Collin DeVore

Dr. Kazianga

Econ 3113

11/1/15

An Economic Analysis of the Automotive Industry during the Great Recession

Introduction

The Great Recession is a global recession that was most heavily experienced in 2007 and 2008. During this time, the automotive industry experienced a large economic downturn that would take years to recover from. While there does not seem to be a full understanding of what exactly caused the recession, there are many different factors that appear to have affected the different markets. One of these factors is the rising gas prices that may have had the most direct effect on the automotive industry. With this in mind, plenty of research has been done regarding the car industry and what it experienced during these times. With this information, an analysis can be made in order to more fully understand what the automotive industry went through. In the following pages I present my analysis of the impacts that the Great Recession had on the automotive industry. While this analysis may not appear to have any use now that the Great Recession is over, it is nonetheless important due to the fact that extensive knowledge of what has happened in the car market could lead to better regulation for the automotive industry in the future.

Literature Review

In economic literature, many studies have been done regarding different ideas regarding the automotive market, though most focus on consumers' response to government regulations during the Great Recession. Goolsbee and Krueger released research over the economic policies enacted in 2007 and 2008 in order to rescue Ford, General Motors, and Chrysler (Goolsbee and Krueger 2015). They tested to see the effectiveness of the policies and what should have been changed (Goolsbee and Krueger 2015). Li, Timmins, and Haefen analyzed what consumers do when the price of gas goes up, finding that consumers tend to get more fuel-efficient vehicles and get rid of the vehicles that are not fuel efficient (Li, Timmins, and Haefen 2009). With this paper I hope to bring together the basic information regarding the supply and demand shift and what could have caused them, assuming perfect competition. This does not appear to have been done yet, though it is the first step that needs to be taken when trying to understand what was happening to the automotive industry during the Great Recession.

Analysis

At first, an assumption must be made that the automotive industry experiences perfect competition. This is done for simplicity. Later, different assumptions will be tested, such as what the industry would experience as a monopolistic industry or an oligarchy. Under these conditions, the automotive industry can be examined as a whole without dismissing the fact that the industry may experience any number of different organizational structures. Of course, it may be that none of these represents the industry perfectly, however, through such thorough analysis, the conditions that must be met to explain what happened should become clear. This will give a more accurate explanation of the effects of this recession. It may be that the

different organizational structures are similar in what effects they show, but they will still likely be different under quantitative analysis. With all of this in mind, the analysis of the automotive industry during the Great Recession can begin.

i) Supply and Demand Shifts

Due to the large amount of information that can be found regarding the prices and quantity of automobiles that have been sold in the used car industry, their information can be analyzed in order to represent the car industry as a whole. While not a perfect sample, it should provide enough evidence as to what is happening. According to *NIADA's Used Car Industry Report*, in 2006, the average price of an automobile was 8,492 dollars, and the quantity that was sold a year by each used automotive dealer was estimated to be 307.5 (NIADA 16-18). Furthermore, the number of used automotive dealers was estimated to be 44,321 in the United States alone (NIADA 16). After multiplying the quantity sold by the number of dealers, it will be found that about 13,628,707.5 used automobiles were sold in 2006. In 2007, the average price of an automobile went up to 8,650 dollars and the quantity sold each year by each dealer fell to 302.4 (NIADA 16-18). Furthermore, the number of dealers fell to 42,791, giving us an estimated 12,939,998.4 automobiles sold in the United States in 2007 (NIADA 16). The increase in price and the decrease in quantity suggest that the supply curve shifted leftwards, and the equilibrium went up by about 158 dollars and left by about 688,709.1. There does not appear to be any evidence that the demand curve shifted. This supports my hypothesis that, in the early days of the recession, people held onto their cars in order to avoid having to pay the expenses for new cars.

The next shift occurs in 2008. This time, the average price for a used car fell to about 8,358 dollars, and the quantity sold per year per dealer fell to 283.2 (NIADA 16-18). The number of dealers fell to 38,662, with an estimated quantity of 10,949,078.4 automobiles sold overall (NIADA 16). This suggests a leftward shift of the demand curve. Also, the equilibrium moved down by 292 dollars since 2007 and left by 1,990,920 automobiles. This is a much larger gap in price and quantity than was experienced in 2007. This seems to suggest that, in the beginning of the recession, people found that they could save money by keeping the automobile that they were currently driving, yet the people who were selling their vehicles were still buying more. They could be buying more fuel efficient cars, or many different cars in order to save money, or it may be that the recession had not yet hit the car industry as hard as it would in 2008. This is supported by the fact that the decrease in the number of firms was less between 2006 and 2007 than it was between 2007 and 2008. Furthermore, it is important to note that, using the data given, the elasticity was about -2.9138. In 2008, it appears that the industry was hit harder than it was before by the recession, suggesting that people were not wanting as many automobiles at any price because some found that they could save more money by not spending it at all. This is supported by the large change in the number of firms between 2007 and 2008. The calculated elasticity for 2008 is 5.2047, suggesting that the automobiles were more elastic in 2008 than they were in 2007. Using the data, the number of firms between 2006 and 2007 went down by 1,530 firms. Likewise, between 2007 and 2008, the number of firms decreased by 4,129. By 2009, the number of firms would have decreased by 2,244 to 36,418, even though the economy would have recovered by this time (NIADA 16-18).

