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"Changes in the short-term price elasticity of gasoline demand in the US"

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Tesis de Maestría en Economía de

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*"Cambios en la elasticidad-precio de corto plazo de la demanda de gasolina en Estados Unidos***"**

Resumen

Comprender la elasticidad de demanda de gasolina es importante para mejorar politicas publicas y entender dinâmicas de trading en el mercado petrolero. Esta tesis contribuye a la literatura presentando una revision exhaustiva de los estúdios existentes sobre la elasticidad-precio de la demanda de gasolina, y extendiendo el analisis sobre la elasticidad de la demanda en Estados Unidos realizado por Hughes et al. (2008) con datos mas recientes. La conclusion principal de esse estúdio fue que la elasticidad de la demanda cayo entre princípios de la década del 70 y comienzos de la década de 2000. Este trabajo extiende el estúdio incluyendo la primera mitad de la década de 2010. Se concluye que la elasticidad precio de la demanda es menor que lo que era en la década del 70, y sembrando dudas sobre la efectividad de politicas publicas que busquen reducir la demanda de gasolina enfocandose exclusivamente en el precio.

Palabras clave: elasticidad, demanda, gasolina, política energética, Estados Unidos

*"Changes in the short-term price elasticity of gasoline demand in the US***"**

Abstract

Assessing the demand elasticity for gasoline is important to improve public policy and understand better oil trading dynamics. This thesis presents a comprehensive review of the existing literature on the price elasticity of gasoline demand and adds to the existing corpus by replicating the study of US gasoline demand elasticity performed by Hughes et al. (2008) with more recent data. Their main conclusion was that the elasticity of demand dropped between the 1970s and the early 2000s. We extend the study to cover the early 2010s. Our findings confirm that the price elasticity of demand is now lower than it was in the 1970s, casting doubt on policies focusing exclusively on price to reduce gasoline demand.

Keywords: elasticity, demand, gasoline, energy policy, USA
Códigos JEL: . D12,L91,Q31,Q41,R40,R41

1. Introduction

Assessing the demand elasticity for gasoline is important to improve public policy and understand better oil trading dynamics. The development of the gasoline market has been a key feature of the fossil-fuel based economy (Smil 2017), and dealing with the multiple externalities/consequences that derive from it – pollution/climate change, congestion, road use, energy dependence- has been at the forefront of public policy debates. For this reason, several papers studying the demand elasticity of gasoline exist.

The aim of this thesis is, first, to conduct a comprehensive review of the existing literature on the price elasticity of gasoline demand. The second aim is to add to the literature by replicating the study of US gasoline demand elasticity performed by Hughes et al. (2008) with more recent data.

Hughes et al. studied changes in the short-term price elasticity of gasoline demand in the US, comparing the period 1975-1980 with 2001-2006. They concluded that the price elasticity of demand dropped between the periods. This paper will extend their study to the period 2011-2016 – a period characterized by a huge increase in the US production of crude oil that brought with it a large drop in oil prices. We will follow the same methodology -an OLS regression analysis- and data – EIA data on oil demand, BLS/BEA data on prices and economic activity. Our findings confirm that the price elasticity of demand is now lower than it was in the 1970s, casting doubt on policies focusing exclusively on price to reduce gasoline demand.

The rest of the paper proceeds as follows: section 2 introduces a literature review; section 3 describes the data that will be used; the econometric model is presented in section 4; the model's results are discussed in section 5, and section 6 concludes.

2. Literature review

Estimating the price-elasticity of gasoline demand has been a fertile academic topic for decades. As Smil (2008) indicates, the advent of the internal combustion engine revolutionized personal mobility and had a profound influence in our way of living. It also had several knock-on consequences, such as:

(1) Pollution – with transport fuels being responsible for 30% of CO_2 energy emissions in the US according to the EIA;

(2) Energy security – oil supply is vulnerable to geopolitical shocks, as seen during the oil shock of 1973, the Iranian revolution in 1979, the Iran-Iraq war in the 1980s, the two Iraq-US wars in 1990-91 and 2003, Venezuelan strikes in 2002 and more recently the Arab spring in 2011.
(3) Congestion – according to INRIX (2018), road congestion in the 5 most congested cities in the US costed $75bn, mainly via lost hours.

