Demand Elasticity in Gas Markets

University Honors Thesis

Brendan Davis
6/12/2013
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Abstract

Gas prices are being driven up across the world. As tightening supply and increasing demand hits the marketplace this leaves many people speculating on the future of the oil industry. Efforts have been made in the United States to both find alternative means to create oil to allow a continued use of the combustion engine. Increased drilling activities have been seen around the world, and much of this drilling is of unconventional gasoline. Different alternatives to gas and tax structures have been proposed to by interested parties to help alleviate the impacts gas consumption will have on the future of society. This paper explores the motivation behind why there is a continued demand for gasoline, and not a trend toward a substitute as most economic models would suggest. Data from The World Data Bank has been compiled in this paper to create accurate models of the gas market in the United States. My findings indicate that there gas is income elastic and this means that by creating policy affecting incomes there can be a change in market behavior.

Introduction

The invention of the automobile was one of the greatest inventions of mankind. It allowed transport of persons and goods easily from one location to practically anywhere. Gone was the reliance on train systems and the foot to get where one needed to go. With the factory production of affordable vehicles people were increasing consumption rapidly of gasoline. American towns began to develop with wide roads to reflect this newfound technology.

The United States government played a large role in boosting this infrastructure. The Department of Transportation was tasked with managing these roads and highways, and regulating the vehicles which could drive them. The roads served the function of transporting
not only Americans, but improving national security by allowing military vehicles to traverse the large nation. Sections of the national interstates were set up to allow planes to land for military defense. Gas taxes were set up to help pay for new roads to be built, and when new roads were built more people began to consume gasoline. This structure turned gas vehicles into the largest transport structure in the United States.

In Europe where buildings were built closer together it was more difficult a transition, and many vehicles were of a smaller build to reflect the packed city structure. Europe had more train infrastructure as well that people could take advantage of when traveling from city to city. The tighter structure of cities allowed there to be both more foot and bike traffic, and it made little sense to drive the couple of blocks needed to go to the shop.

In the United States things were more spaced out. With the increase in vehicle transport shopping became easier for consumers and consumption rose. This spurred even more economic growth. Cars became a staple of the American household, and gave a new image of what it meant to be an American. In many communities it became a symbol of affluence, and in others a symbol of freedom. Infrastructure was developed around owning a car as the primary means of transportation.

These developments helped spur the United States to a superpower and a global economic force. Now many years down the road the American Dream does not look as bright and cheery as it once did. Market failures and economic woes have led to a period commonly referred to as the Great Recession. The cost of gasoline has increased dramatically as a result of shortage coming from the wars in the Middle East, and of increased competition with other new
markets such as India and China. While not necessarily bad for the producers of gasoline this leads many to expect drastic economic ramifications if not addressed.

**Alternative Transportation Structures**

Many cars in the United States have become more compact offering greater fuel economy. Foreign cars from Europe have begun to make a greater presence in the marketplace. Hybrids too have been developed by auto manufactures, offering electric hybridization that consumes less gasoline in the cities where many cars are driven. For the most part this has barely made any difference on the consumption of fuel within the United States. More people are buying vehicles, and when they do they buy vehicles which are barely more efficient than the previous ones. Vehicles also have a slow turn over, making it difficult for manufactures to sell these new fuel efficient cars.

Many people herald electric vehicles as the savior of the car industry. These vehicles do not consume any gasoline and therefore are appealing as an alternative. Without a proper infrastructure in place to provide charging stations these vehicles have a very limited range, and are not ideal to homeowners who would like to go on long trips with the family. There is also less storage room in these tighter shaped vehicles as compared to the quintessential sports utility vehicle. The high costs of purchasing an electric vehicle since the product is pretty new and many people by used vehicles leave most of the population avoiding this alternative. The market share of these vehicles is incredibly small, and the owners of these vehicles treat them more as a novelty item than a viable transport.