ii) Consumer and Producer Surplus

One of the most important ideas that must be considered after these price and quantity changes is the idea of the consumer surplus and the producer surplus. Using these two ideas, we can see who the economy effected more at different times in the automobile market, whether or not it was producers or consumers. Furthermore, knowing this information will allow us to understand whether legislation should help the consumers more or whether they should help the producers more.

Taking the elasticities of demand during the different years in the Great Recession, an estimate may be made in order to understand who had the higher amount of surplus, consumers or producers. While this estimation may not be perfect, it may provide valuable insight as to the affect that taxes and subsidies will have on the industry, and the elasticities themselves will show how important the prices of the vehicles are. This is important because it could show that the prices of the vehicles were part of the problem.

Using the calculations from before, the elasticity of demand in the used car industry was -2.9138 in 2007 and 5.2047 in 2008. This would suggest that demand was inelastic in 2007 and very elastic in 2008. This shows that consumer surplus was higher in 2007 than it was in 2008, since the more inelastic side generally contains more of the consumer surplus. With this information, the assumption that consumers had the higher amount of surplus in 2007 and producers had the higher amount of surplus in 2008 can be made. This shows that, as the Great Recession moved on, the producers became closer to price takers than they had been before, which may be due to the change in consumer preference or the idea that they were keeping

their old cars to save money. This would give consumers the advantage, and most taxes and other such government legislation would fall more on the producers than on the consumers.

iii) Complementary Goods and Substitute Goods

The next idea to consider is the idea that the automotive industry faces certain substitute goods and complementary goods. While this is already calculated into the data that has been shown, the fluctuations of the substitute and complementary goods will help to explain the fluctuations in the selling of automobiles. Also, it will provide more information as to what the consumers were responding to and how they responded. When it comes to automobiles, the biggest complementary good is gas. With this in mind, it can be quickly noted that much of the difficulty that the automotive industry was having during these times can be attributed to the high price of oil. With this in mind, there are some short range substitute goods that people turned to in order to escape the high cost of gas.

A) Complementary Goods

Using the data provided from energytrendinsider.com, the average price of gas while correcting for inflation was going down from $1.49 per gallon in 2000 to $1.34 per gallon in 2002 (Avro 2012). After this time the prices rose steadily until falling from $3.26 per gallon in 2008 to $2.35 in 2009, just one year after the end of the Great Recession (Avro 2012). Looking at the quantity used in 2006 to 2007, it is found that the number of gas used in the United States went from about 141,841,308,000 gallons used in 2006 to 142,349,298,000 gallons used in 2007 (American Fuels 2014). This rise in prices, paired with the rise in quantity used by

consumers, suggests that there was a rise in demand present at this time. This could possibly be the result of a consumer reaction to the rising gas prices. For instance, it may be that consumers were spending more money on gas that they could hold in reserve because they were beginning to understand that the price of gas would keep rising for some time. This would have been clear late in 2007, and this would have had an effect on the number of cars that were being sold. It may also account for the fact that consumers were buying fewer used cars and were buying more gas. It seems that the consumers in the nation were preparing for the prices of gas to raise significantly and were preparing for it by stocking up on gas and keeping their cars.

In 2008, the quantity of gas sold drastically fell to 138,182,394,000 gallons (American Fuels 2014). This appears to be due to a leftward shift in the supply curve due to some sort of economic policy or other difficulty that would result in gasoline distributors having less gas available for them. As a result of this, the price of gas would rise while the quantity of gas sold would lower, as can be seen with the data. In 2009, the quantity of gas sold fell to 137,916,660,000 gallons (American Fuels 2014). Due to the fact that the both the price of the gas and the quantity of gas sold fell, we can assume that the demand for gas fell at around this point. Due to the fact that the automotive industry was selling a lot of automobiles at around the same price again, it appears that consumers found that they could save money by getting more fuel efficient vehicles, which could possibly restore the automotive industry while lowering the need for gas.