Each of these issues can be tackled by public policies, either mandates (on fuel economy, driving restrictions, etc), or price (taxation). In order to assess the impact of public policies on demand, it is critical to have a good understanding of the demand elasticity.

Understanding consumer behavior in the face of price changes is also important from a commodity-trading point of view. The oil market is the largest commodity market in the world (see for example, visualcapitalist (2016)). Gasoline represents 25% of the global oil market and US gasoline demand is approximately 40% of global gasoline demand (IEA, 2018).[1]

So what drives demand for gasoline? The most common framework (see for example Brons et al 2008) decomposes demand as a function of: (1) car ownership; (2) fuel economy of the car fleet and (3) vehicles miles travelled. Gasoline prices affect each of these variables, but the response time is different – once a car model is purchased, the car ownership and fuel economy of the car are given and thus the main consumer response is limited to either travel or not, and if travel do it by car or an alternative method. Therefore, it is vehicle miles travelled that has the greatest influence in the short-term price elasticity of demand. Another inference from this framework is that long-term elasticity should be larger than short-term as consumers have more time to adapt to higher prices.

There are diverse methodological approaches to estimate the price elasticity of demand. The bulk of the literature focuses on revealed preference studies (ie econometric studies looking at data on observable consumer behavior), but there is also a smaller field on a stated preference framework, based on surveys on hypothetical consumer behavior in different price scenarios - see for example Honsinger et al. (2017).

Within the revealed preferences framework, there is great diversity in terms of geographic scope, period covered, type of data used (macro or micro data). Table 1, extracted from Honsinger et al. (op cit) is a useful summary of the main studies on fuel demand elasticity. Their review confirms the

[1] There is also a very large literature on the effect of oil prices in the economy which is also relevant for trading purposes. Good if slightly outdated examples are Killian (2008) and Hamilton (2009, 2011)

intuition that long term elasticity is larger than short term. What we also see is that more recent results tend to show a lower elasticity than older studies.

Table 1. Price elasticities of fuel demand reported in the literature

Source	Observation period	Geographic region	Elasticity of fuel demand		Data type
			Short term	Long term	
Archibald and Gillingham (1980)	1972–1973	USA	−0.43	–	D
Goodwin et al. (2004)a	1974–1981	Worldwide	−0.35	−0.93	A, D
Hughes et al. (2008)b	1975–1980	USA	−0.275	–	A
Dahl (2012)a,c	1954–2005	Worldwide	−0.15	−0.55	A, D
Dahl (2012)a,d	1954–2005	Worldwide	−0.10	−0.33	A, D
Kayser (2000)b	1981	USA	−0.23		D
Puller and Greening (1999)	1980–1990	USA	−0.35	–	D
Hymel et al. (2010)	1966–2004	USA	−0.075	−0.361	A
Brons et al. (2008)a	1972–1999	Worldwide	−0.36	−0.81	A, D
Goodwin et al. (2004)	1981–1991	Worldwide	−0.16	−0.43	A, D
Brännlund and Nordström (2004)	1985–1992	Sweden	–	−0.98	D
Sentenac-Chemin (2012)c	1978–2005	USA	–	−0.3	A
Havranek et al. (2012)a,c	1974–2011	Worldwide	−0.09	−0.31	A, D
Wadud et al. (2009)	1984–2003	USA	−0.266	–	A
Odeck and Johansen (2016)	1980–2011	Norway	−0.26	0.09	A
Hirota et al. (2003)	1990–2002	Worldwide	−0.195	–	A
West and Williams (2007)	1996–1998	USA	−0.51	–	D
Romero-Jordán et al. (2010)	1998–2001	Spain	–	−0.55	D
Wadud et al. (2010a)	1997–2002	USA		−0.473	D
Austin and Dinan (2005)	2001	USA	–	−0.39	A
Lin and Prince (2013)c	1990–2012	USA	−0.03	−0.239	A
Burguillo et al. (2017)	1998–2005	Spain	−0.35 to −0.49e		D
Burke and Nishitateno (2013)c	1995–2008	worldwide	–	−0.2 to −0.5	A
Hughes et al. (2008)b	2001–2006	USA	−0.056	–	A
Hymel et al. (2010)b	2004	USA	−0.055	−0.285	A

a Meta study (otherwise primary study).

b. Focus on periods with high fuel price variation.

c. Analysis based on gasoline consumption only.

d. Analysis based on diesel consumption only.

e. Estimated mixture of short- and long-run elasticities.