There are proponents for increased use of public transportation. This model has long existed in American cities, and traditionally has been associated with being poor. While this
stigma is cannot gather enough muster to stagnate the entire market it is a contributing factor. The biggest stigma against transport is that it is slow. Most Americans do not realize that this reflects that there is not enough demand for the transport, and thus the community offers less of the quantity that would shorten time. This effect is cyclical. Unless there is a dramatic shift within the market it is likely to continue on into the future. There is also the limit of locations where one can travel using public transportation, and people are at the moment willing to pay more for the convenience of a vehicle. There is also the issue where public transportation is limited to the city, and therefore cannot be accessed by nearly half the population of the United States.

There is a growing trend to ride bikes as an alternative to driving vehicles. This method costs significantly less, but it also is very limited in its scope. Riding bikes does not offer an advantage in the amount of time it takes to transport, nor an advantage in the distance covered. The infrastructure of the United States does not favor the usage of bikes. There is a great lack of bike lanes since many individuals fear that by putting them in there will be less car lanes that they would prefer to drive in. Many car owners also fear driving and hitting bikers as the bikers are not very well protected from injury.

Another reason why bikes are not the best method of daily travel is that everything is spaced very far apart in the United States. One would exhaust one’s self just trying to get to the market, let alone bringing back the foodstuffs. That being said it does not necessarily have to constitute the primary means of transport, and if budgets tighten enough in the United States they might become more common place for economical rather than political reasons.
Policy in Practice

It is a policy debate within the United States right now to try to decrease the amount of gasoline used. Whether to combat climate change, or simply reduce dependence on a large industry that is not based in the United States. If the alternative methods above are currently receiving a lukewarm response, what then is the proper mechanism by which to drive the market in a direction where less gasoline is consumed? Surely it would not be prudent to wait to build the infrastructure until supply of the resource has dwindled into nothingness.

Price is one thing which can be changed easily, and price changes are the focus of this paper. How much is the consumer willing to spend on gasoline? At what point do they move to embrace the alternatives mentioned above? Is the change due to market costs, or are there other factors involved in making there be less gasoline consumed? There is a great deal of interesting observations that can be made with regards to this unique market.

Demand elasticity is the most important factor to grasp in this equation. Demand Elasticity is, “the amount of change in demand for a good or service when its price changes.” (Black’s 2009) A good can either be highly elastic or highly inelastic to price changes. Highly elastic goods have a much higher change in demand as a response to the price changes, while inelastic goods remain practically unaffected by price changes.

An example of a good with an elastic demand would be apples. If the price of apples increases the consumer becomes less willing to buy so many apples. They either will buy fewer apples, or purchase an entirely different commodity altogether depending on their preferences. This can have many different ramifications on the marketplace. If the person consumes less
apples and values oranges as a rather similar commodity, then the person will purchase more oranges. This is because oranges act as a substitute of apples.

If they maintain high preferences for apples they might purchase inferior apples as opposed to the higher quality ones. If Fuji apples become more expensive one year, the consumer may instead choose to purchase Gala apples. There might also be a motivation to purchase older apples of the same variety that are about to turn poorly.

Another effect of the rising price of apples would be to make it so that goods you would normally buy with apples are purchased at a lower rate. Say the person loves to make applesauce. Cinnamon is necessary when making this food. If the person is buying less apples then they need less cinnamon, therefore they buy less of it. This good can be referred to as the compliment of the apple.

When demand is inelastic the person would opt to continue purchasing the same type of apples at the same quantity regardless of the price. This is what seems to be the case with the gasoline market, and it is important to note that there are different kinds of demand elasticities. The first would be if the product is price elastic; meaning that if there was a greater price then the consumer would opt to purchase either more or less depending on the degree to which the demand is elastic. The more elastic the demand then the less which is purchased, the more inelastic the demand then the same quantity would be purchased.

The second focuses on whether the product is income elastic or income inelastic. When the consumer has a major decrease in purchasing power the ability to purchase all goods is dramatically affected rather than just the one good being analyzed. If there is no income effect then the consumer will opt to purchase the same quantity of the good despite budgetary
restrictions. If there is income elasticity for the demand of the product then the consumer will purchase less of it to reflect the lower purchasing power.