B) Substitute Goods

When it comes to substitutes, there are usually only short range products that can be supplied, such as bikes. For long range substitutes, the automotive industry would most likely have to supply products such as electric scooters or motorcycles. With this in mind, the supply and demand curves for bikes, motorcycles, and electric scooters should show an inverse relationship with the market supply and demand for automobiles. To some extent, this is true. Using the data from BikeEurope.com, the quantity of bicycles bought from 2007 to 2008 changed from about 18,225,000 bicycles to about 18,577,000 bicycles (Bike Europe, 2010). Other than this small raise in the sales of bikes, the sales of bicycles in the United States has been declining since before 2005 (Bike Europe, 2010). Due to the variety of bicycles and bicycle style, it is hard to find the average sales price of bicycles in the years 2007 and 2008. Some corporations, such as Fox, have reported that their sales were at 105,000,000 dollars in 2007 and 131,700,000 dollars in 2008 (Formosa 2009). If we use these sales prices as a sample size to give us an idea of what may have been going on in the bicycle market, we can divide the sales by the quantity sold these two years. Doing this, we get about 5.76 dollars in 2007 and 7.09 dollars in 2008. Although these prices are clearly unreasonable, they do show that the average price of a bicycle, along with its complements, had gone up, just like the quantity that was sold. This would suggest an increase in demand for bikes during the recession. Knowing this gives us more understanding as to why people are not buying as many vehicles. Instead, they are investing in substitutes such as bicycles in order to escape the rising cost of fuel and other such expenses.

iv) Consumer Preference

In recessions and other such economic downturns, it is usually safe to assume that consumers will try to save money in any way that they can. In the case of the Great Recession, consumer preference will start to change in order to accommodate the rising gas prices. With this in mind, consumers will buy more fuel efficient cars so that they can save on variable costs. This has been shown to be the trend during economic hardships in other studies, such as the research performed by Li, Timmins, and Haefen mentioned previously (Li, Timmins, and Haefen 2009). Nonetheless, it is important to make sure that this happened during this time in order to have a better understanding of what happened at these times.

If we assume that fuel efficient vehicles have a different demand curve from the one used for the rest of the vehicles, it should show us the general trend of the market in this situation. Furthermore, it may help to explain how some of the automotive dealers have kept in business during this time. Consumers may start showing a preference for these vehicles, not only because the price of the complementary good will be lower, but because these vehicles may be cheaper. For this reason, it may be that consumers started to prefer different vehicles, rather than fuel efficient vehicles so that they can save on the fixed cost of owning a new vehicle. Furthermore, this can influence the indifference curves that were being used at the time by raising the value of some of the cars. This information could therefore help researchers to understand what consumers will do with their budget when they want a car. For instance, they may be willing to spend more for a nicer car if they know that it will save them in the long run, or they may just spend less on a car so that they can spend more on gas later on. This will also show us how the industry had to adapt in order to survive. Knowing what the consumers were looking for can help researchers to know why certain firms shut down while others did not.

Firms with a higher amount of the cars that consumers are looking for will most likely have a larger revenue, and, therefore, less firm shut downs.

According to Tracy Samilton of michiganradio.org, cars were becoming more fuel- efficient from 2007 to at least 2010 (Samilton 2011). She is backed up by many different sources in saying this, but she suggests that the consumer preferences have an impact on the fuel efficiency of cars that the automotive industry makes up for by quickly supplying vehicles with more fuel- efficient cars (Samilton 2011). While this change may be hard to measure, she also points out that this has been the trend during the Great Recession, and that not long after the Great Recession, the government passed new legislation in order to encourage the industry to make vehicles more fuel- efficient (Samilton 2011). This should provide enough evidence, along with numerous scholarly articles, to suggest that consumers became more partial to fuel-efficient vehicles during the Great Recession (Samilton 2011). This may not entirely be due to the idea that consumers were responding to gas prices, either. Samilton interviewed a researcher named Brandon Schoettle, who points out that consumers also buy more fuel-efficient vehicles to save money when unemployment is high (Samilton 2011). With all of this in mind, it becomes clear that consumers' preference may have changed at this time to influence the automotive industry. Any firm that could not react to this change in consumer preference may have had to face some sort of shut down.