A: Data type: A – aggregated, D – disaggregated.

Hughes et al. (2008) made an important contribution on the changing nature of demand elasticity, showing there was a shift in the short-run price elasticity of gasoline in the US. It reduced from -0.21/-0.34 (depending on the specification used) in the 1970s to -0.034/-0.077 in the early 2000s. They hypothesise that the demand has become relatively less elastic due to several behavioral/structural changes such as "changing land-use patterns, the implementation of the Corporate Average Fuel Economy program (CAFE), the growth of multiple income households and per capita disposable income, as well as a decrease in the availability of non-auto modes such as transit". In this vein, Gillingham and Munk (2018) compare US and European elasticities, finding that the increased elasticity of European demand is explained by the availability of public transport.

A novel contribution from Levin et al (2016) finds much larger estimates, ranging from -0.29 to -0.61 depending on the specification used. A key feature of their paper is its dataset- it relies on micro-data from Visa, showing individual customer purchases as well as total daily purchases made at gas stations. They show that relying on aggregated data will lead to less elastic estimators than using disaggregated data. Brannan (2012) notes that Levin's study focuses on daily elasticities which may be less relevant for the purposes of public policy – but helpful for a gasoline retailer trying to understand how his pricing policy may affect consumer behavior.

Interestingly the bulk of short-term estimates for the price elasticity of gasoline demand in emerging countries reviewed by Huntington et al. (2017) are in the region of -0.2 to -0.77. The only exceptions are Saudi, Venezuela and Iran, all countries that have significant subsidies on fuels (see figure 1, extracted from IEA). These results are consistent with the idea that structural features specific to the US have reduced short run price elasticity of demand.

Our study fits within the existing literature as follows: it is a revealed preference framework; the focus is on the short-term elasticity of demand in the US, the country for which the most reliable and frequent data exist. We will focus on data at a macro level, using the framework of Hughes et al (2008). Our contribution to the literature will be to extend the study to cover the period 2011-16. This period is of relevance as it sees a supply-driven price collapse, mainly due to the large oil production in the US that resulted from a combination of horizontal drilling and hydraulic fracking techniques. Kilian (2016) shows that the shale revolution didn't cause a US-specific drop in gasoline prices, but had a clear indirect effect on gasoline prices by lowering international crude oil prices.