When bringing these concepts of compliments and substitutes to gasoline it is possible to get a better understanding of the gas market and why it operates the way it does. Gasoline does not really have a good substitute. People cannot plug in their gas powered sedan into the nearest outlet and suddenly be able to have an electric vehicle. The amount of substitutes is narrow is scope. Ethanol made from corn is probably the most traditional of these substitutes, and a federal law has mandated that gasoline contain ethanol. This does not mean that a consumer can travel to a gas station and elect to have ethanol poured into their tank.

There are different grades of gasoline that can be purchased based on the amount of lead that has been removed from the gasoline. The more lead that has been removed the higher the price goes. The greatest amount of gasoline purchased is that of regular unleaded, reflecting the consumer does not perceive any personal advantage from purchasing the less toxic variety.

Since there is no viable substitute for gasoline it is difficult for market forces to naturally drive the price down. This leaves the consumers with only one option, and that is to evaluate the compliment. In this case that would be the car, since without it there would be no need for gasoline. There is much speculation on what would make a good alternative method of transportation as I have previously noted, but most of these alternatives have yet to see widespread acceptance throughout the United States despite many pushes by different interest groups.

Costs play a big role in keeping consumers from buying into alternative methods of transportation. Electric vehicles are rather expensive, and during the recession most people did
not have the cash on hand to invest in a new vehicle. Low gas consuming vehicles also are newer models which prevents people from buying them for low prices used. There are smaller vehicles that are cheap and have high fuel economy, and these vehicles are slowly increasing their market share within the economy. However the number one bestselling automotive is still the sports utility vehicle.

When people are stripped of cash on hand to make buying decisions it is difficult to get them to even contemplate a new purchase. Durable goods tend to be kept on hand, and manufactures of durable goods are hard pressed to make sales and must often contract their production. Vehicles are highly durable goods and can easily get thirty year lives if well maintained. The recession hit hard and people were unwilling to buy new vehicles causing much contraction within the market.

There was a program which was initiated that was meant to get people to turn over their low performing vehicles for new ones with higher fuel economy. The United States government created a program to buy back older vehicles called Cash for Clunkers. In this program people would turn in their old vehicles and receive a subsidy to purchase a new vehicle. While well intentioned this program did not have the effect it desired. It did help the auto manufactures, but “for transactions under the program, consumers still prefer SUVs and large cars. The extra $1000 rebates actually increase consumers' tastes towards SUVs.” (Liu 2011) So it had the opposite effect on consumers’ preferences, since the larger more expensive vehicles actually became cheaper.

It is important to remember why people purchase vehicles. It is not simply to get from one location to another. People like to be able to have their vehicles perform multiple functions,
and the amount of room one has in a vehicle in many ways can be preferable. The size of the vehicle becomes almost a necessity, and many people are unwilling to compromise on that count. If it were merely about transport of the driver there would be a much greater movement towards bikes and public transit. Instead owners prefer to be able to carry a great deal of things, whether it be passengers, travel equipment, or purchased goods.

One might still be tempted to find an alternative to the bigger model of vehicle though. There are other ways to purchase goods. Rather than having to go to the store all of the time why not purchase online? People have been able to make purchases online for a while now, and have the goods delivered straight to their doorstep. With a greater cost of gasoline would not people naturally cut costs by making more of their purchases online? There is even a movement within the United States to purchase groceries online and have them delivered right to the doorstep.

Unfortunately this is not how the market has been shown to operate. With the recession people have actually been shown to simply purchase less. In a study of 155000 households the amount of money spent on filling the tank was compared with the purchases made online. It was shown that, “individuals whose work commute is costlier purchase less online, by way of an income effect.” (Martens 2011) This comes despite the fact that they would be able to save money by making purchases online and avoiding the sales taxes associated with in store purchases. It is a prime example of the inelasticity of gas demand within the marketplace.

People are willing to make fewer purchases just so that they can continue spending the same amount on fuel. This income effect shows the dependence that individuals have on gasoline, and that there is no room for compromise on it. Since it is the objective of many policy
makers to reduce the consumption of gasoline then it is up to the government to create programs
designed to help. The Clash for Clunkers program failed because the scope of the subsidy was
too broad. The program did not reduce CO2 emissions to a level to satisfy the creation of the
program. It reduced “CO2 emissions by only 9–28.2 million tons based on upper and lower
bounds of the estimate of the program effect on sales, implying a cost per ton ranging from $92
to $288 even after accounting for reduced criteria pollutants.” (Li 2013) A narrower scope
would allow the vehicle purchases to be tempted to buy vehicles that are designed with a greater
fuel economy and lower CO2 emissions.

