaller, more fuel efficient vehicles. However, consumers will likely prefer larger products than currently forecasted the longer oil stays as low levels. The industry has a long lead time from product conception to the showroom floor, generally 3 – 5 years for many manufactures, so planning decisions for new vehicles may need immediate re-evaluation. Overall, new low oil prices may require adjustments to longer-term product plans, but will also benefit the industry through stronger sales and lower ownership costs by reducing the cost of personal transportation.

In economic theory the use of complementary goods is associated with the use of another good, while substitute goods are goods viewed by consumers as similar or comparable in some way. Within the auto industry, vehicles and petroleum are considered complimentary goods whereas gas-guzzling trucks and SUVs are similar enough to their smaller more fuel-efficient counterparts to be considered reasonable substitutes. Understanding these two distinct categories of goods is helpful in thinking about how price changes affect the demand for different types of goods. With the significant decline in the price of oil over the past year, this distinction is essential in understanding how the auto industry has and will be affected.

Lower Oil Prices Fueling Demand for Automobiles

As gasoline is a petroleum-based product, price changes in crude oil directly affect its price. A decrease in the price of gasoline means automobile owners have more disposable income to use for other purchases. Owners who may have been trying to stretch out the lifetime of their vehicle may just decide that the extra income they save from lower fuel prices can be used to finance the purchase of a new vehicle now. For those who were unable to afford the expenses of vehicle ownership, depressed fuel prices makes driving a lot cheaper and consequently, vehicle ownership becomes much more attractive.

Yet, the affect of lower fuel prices on vehicle consumption will vary depending on different markets. Consumers in a high fuel-tax nation such as Norway, although experiencing the exact same absolute price change as consumers in the lower fuel-tax US, face a lower overall percentage change in the price. The price change will thus not appear as significant in Norway as it does in the US, and this consumer perception should result in more significant changes in American vehicle purchases than Norwegian ones. Further, some would argue that in periods of highly volatile oil prices consumer uncertainty about the future direction of prices increases, and consequently current price changes have a limited affect on new vehicle purchases. From this perspective, changes in automobile sales may reflect consumer expectations of fuel prices more so than current prices. While the recent increase in overall automobile sales could reflect expectations that prices will remain low, most industry experts are directly crediting the increase to the recent plunge in fuel prices arguing that American automobile consumers are much more short-sighted than some would like to think.

Automobile Substitutes

While overall automobile sales in the US have increased due to the lower fuel prices, it has been the gas-guzzlers that have been growing more rapidly than their more fuel-efficient substitutes, as one would expect. Lower fuel prices make the difference in the cost of driving a low fuel-economy vehicle versus a high fuel-economy vehicle less significant and thus consumers opt for the advantages – extra space and greater feeling of safety –that come with owning the bigger, less fuel-efficient vehicles.

American automobile manufacturers are not indifferent to the types of vehicles consumers purchase, and the trend towards SUVs, trucks and bigger cars are a real boon for the industry for a couple reasons. Firstly, US automakers have generally offered vehicles with lower fuel economy than their foreign counterparts and are thus going to benefit more from the trend towards these vehicle types. The other reason is that profit margins on smaller vehicles are generally less than those on larger ones, while losses are generally suffered on electric vehicle sales. While American automakers are soaking up the higher profits now, there is some worry that they could face penalties from regulators in the future. New fuel economy standards are to take effect in 2016 and the federal government is aiming to see new vehicles with a fuel economy of no more than 54.5 miles per gallon over the next decade. While enjoying high profits now, without a plan to improve overall fuel-efficiency in their vehicles, auto-manufacturers could face heavy fines in the future. Future regulations and/or subsidies that incentivize the purchase and manufacture of greener vehicles could be a potential limiting factor in the substitution effects of lower fuel prices.

The Bottom Line

Based on an understanding of complementary and substitute goods, the American auto industry is exhibiting expected effects from the recent plunge in the price of oil. Lower fuel prices make driving cheaper, consequently making automobile ownership more appealing. The reduced cost of driving also means the difference between the gas-guzzlers and the smaller fuel-economy substitutes less significant, creating a shift in consumer preferences towards bigger and more powerful vehicles. While American automakers are enjoying the significantly higher profits from this trend, they would be wise to invest these increased earnings in strategies that improve the fuel-efficiency of their vehicles in order to comply with greener standards.