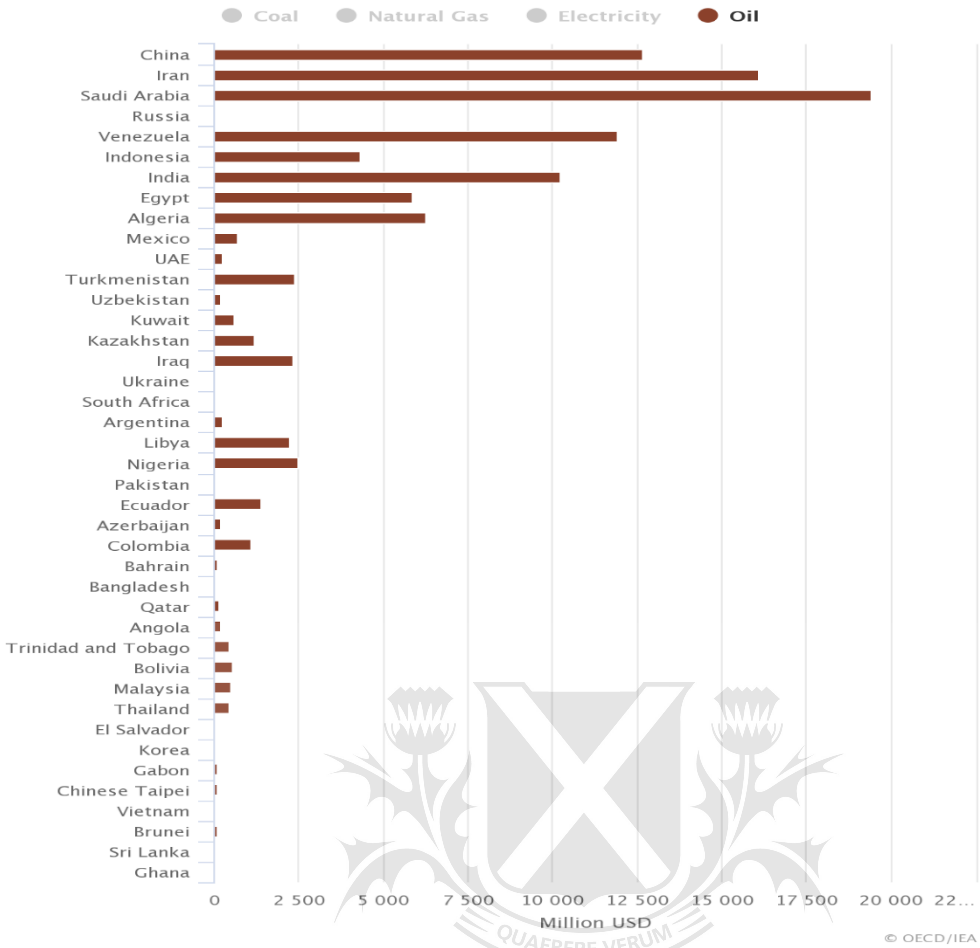

Figure 1 (Oil Subsidies by country, million USD, 2016). Source: IEA (2018)

3. Data description

Hughes et al. select two 5-year periods for their study, November 1975 through November 1980 and March 2001 through March 2006. They call this a quasi-experiment given that demand and price movements were relatively close. We haven't had a similar situation of stable prices followed by a rally since then. However, we did have stable high prices, followed by a collapse, in recent years (see figure 2), which is why we pick the period Jan 2011-Jan 2016 for our third study.

If we look at the whole period from 1975 until these days (figure 3), we will see that following a sharp rise in the late 1970s (covered by the first data subset), prices were broadly stable until the early 2000s, when they started to rise (period covered in the second subset). There was a very volatile period around 2008 with prices peaking shortly before the financial crisis and rebounding in 2011 following the Arab Spring. Finally, prices had a sharp correction down since 2014 following a large increase in US crude oil production.