Another proposition for what the government could do to decrease this market
inefficiency would be to set standards and regulations for automobile manufacturers. This
opportunity is being taken advantage of fortunately, and automotives are becoming more and
more fuel efficient. The creation of “the Energy Independence and Security Act of 2007
increased the CAFE standard for new vehicles by about 40%, to be effective by the year 2020.”
(Klier 2012) Currently by the year 2017 the average fuel economy is to be 36.6 miles per gallon,
and by 2025 that is to rise to 54.5 miles per gallon. With higher standards set there will be less
gas consumed per vehicle. However that still does not make it so that gasoline price changes
have less of an effect on the consumer. There would still be inelastic demand for it, and as prices
rise they might still be paying the same amount for gasoline without having moved away from
relying on it. That being said, a delay in the catastrophe which might result from not changing
habits will definitely help.
**Tax Proposals**

Then there is the raising of the prices through taxation. Oil is a heavily taxed commodity within the United States currently, as it is with most goods that have an inelastic demand. Goods with an inelastic demand are habit forming by nature, and no matter what the price is people tend to desire the same amount of the good. This could prove problematic for this solution, as it seeks to make the people purchase less gas and buy into the alternative methods of transportation.

This leads to some interesting questions. What price would be high enough to cause people to migrate from one form of transportation to another? Is there a price high enough? Will this not simply have an income effect whereby you tax the individual out of all high disposable income and make it so that they decrease consumption heavily by way of income effect? Are there other taxes that can be implemented that do not have this effect?

Researchers at the University of California Davis have concluded that “the optimal gasoline tax… is $1.37/gallon.” (Lin 2010) This rate is high because they are seeking to accomplish some objectives with the tax. They are looking to decrease congestion, decrease gas consumption, and protect the environment. They are also looking to increase revenue for government spending on other projects. It is interesting to note that most gasoline taxes currently go to infrastructure of the highways, and by doing so help boost demand for more gas to be consumed in the future by more people driving on the roads.

The decreasing congestion may actually lead to greater fuel economy by virtue of not burning gas while idle, and also increase the amount of individuals taking public transit or commuting to work. This is a problem in most cities in the United States and less time spent commuting would increase the economy greatly. People could spend more time either working
or doing leisure related activities which increase consumption, both of which boost the economy. There are a great many hours lost to commuting, and to have them put into the economy would be highly beneficial.

While it does decrease the amount of gas consumed according to the paper it might be interesting to note that a great deal of the savings of gas consumption come from the fact that people are no longer as willing to spend the money traveling. This greatly hurts the tourism industry, and if one is looking for protecting the environment then it seems a bit harmful to that cause. National Parks will receive fewer visitors as people are no longer willing to spend the money to go on a long trip. Without people visiting the parks then there is less pressure to protect them and they quickly become harvested for lumber or agriculture.

With the high costs cutting into the ability to purchase goods that are not necessary and an income effect leading to a decrease in the consumption of goods and services it is still a dangerous proposal. The tourism industry takes a huge hit, but so do many other industries that rely heavily on gasoline. The transportation of many goods within the United States is based on a system of large trucks that bring goods all over the nation. These high costs of gasoline are transported directly to the consumer of the merchandise the vehicle delivers. With a higher demand elasticity for most of the goods shipped throughout the United States it would not bode well for the producer of these goods. People will buy less of these goods because their purchasing power has decreased dramatically. This could lead to a contracting economy if the income of the purchaser does not increase. This is another reason why it is imperative to find a way to make gasoline more elastic or find alternatives to gasoline.
Trains can be used to transport vast quantities of objects with relatively few costs, but the structure currently in place in the United States makes it so that shipping things by train is not necessarily cheaper. With high gas prices in the future it would be good to get this sorted out now, lest the costs of all goods rises on the consumers. Creating a system of trains where the passengers ride on one set of tracks and goods are sent on another would increase consumption of both, however right now most of these share the same tracks. High speed rail is not feasible in the United States right now, even though a recession is the best time to invest in infrastructure since it is at its cheapest.