Summary of key findings

An analysis and explanation of the linkages existing between oil price trends and transport fuel prices have been provided for road, aviation and maritime (rail traction plays here a minor role as it is mostly powered by electricity). This chapter has described in detail the overall international scenario that has characterised recent oil price trends on the market: the continuous growth until July 2008 and the following sharp decline. It has been emphasised that oil price impacts on the transport sector have been compensated in the Euro-zone by the strong appreciation of the Euro against the US Dollar on currency markets.

Looking instead at the relationships between crude oil and fuel prices for the different transport modes, the study has focused here on three distinct transport sectors: road, aviation and maritime. As far as road transport is concerned, oil prices only partially represent the total fuel price, since the remaining part is closely tied to the interaction of various other factors like scarcity of specific fuels, market forces, processing and distribution costs, etc. In particular, fuel prices for the road sector are dependent upon excise taxes that constitute a fixed element of the final consumer price of fuel. This means that each time either an increase or reduction in crude oil price occurs, these changes affect only the part of the final pump price related to the industrial production of fuel (e.g. primarily raw material costs). At a European level, the regulation of taxation for energy products is provided, which since 2011 has set the minimum rates of excise duties for unleaded petrol and diesel fuel at 0.359 €/litre and 0.302 €/litre, respectively. Generally speaking, since the level of taxation represents the component that largely fixes the final fuel price, this has contributed alleviating the effects of the sharp boost in oil prices which occurred in the last four-year period in the total road fuel price.

On average, across the EU, the diesel price has increased by 44% between 2011 and 2015, while the price for unleaded petrol has recorded a smaller increase (26%) but, compared to trends in diesel, with larger differences in the pre-tax component of petrol. Finally, as regards the maritime and aviation sector, due to the absence of taxation and the low processing and distribution costs, the variation in the price of crude oil directly affects these two transport modes. In conclusion, the relatively limited correlation between oil price and fuel user prices partly explains why the sharp increase in the former has not led to a reduction of fuel consumption in the transport sector. On the basis of the evidence registered in the recent years in terms of the variation in fuel prices versus oil prices, and considering also the effects of taxation, the impact of a doubling crude oil prices on fuel costs may be roughly estimated.

The percentages in the table were considered as a share of the production costs of crude oil in total fuel costs. In road transport, the average for the EU was 40%. This data has been compared with recent developments of

p-ISSN: 2348-6848
e-ISSN: 2348-795X
Volume 03 Issue 18
December 2016

both crude oil and fuel prices to check consistency of assumptions. For aviation and maritime, recent evidences have shown a very high sensitivity of fuel costs to high oil prices, also considering that the refining and distribution costs are much less than those of road transport fuels.

Petroleum product	Effect of doubling of crude oil prices on fuel costs
Road freight diesel	~40%
Rail freight –diesel	~40%
Rail freight –electric	~15%
Inland navigation gas oil	~100%
Maritime shipping bunker fuels	~100%
Aviation jet fuel	~100%

Table 1: Sensitivity of fuel costs to crude oil prices

Conclusion:

The impact of high oil prices on the economy may be relevant in the short-term but more limited in the medium/long-term. Mitigating the impacts by investing in energy efficiency and alternatives could even lead to a positive economic impact in the medium to long-term, while a world recession or a situation with insufficient energy supply could multiply the negative impacts by factors of five to ten. Investments in energy efficiency and alternatives may be regarded as the key factor for dampening the negative impacts of high oil prices as they may (i) directly provide a positive stimulus for the economy as part of final demand, and (ii) indirectly help to reduce the vulnerability of the economy to oil price increases by reducing energy demand. Looking at the effects of high oil prices specifically on transport, the impact will be stronger on personal mobility than on freight transport because of the higher rigidity of freight traffic, which is strictly linked to the behaviour of the economy. Transport cost increases will provoke a slow down in trade but it is expected to be small because of less pronounced impact of oil prices on transport costs. At the same time, high oil prices are expected to have a different impact on economic sectors with increased production in sectors like energy and construction, which generates significant amounts of bulk goods often travelling over shorter distances. The result will be to shorten the average distance of transported goods, but at the same time to increase the number of tons transported.

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