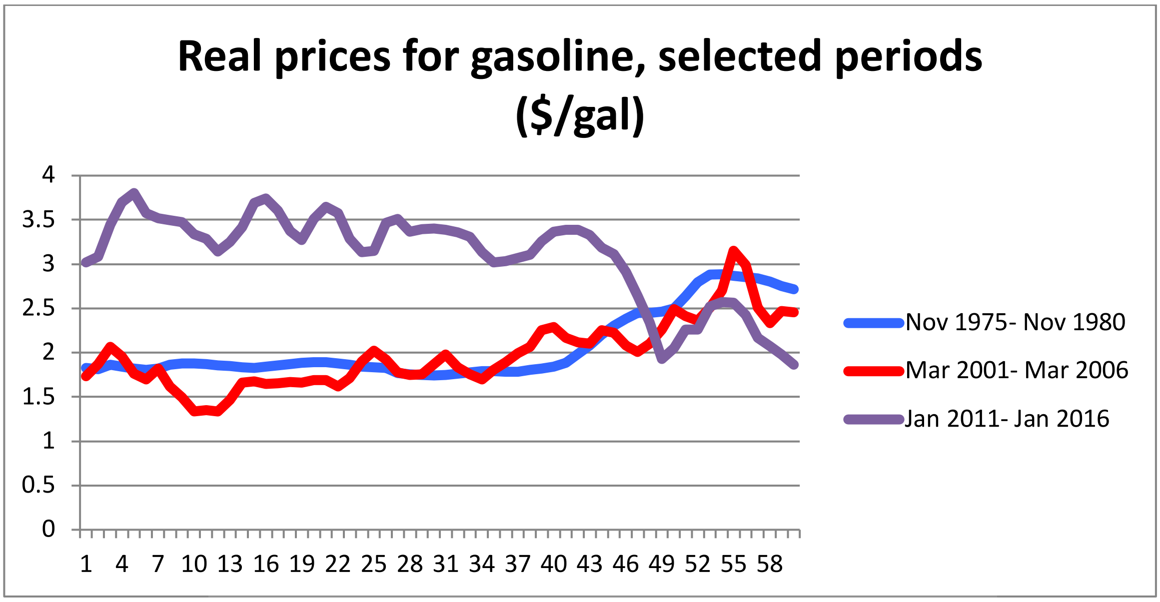

Figure 2 – source – BLS/BEA deflator

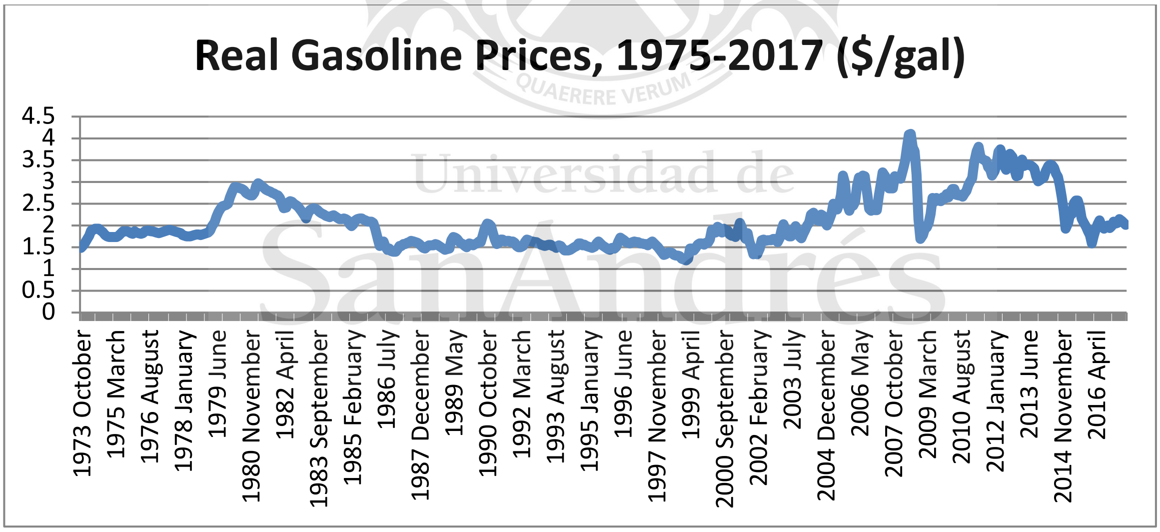

Figure 3 - source – BLS/BEA deflator

4. Econometric Model

To estimate the short term price elasticity of demand we will follow Hughes et al (2008). The basic specification of their model is:

$$lnG_{jt} = \beta o + \beta_1 lnP_{jt} + \beta_2 lnYjt + \varepsilon_j + \varepsilon_{jt}$$

Where

G_{jt} is the per capita demand for gasoline during month j on year t, measured in gallons. Per capita demand is inferred from EIA data as follows: Refinery production-Exports+imports-stock build, divided by the total US population.

P_{jt} is the real price for gasoline during month j on year t. This study follows Hughes et al. in using U.S. city average prices for unleaded regular fuel from the U.S. Bureau of Labor Statistics. Prices are adjusted for inflation using the 2009 GDP deflator from the U.S. Bureau of Economic Analysis (Hughes et al use 2000 prices, but I couldn't find this deflator to replicate this part of their study). Since the BEA deflator is quarterly while the price data is monthly, a monthly deflator time series was created using cubic spline interpolation.

Yjt is the real per capita personal disposable income. The source for this data is from the U.S. Bureau of Economic Analysis, with nominal data adjusted for inflation using the same method as is used for prices.

ε_j is a fixed effects variable to account for the monthly seasonality of gasoline demand.