There are other ways to decrease the consumption of gasoline through tax increases, and not by taxing the gas directly. The study Deakin 1996 explored five different mechanisms by which to raise taxes, and only one of them was an increase on the gas tax. What is surprising about this study is their finding that “a combination of congestion pricing, employee parking charges, a 50 cent gas tax increase, and mileage and emissions feeds would reduce VMT and trips by 5-7 percent and cut fuel use and emissions by 12-20 percent.” (Deakin 1996) Ignoring the increase of gas tax there are several other ways with it would increase the cost to use a vehicle without compromising the citizen’s ability to purchase goods.

Paying charges for congestion might make it so some people would be less willing to either drive to work, or more willing to carpool to reduce the costs of the tax and the possibility of congestion. This is not exactly a common way to tax people, but it is a way to deal with many of the problems with too many people driving. A great deal of all driving is to go to work, and using a car alone is not as practical in this scenario. The tax payer would be more willing to compromise in order to get to work, whether it be avoid the tax or pay it, and it does not influence the individual’s ability to drive to the market or go on a road trip.
Another very similar tax mechanism would be to make the employees pay a tax for parking. If there was a tax for driving to work people would carpool more often and this would lead to less vehicles on the road burning gas. Making it ideal for people to not use the car for the daily unnecessary uses is a definite way to decrease the amount of vehicles traveling to a location. Colleges do this by charging parking fees and it works well to reduce the amount of vehicles in the parking structures. If parking were perfectly free at all schools more people would be driving to campus rather than taking public transport.

The consumption of gasoline does not change based on its price very much. So there are very few taxes that can be placed on gasoline with the ability to address the ecological concerns and economic concerns. While it is possible to increase taxes on gasoline drastically there is a great risk to the economy.

One way to compensate for this is a tax proposal of my own. Increasing the taxes enough to cause people to desire to spend less on gasoline and then redistributing these taxes equally to all tax payers as a lump sum. An example of this would be where there are three people that compromise the entire market. A tax of $1 per gallon would decrease the total amount of gas consumed by all people, even if only a little based on the elasticity of gas. These three individuals each drive a different amount, and let’s assume their fuel economy is the same. Person 1 consumes 30 gal and therefore pays $30 in taxes. Person 2 consumes 45 gal which costs $45 in taxes. Person 3 consumes 60 gal and pays $60 in taxes. Each person then receives back $45 from the government as a lump sum, which is the amount they paid in taxes divided equally between them.
If poorer individuals choose to drive less due to lower incomes then they will receive a bonus amount of income that will be consumed. This approach incentivizes lower gas consumption, and does not necessarily punish everyone for using the gas that they need to operate in the current societal structure. This method would make it so that those who were not consuming as much actually get an income benefit and those who were consuming more get an income loss. This would teach people to spend less on gas based on its income elastic effects.

**Data and Results**

Data which I gathered from The World Data Bank shows that the amount of energy consumed by Americans has been decreasing due to the income elasticity during the recession. When compared with changes in oil costs this graph is also shown to be price inelastic. See Chart 1. Chart 1 shows the energy use per capita in the form of kg of oil. Starting as early as the records go (1960) I traced the amount of oil consumed to 2012. The y axis indicates the kg consumed in thousands. What we see is a steady increase over time as America booms and the American Dream is being pursued.

Later it dips off in the late 1970s in relation to the contractionary period where the American wage became suppressed. Then it becomes a flat line in the late 1980s. This continues to 2007 where it begins to decrease to values lower than that of the recession in the early 80s. 2007 average was 7758.2 kg of oil consumed, while the low point of 2009 was 7057.3 kg. This comes despite the fact that gas prices were the lowest that they had been in a while during the start of the Great Recession. During the mid 2000s there were much higher prices of oil, with no change in the levels of consumption. 2009 was the lowest level for gas prices during the Great Recession in the United States. This shows that price was not the cause of the decrease in
consumption, but rather the income levels of the individuals. Overall contractions on spending hit the market causing less energy to be used.