v) Firm Shut Downs

Under the assumption of perfect competition, we can examine why many of the automotive dealers have shut down. The basic idea is that a temporary shutdown will result from a firm not

being able to pay off their variable costs, which usually ends up being the price of labor. If the revenue covers any more of the costs, then the firm will stay in business, which may be the case with some of the firms that are still present after the recession. After this is done, a firm must decide what they need to do in order to earn a profit by checking for economies and diseconomies of scale. It is likely that the firms during this time were having trouble adjusting for economies and diseconomies of scale because they would not likely benefit from either scaling up production or scaling down production, so they would have to shut down. According to NIADA's report mentioned earlier, the number of used dealerships in America was 44,321 in 2006, 42,791 in 2007, 38,662 in 2008, and 36,418 in 2009 (NIADA 16). This information shows a loss of 1,530 dealerships between 2006 and 2007, 4,129 dealerships between 2007 and 2008, and 2,244 dealerships between 2008 and 2009 (NIADA 16). Of course, it will be hard to understand how many firms have operated at a loss, though the overall loss to the industry can be estimated using the average price of the vehicles and the amount that has been sold, as has been shown previously. It can also be difficult to see how many firms had to shut down temporarily as they analyzed their businesses and waited for an opportunity to reopen. This is most likely to happen with larger firms that have enough revenue and government support in order to pay off their costs. As for the variable costs that could have caused these firms to shut down, this can be due to many different factors other than loss of money. The minimum wage could rise, for instance. This would lead to large layoffs, as would many other different government legislation. For the purposes of understanding what was happening in the market, however, it is best to assume that losses to the industry caused many firms to shut down permanently.

According to a report by Viveca Novak and Joe Miller written in 2008, auto workers that were in unions at this time were earning around twenty- nine dollars an hour (Novak and Miller 2008). When the benefits that are given to workers and retired workers are calculated in, however, this number rises to about seventy or seventy-five dollars per hour, depending on the firm, or an estimation of seventy three dollars per hour provided by many different cites (Novak and Miller 2008). These benefits include the actual amount of time that they are paid, the health insurance that they received, and even benefits that go to those in the industry that have retired (Novak and Miller2008). Novak reports that "What's causing the number to balloon is the cost of providing benefits to tens of thousands of *retired* auto workers and their surviving spouses" (Novak and Miller 2008). Since it is hard to get an accurate estimation of the number of retired auto workers there are and how much they get in benefits on average, and doing so may only further the amount of error in the estimation, the estimation of seventy three dollars per unionized auto worker should be a fair estimate of the amount of variable cost incurred, since many of the workers in the industry are unionized and their average amount of benefits was such a huge controversy at the time. According to research done by Micheala D. Platzer and Glennon J. Harrison in 2009, there has been a job loss of 435,000 jobs from about 2000 to around 2009, when the research took place (Platzer and Harrison 2). Furthermore, the number of jobs in the U.S. industry had not gone below one million jobs until 2007, and there were only 880,000 jobs in 2008 (Platzer and Harrison 2).

Using the information from Novak, along with the information from Platzer and Harrison, this would mean that, assuming the variable costs stayed constant, the U.S. automotive industry had been paying over $73,000,000 per hour on workers, which slowly went down to

about $64,240,000 per hour due to a decrease in the amount of workers. Using the data from NIADA's Used Car Industry Report, the amount of money earned from cars in the industry can be calculated in order to get an understanding of how much the earnings covered in the overall market (NIADA 16-18). In 2007, the earnings were about $111,930,986,200 and the earnings in 2008 were about $91,512,397,270 (NIADA 16-18). If we assume that the auto workers worked for eight hours a day five days a week, the industry would have been paying about $151,840,000,000 a year on workers in 2007 and about $133,619,200,000 a year on workers in 2008. This data may not be perfectly accurate to the large amount of estimations that must be made in order to arrive at this conclusion and the amount of assumptions that must be made, such as the idea that all of these workers are making the same amount. It could also be due to the fact that the amount of money made was taken from a sample size while the average pay of the workers was an estimation of the entire country. Nonetheless, the data suggests that, overall, the amount of revenue made, if nothing else, came dangerously close to going under the amount of variable costs for the country. It also shows that it is likely that the industry was operating at a loss at this time, but was still running so that the firms could cover at least some of their fixed costs. Lastly, this information provides evidence as to why the government would try issuing so much legislation at this time in an attempt to help the automotive industry, and, therefore, the economy. One of the factors that may have influenced the amount of firms that have shut down due to this is geography, which can have an influence on every single aspect of the economics of the automotive industry.

VI) Legislation

During the Great Recession, the United States government began to enact different laws in an attempt to stimulate the economy through the automotive industry. These policies were directed at helping consumers, providing help such as subsidies to the automotive firms themselves, and trying to preserve the many jobs that the automotive industry provides. Usually, these efforts are aided by research papers such as these, though they are not always aided in this way at the time. Some policies, of course, hurt the economy even though they seem to be trying to help it, such as tariffs and import quotas that create a large deadweight loss to society.