5. Results

The model is estimated using OLS in R. Table 2 presents the results. For 1975-1980 (column 1) the results are in line with the results from Hughes et al. (see tables 3 and 4 for a comparison of the main results). Price elasticity is estimated as -0.329 (vs their -0.335) and is found to be statistically significant. Income elasticity is estimated as 0.489 (vs their 0.467) and also statistically significant. The results for the 2001-2006 (column 2) are more puzzling, as price elasticity is estimated as -0.032 (vs their -0.042) but the hypothesis of elasticity being 0 cannot be rejected. Income elasticity is estimated as 0.241 (vs their 0.53) and the statistical significance is low (the probability of rejecting the hypothesis of no income elasticity is less than 10%). The results of the Jan11-Jan16 (column 3)are also puzzling. Price elasticity is estimated at -0.128, suggesting that the price sensitivity of demand increased throughout the 2000s. However, the income elasticity result comes at -0.349 (although the hypothesis of no income elasticity can't be rejected). One possible explanation for such an odd result may lie on the data used - the US personal income data exhibited a very odd behaviour during 2013 which is a key period in our study. Another explanation, along the permanent income hypothesis, may be that households suffered a temporary decrease in income but didn't adjust consumption, financing themselves with debt.

An alternative specification would be to use Real Personal Consumption Expenditures per capita as a proxy for income data. Unfortunately such data is not available for our first period, but having done that study for 01-06 and 11-16 (columns 5 and 6) we find that expenditures are a significant explanatory variable of demand but the price elasticity of demand remains well below that of 75-80 and in the case of the Jan 11-Jan 16 the coefficient for the elasticity of demand.

Another possibility is to repeat the study but using lagged prices (Hughes et al. also test this specification). In this case 6 months lags are used (columns 6-8). Results are consistent with our previous findings – the price elasticity of demand is lower now than it was in the 1970s.

Our results are consistent with those of Hughes et al. Sometime since the 1970s the US short term price elasticity shifted, and demand got less reactive to gasoline prices. So what could be behind this result?

It is clear from the data that the efficiency of the car fleet has increased. As shown in figure 4, vehicles miles per capita travelled haven seen a steady increase since the 1970s, while demand of gasoline in gallons per capita has been stable. There is a strand of literature that focuses on the "rebound effect" – a theory that increased efficiency in the car fleet leads to higher VMT and thus hasn't got as strong an effect on gasoline demand as anticipated - but recent studies such as Hynel and Small (2015) suggest that the "rebound effect" has been getting smaller over time – consistent with the results presented here.

Li et al (2014) argue that these results of a lower elasticity are due to incorrect econometric specifications. Under their instrumental-variables approach, they get very large estimates of gasoline demand elasticity. However, Coglianese et al. (2017) show that Li's specification uses invalid instruments, and correcting for those yield estimates closer to the recent literature of no significant price elasticity of gasoline demand.

Another factor usually mentioned in elasticity studies is urbanization. In theory urban drivers' demand is more elastic, as they are able to substitute driving with public transport, but drivers living in rural communities have their demand less elastic to lack of substitution. Gillingham and Munk (2018) find evidence on this effect with microdata in Denmark. However, with the share of US urban population going from 70% in 1970 to 82% in 2015 (Statista), this should have made the US demand more elastic, not less. A more nuanced argument is that the pattern of urbanization matters. In the US several cities have ssen an expansion in urban sprawl. However, Schmuck (2009) shows that there is very little effect from the shape of urban form on the price elasticity of gasoline. Table 5 adds a measure of public transport cost (FRED series CUUR0000SETG, adjusted by the GDP deflator to 2009 prices) to the model to test whether public transport cost changes the elasticity of demand for gasoline (column/specifications 9-11). We see virtually no effect to the coefficients for the 70s and early 2000s, but for the early 2010s we see that there is a positive relationship between the demand for gasoline and the cost of public transport. The price elasticity of gasoline itself appears to be slightly smaller, but data suggests that there may be a substitution effect between driving (as expressed in gasoline demand) and the cost of public transport.

A more plausible explanation for the drop in price elasticity of gasoline demand is that, as the share of energy expenditures as percentage of total expenditures decrease (which has happened since the 1970s in the US), the demand becomes less elastic. EIA (2017) presents several arguments in this direction.