Chart 1

Next I decided to take data on the CO2 emissions per capita. This is useful in determining if there are any trends indicating a switch to use more energy which does not come from fossil fuels. In Chart 2 I graphed the average CO2 emissions per capita in metric tons. The data set goes from 1960-2009. Surprisingly the 2009 emissions per capita reached a level not seen since 1964. What this shows is the recession caused a massive decrease in the consumption of energy that produces CO2 emissions. If there was no difference between technologies and Americans continued to use the same amount of bio fuels this graph should look the same as Chart 1. For the most part this holds true, except the last two years of data. In chart one the energy use remained a constant during the last two years and had leveled off, but in Chart 2 there
is a drastic drop off. It seems that people are consuming the same level of energy, but at a lower level of carbon emissions.

What this means is that people are using significantly less bio energy than they were using previously. Since it was far too short run for there to be any massive technology improvements and investment in infrastructure to cause such a dramatic shift it would have to be based on transport. People are driving significantly less due to the income elasticity of gasoline. If income were to continue to fall people would be driving less and less. It is important when looking at this graph to remember that this is not total carbon emissions, but emissions per capita. CO2 is still a problem as population has increased.

Chart 2

The amount of people driving in the United States is still increasing. Even if people were to each drive significantly less it would still not be able to address this issue. A greater
population requires a greater number of transports. Since there is not enough infrastructure in place to allow for these citizens to use public transportation this problem will persist into the future. In Chart 3 I have graphed the total CO2 emissions of the country and it is possible to see the trends. Overall it has been progressively rising as the United States pollutes more and more. It only drops off during the contraction periods and cannot be shown to be slowing down. After the recession it has begun to pick up again, indicating that the momentary lapse of CO2 pollution was only a fluke. Despite Chart 2 showing a constant and then a drop Chart 3 shows the actual impact of the increasing population. Individual citizens may be making effort to slowdown impact, but that does not stop the steady rise. There are still over 17 metric tons per capita being produced.

Chart 3

Some people might argue that a great deal of Chart 3 can be associated with rising fuel economy in cars. They believe that because of all of the legislation which has been put into
place there has been a significant increase in fuel economy of vehicles. Unfortunately fuel economy has not increased that much in the past few years, as per the fact that no one can afford new models of cars with tightened budgets. This is shown clearly in my demonstrative Table 1.

Table 1

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Table 1 shows that fuel economy of vehicles is staying significantly lower than current standards hope. In fact they were much higher during the mid 1990s than they are currently. With vehicles that have low standards it is harder for people to consume less gas. There is still the daily commute and there are plenty of other places people need to go in their vehicles. With the high amount of consumption per vehicle remaining constant despite higher prices of gas it is clear that people are not actually able to react to market changes. The vehicles that they have the capacity to buy are lower standard vehicles, and they consumers will continue to purchase these vehicles well into the future. When the vehicles which have a higher fuel economy finally become used and affordable more people will be interested in investing in them, as shown by the mid 90s blip.

Since the fuel economy is remaining constant it is important to look at the price of gasoline. What other causes might be able to show the results of my earlier charts if not a high income elasticity? The actual price of the gasoline is very important to look at. People would argue that the higher prices of gasoline actually lead to a lower consumption of gasoline. This
argument allows for some elasticity within the demand for gas based on the price, and it is only fitting to reason with it through a figure. Chart 4 has data collected from the U.S. Energy Information Administration. On the X axis is the year and the Y axis is the cost per gallon of gasoline.

Chart 4

Data from 2002-2008 shows a sharp rise in the cost of gasoline, from $1.50 to $3.25.

Recalling back to Chart 2 where the amount of CO2 emissions per capita was listed this same period is a flat line, dropping off at the end. This drop off is in tandem with the drop off in Chart 4. If the argument that the higher prices would lead to less fuel consumption were true then Chart 2 would have seen a steady decline during this period and a rise when in actuality it dropped off.

This is an example graphically that shows how gas is not price elastic, and having a tax which directly influences the price of gas will not actually decrease the consumption. Since people are trying to decrease consumption in order to save the planet this does not bode well for them. Instead the only way to get people to consume less gasoline is to shift their income. It
would hardly seem fair to suppress American wages and if the citizens are aware it is not conducive to reelection campaigns.