In the case of the automotive industry during the Great Recession, the government not only helped to subsidize certain firms in the industry but also allowed the companies to run in a different way than was legal before, such as allowing the companies to pay much lower wages to workers (Palmquist 2013). Most of the legislation and help was aimed at two members of what is known as the Big Three (Ford, General Motors, and Chrysler), who owned a large portion of the firms (Palmquist 2013). Chrysler and General Motors used these subsidies and this legislation, while Ford decided not to receive any help (Palmquist 2013). From the United States alone, General Motors received 67.4 billion dollars while Chrysler received 12.4 billion dollars in subsidies (Palmquist 2013). With the new legislation, both corporations completely reorganized the way that they did business so that they could lower their variable costs and attempt to boost production, which, over time, worked, as the corporations became more equipped to handle foreign competition (Palmquist 2013). According to research done by Matt Palmquist, who presents a thorough examination of what the government did to help the automotive industry during the Great Recession, General Motors, Chrysler, and Ford lowered

wages and laid off about 80,639 workers in an attempt to lower their variable costs (Palmquist 2013). This appears to have worked, since Palmquist reports that "GM's North American Hourly labor costs declined from $16 billion in 2005 to $5 billion in 2010" (Palmquist 2013). With the variable costs lowered, it would be less likely that these corporations would have to shut down completely in the long run, and they could use what was left of the money that was gained from the government to focus their efforts on other problems that they were having, therefore reorganizing their corporations even more to achieve the maximum benefit.

VII) Conclusion

The decline of the automotive industry during the Great Recession could have arguably been caused by a number of factors, some of which may not have even been studied yet. With this in mind, it becomes clear that this industry must be studied thoroughly so that, in the future, these kind of economic troubles may be prevented. In summary, this event appears to have been started when the complementary good of gas had a drastic rise in price that consumers responded to by hanging on to their old vehicles and using more bikes for short term travel. This later caused a fall in demand that hurt producers, whose products were slowly improved to be more fuel efficient so that they could match the consumer preference at the time. Many firms could not afford their own labor, so many people were fired and many firms were shut down. The largest three corporations in the United States at the time, Chrysler, Ford, and General Motors, received help from the government, though Ford received it indirectly. This led to a complete reorganizing of the industry that would have a large effect on how they do business. In this paper, I have provided empirical evidence of all of this using the assumption

of perfect competition. While this may not be the best assumption to make, it begins to answer the questions of how the market was working at this time, and, therefore, begins to answer the questions regarding how the automotive industry works now. The reason that all of this is important is because it allows researchers to better understand how the automotive industry decline can be avoided in the future, and it can also help them to understand the way that this industry works in the present by providing information as to why the industry is set up the way that it is.

VIII) Works Cited

Avro, Samuel R. "Charting the Dramatic Gas Price Rise of the Last Decade." *Energy Trends Insider* (2012). Web.

Bike Europe. "USA 2009: Dark Clouds Over US Bicycle Market." 20 October 2010. *Bike Europe.* Web. 30 November 2015.

Carol Corrado, Wendy Dunn, and Maria Otoo. *Incentives and Prices for Motor Vehicles: What has been happening in recent years?* Finance and Economics Discussion Series. Washington, D.C.: Federal Reserve Board, 2006-2009. Web.

Formosa, Nicole. "Fox Racing Shocks Sales Up in 2008." 15 March 2009. *Bicycle Retailer.* Web. 30 November 2015.

Gregory, Mike. "2013 Gasoline Consumption." *American Fuels*. 19 March 2014. Web. 30 November 2015.

Harrison, Michaela D. Platzer and Glennon J. "The U.S. Automotive Industry: National and State Trends in Manufacturing Employment." Research Document. 2009. Web.

Krueger, Austan D. Goolsbee and Alan B. "A Retrospective Look at Rescuing and Restructuring General Motors and Chrysler." *Journal of Economic Perspectives* (2015): 3-24. Web.

Miller, Viveca Novak and Joe. "FactCheck.org." 11 December 2008. *Auto Worker Salaries.* Web. 30 November 2015.

NIADA. "NIADA's Used Car Industry Report." Industry Report. 2010. Web.

Palmquist, Matt. "The Auto Industry's Big Bailout Bounce." *Strategy+ Business* (2013). Web.

Samilton, Tracy. "Michigan Radio.org." 15 July 2011. *Emissions from New Cars Drop Since 2007.* Web. 30 November 2015.

Shanjun Li, Chrisopher Timmins, and Roger H. von Haefen. "How Do Gasoline Prices Affect Fleet Fuel Economy?" *American Economic Journal: Economic Policy* (2009): 113-137. Web.