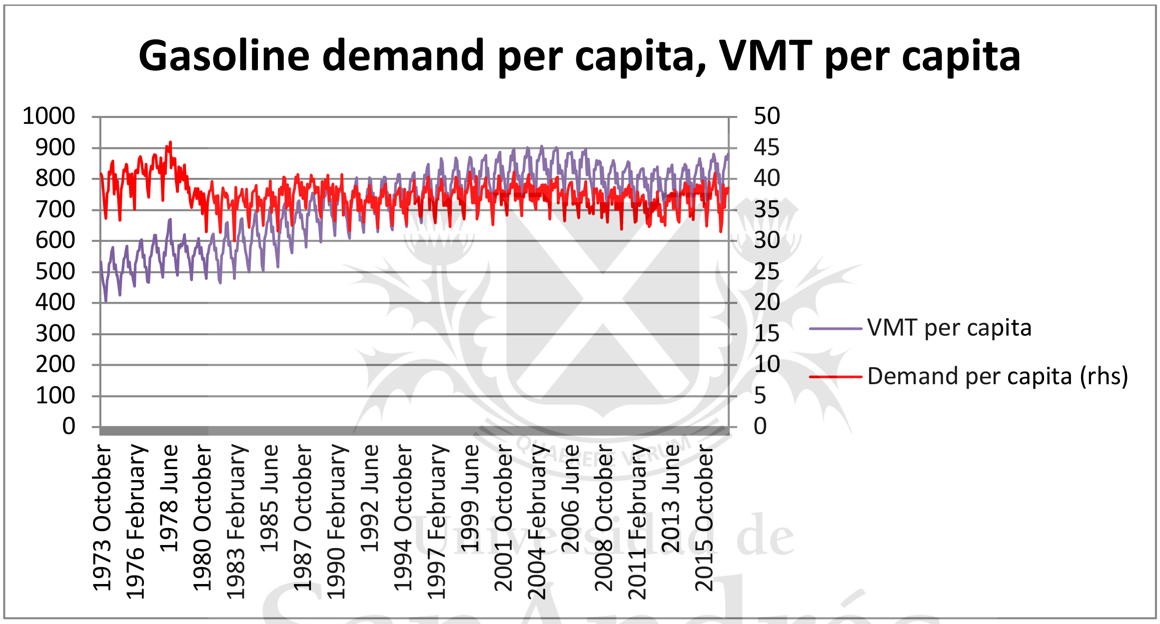

Figure 3 - source – FRED, St. Louis Federal Reserve

Table 2- Regression output

	Dependent variable:							
	Nov 75- Nov 80	Mar 01- Mar 06	Jan 11- Jan16	Mar 01- Mar 06	Jan 11- Jan16	Nov 75- Nov 80	Mar 01- Mar 06	Jan 11- Jan16
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Ln P	-0.329***	-0.032	-0.128***	-0.059**	0.027			
	(0.026)	(0.020)	(0.031)	(0.024)	(0.045)			
Ln P (6m lag)						-0.331***	-0.035*	-0.086***
						(0.037)	(0.019)	(0.031)
Ln Y	0.489***	0.241*	-0.349			0.139	0.193*	0.209
	(0.139)	(0.143)	(0.266)			(0.162)	(0.112)	(0.210)

Ln Expend				0.319**	0.991***			
				(0.124)	(0.335)			
See appendix for seasonality coefficients								
Observations	61	61	61	61	61	61	61	61
R^2	0.881	0.904	0.848	0.911	0.867	0.807	0.906	0.821
Adjusted R^2	0.848	0.878	0.806	0.887	0.830	0.753	0.880	0.771
Residual Std. Error (df = 47)	0.027	0.017	0.025	0.016	0.024	0.034	0.016	0.028
F Statistic (df = 13; 47)	26.686***	34.169***	20.124***	37.054***	23.539***	15.103***	34.829***	16.580***
Note:								*p**p***p<0.01

Table 3- Comparison with Hughes et al.