To graphically represent that it is income elastic I had to create a chart on the incomes of American citizens. To do this I gathered information from The World Data Bank, and labeled the graph Chart 5. This contains the net earnings of all Americans from 1970-2012. These are net earnings of all Americans combined, and therefore are not adjusted to reflect any disparity between classes. I use net earnings to draw a better comparison to Chart 3. Net earnings are also a better reflection of the disposable income which could be spent on gasoline.

Net income steadily rises up to the point where recession begins, and then there is a small contraction period before it rises again. This shows that the consumers are not able to spend as much as before and must therefore consume less. With their ability to consume less they must forgo some gasoline which they would have otherwise consumed. The individual income would have decreased drastically for some people, this leading to a greater volatility on Chart 3. If incomes were more equally distributed within the United States these graphs would have been a perfect fit.

To test how good of a fit they are I ran a regression analysis on the two data sets. This allows me to verify my argument that gas demand is relatively income elastic. Table 2 show the results of this regression. Since 1960-1969 is unavailable for the net national income I have omitted these numbers from the regression and started at 1970. From the regression we are able to pass the significant test and find that the amount of CO2 emissions is predictable from the national net income.

Table 2
From the regression analysis it can be shown that the two are significantly related. The income of Americans has a direct impact on the amount of CO2 they consume from transport. This means that in order to restrict CO2 the income of Americans will have to be reduced drastically, unless an alternate means of CO2 reduction can be implemented. Gasoline will continue to be bought in great quantities despite the price increasing. Chart 5 is a graphical representation of the regression done in Table 2.

Chart 5
Discussion

From the results it is clear what sort of elasticity gasoline has. Consumption did not change with the rising prices of gasoline, but did change when incomes were affected by the Great Recession. If indeed gas consumption is a problem to the health of individuals or the environment then that leaves solutions rather scarce. There are few goods with elasticities like this, and policies to eliminate them are usually done by mechanisms that are not necessarily economic.

Cigarettes and alcohol both are highly price inelastic, and while these are taxed at a high rate it does not necessitate a decreased amount of consumption. Rather the education outreach programs and the social stigma are the only real things that have an effect. Attending university it is possible to see how poor college students taking on massive student debt are still willing to spend money to engage in these activities. Gasoline is difficult to create a stigma against, since the harms have become more of a political football than an accepted fact. Most people accept that cigarettes harm society through second hand repercussions, and drinking can lead to traffic accidents.

On the matter of driving cars it is different than drug consumption. CO2 emissions are not seen as wholly bad by a great percentage of the American population. Despite what the majority of scientists state there is still the problem of stigmas that result from political leanings. There are plenty of studies funded by large oil companies that say consumption of oil is not bad for the environment, nor that it is going to run out any time in the near future. Even were that true it is still creating a vast amount of imports into the nation which is increasing the national debt, and this coupled with fear mongering has hurt confidence in the market place.
Since this paper focuses on trying to decrease dependence on gasoline it is important to find a solution, otherwise society is not going to be prepared for the bad outcomes alluded to. Production in the United States is not enough to slowdown the rising costs, and there are plenty of alternatives that could receive investment to replace the need for gasoline. These alternatives are not tar sands or ethanol, as those methods are arguably worse for the environment than the current pattern. Instead there are the mechanisms for transport addressed at the beginning of the paper, and a greater investment in them would lead to a greater transfer of people from cars to alternatives.

Since incomes are tighter as shown by the graphs there can be little expectation that consumers will opt to make big item purchases on new vehicles that are either electric or have high fuel economy. These people cannot also make large policy decisions that will allow for new bike lanes or rail lines. Therefore it is at the discretion of the governmental bodies to institute new changes that will lead to a shift in market forces. It will not be a natural occurrence.

When incomes are tighter there needs to be some mechanism by which people can travel to locations, that way they can maintain a more constant level of consumption which will help the economy to recover. Cars are too much of a drag, but unless there are policy changes these highly durable goods will remain a large restriction on the economy. The price of gas is continuing to rise, and all of this cash is being spent on an imported commodity from relatively few nations. Saudi Arabia may be well and good, but purchases decrease for other nations which provide the U.S. with other products. There is also the negative impact on domestic products and services.
It almost boils down to a decision between the environment and the economy, and this false dichotomy that has been presented by many individuals has shaped the debate. It is easy to see how that train of thought can be justified though. Assuming that the environment will be largely deteriorated by the consumption of gasoline then the only option for protecting the environment is to decrease the consumption of gasoline. Since gasoline is only income elastic then the government would have to lower peoples’ incomes significantly to create a market where less gasoline is consumed. This results in less consumption from the lowered purchasing power, and cripples the economy. So implementing policy which could take advantage of this scenario is a bad idea.

This leaves the need for the creation of alternative transport that could allow for consumers to actually make a decision, but with a relatively crippled government and a stigma that prefers market forces to government forces it seems the status quo will likely persist. Fortunately these decisions are not entirely made by the gridlocked federal government, and the states have some ability to make policies. The lower revenues make it exceedingly difficult for local government to actually invest in proper infrastructure, and government spending is widely considered intolerable during a recession by the general public. Since there can be little new investment there must be something that can be done.

The new tax systems that were mentioned earlier would help to fix this problem. They can influence consumer behavior and actually generate some of the revenue necessary to undertake the alternative transportation projects. This still leaves the problem where there is a tax system in place that might not actually affect the consumer’s choices. The high tax hikes on gasoline earlier would not have the desired effect, as seen in the comparison of Chart 4 and Chart 2 where the increasing price in gasoline did not affect the consumption. The price inelasticity
seen here makes it so that the tax proposals made in California are not going to have much of the desired results the authors had intended.

**Conclusion**

When policy makers implement a high enough tax to cause a decrease the amount of gasoline consumed would greatly decrease the consumption of other goods as well, and lead the economy into a recession as mentioned earlier. Therefore it is most prudent to implement a tax system on the price which does not have the effect of limiting the consumption of other goods or services, just gasoline. This is the tax proposal I mentioned earlier that would be able to both incentivize a movement away from gas consumption and maintain current levels of other good consumption.

This tax works by increasing the tax on gasoline when it is purchased, but reimburses tax payers later on. If this tax were significantly great enough it would cause people to purchase less gasoline, but in effect it would have little to no impact on their actually long run purchasing power. Once the taxes have been collected they get dispersed to all tax payers evenly. Those who drove less come out with a net gain, and those who drove more come out with a net loss. The individuals who drive less are more likely to be poorer than those who drove more, and thus more likely to spend that money. This causes there to be more consumption within the marketplace and less saving, boosting the economy.

This new tax system would be interesting to explore in another paper, as there is much that could be found out by looking to its feasibility and impact. It could possibly lead to a lower consumption of gasoline and not impact the income of the consumer thereby protecting the current levels of consumption. On the other hand it might unfairly impact individuals who live
in rural communities who must drive a great deal, but earn little income. If such a case existed then it might be a policy implemented at the city level rather than the state level, but before a decision can be made more research must be done.

It is even possible that gasoline is not a commodity that one group of people has to purchase more than another. Wealthier people do not consume a significantly higher volume than those who are not wealthy. Therefore this distribution of wealth is not so great as to cause many people to be riled up in anger, but instead incentivizes traveling by alternative means of transportation. Means of transportation which the individual is allowed to choose based on personal demand. These choices may be walking, biking, carpooling, taking the bus, or driving an electric vehicle. This could be better than simply taking that money and investing it in public transit, because it gives the consumers the freedom to choose and influence the market based on preferences. There is no use investing in public transit in Texas if no one is going to be using it.

The debate on the perfect policy may never be answered. There is still time to act on the current problem though, and an imperfect solution could be better than no solution. The results have shown that gasoline is price inelastic and income elastic, therefore all policies that are made must be able to work with this distinction to drive down the demand for gasoline. So far the efforts made to prevent the oil market from maintaining its stranglehold on the average consumer has been largely left up to the individual. The market has not corrected itself yet, but it seems that the decisions of the consumers are largely based on a political motivation rather than a market beneficial one. It is therefore up to the government to make the proper decision that will impact the market into making the correct choice.
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