	Nov 75-Nov 80	Mar 01-Mar 06	Jan 11- Jan16	Nov 75- Nov 80	Mar 01- Mar 06
	(1)	(2)	(3)	Hughes et al, table2	Hughes et al, table2
Ln P	-0.329***	-0.032	-0.128***	-0.335**	-0.041
	(0.026)	(0.020)	(0.031)	(0.024)	(0.009)
Ln Y	0.489***	0.241*	-0.349	0.467	0.530
	(0.139)	(0.143)	(0.266)	(0.096)	(0.058)

Table 4 – comparison with Hughes et al – lagged specification

	Nov 75-Nov 80	Mar 01-Mar 06	Jan 11- Jan16	Nov 75- Nov 80	Mar 01- Mar 06
	(6)	(7)	(8)	Hughes et al, table 8	Hughes et al, table 8
Ln P lagged	-0.331***	-0.035*	-0.086***	-0.300	-0.033
	(0.037)	(0.019)	(0.031)	(0.039)	(0.005)
Ln Y	0.139	0.193*	0.209	0.409	0.390
	(0.162)	(0.112)	(0.210)	(0.101)	(0.033)

Table 5 – Specification with Public Transport Cost

	Nov 75-Nov 80	Mar 01-Mar 06	Jan 11-Jan16	Nov 75-Nov 80	Mar 01-Mar 06	Jan 11-Jan16
	(1)	(2)	(3)	(9)	(10)	(11)
Ln P	-0.329***	-0.032	-0.128***	-0.329***	-0.032	-0.093***
	(0.026)	(0.02)	(0.031)	(0.026)	(0.023)	(0.033)
Ln Y	0.489***	0.241*	-0.349	0.492***	0.238	-0.224
	(0.139)	(0.143)	(0.266)	(0.159)	(0.156)	(0.26)
Ln PT Cost				0.005	0.004	0.205**
				(0.165)	(0.078)	(0.088)

6. Conclusion

This study supports the thesis espoused by Hughes et al (2008) that the price elasticity of gasoline has experienced a shift since the 1970s and it is currently low for the US. This suggests that fuel-economy mandates and access to public transport may be more successful than taxes to achieve gasoline consumption reductions, in line with the results of Davis and Killian (2011). It also suggests that the incidence of gasoline taxes would fall relatively more on US consumers rather than producers.

In terms of future avenues for research, there has been a major change in transportation markets in the US in recent years – the advent of ride-sharing applications such as Uber and Lyft. There are already some studies on the social costs of these apps, as well as their effect on demand. For example, Barrios et al. (2018) show that ridesharing is associated with an increase of 2-3% in the number of motor vehicle fatalities and fatal accidents. VMT, measures of excess gas consumption, and annual hours spent in traffic go up following the entry of ridesharing. Circella et al (2018) present anecdotal evidence that ride-sharing services lead to an increase in demand by substituting journeys that would have otherwise been made by public transport/bicycle/walking/not made. There is not enough data yet to assess the impact of higher gas prices on ride-sharing use, partly due to lack of data and partly due to the large subsidies that ride-sharing companies are giving to its drivers/customers. Still, as time goes by it should be possible to incorporate the effects of ride sharing applications to gasoline demand elasticity studies. Intuitively the advent of ride-sharing apps should increase elasticity via the public transport substitution effect.

From a global policy making point of view, as time goes by the relative importance of Eastern demand of gasoline will increase. Sen et al (2017) is a useful survey of gasoline demand patterns in this region. They show that there is still significant growth potential given the low base of automobile penetration, but the pattern of growth will likely differ from previous experiences given the large policy drive to incentivize non-oil transport demand. The effect of these policies on demand elasticity is not clear, but it does suggest that, in line with our results, the focus of the policy is not on gasoline prices but rather efficiency mandates or subsidies for substitutes such as electric vehicles.

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FRED, St. Louis Federal Reserve. VMT, population, GDP time series, public transport cost. https://fred.stlouisfed.org

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Appendix – seasonal effects by specification:

	Dependent variable:							
	Nov 75-Nov 80	Mar 01-Mar 06	Jan 11-Jan16	Mar 01-Mar 06	Jan 11-Jan16	Nov 75-Nov 80	Mar 01-Mar 06	Jan 11-Jan16
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Jan	-0.060***	-0.053***	-0.105***	-0.055***	-0.100***	-0.059***	-0.050***	-0.098***
	(0.016)	(0.011)	(0.016)	(0.010)	(0.015)	(0.021)	(0.010)	(0.018)
Feb	-0.001	-0.008	-0.091***	-0.011	-0.080***	-0.001	-0.004	-0.082***
	(0.017)	(0.011)	(0.016)	(0.011)	(0.016)	(0.022)	(0.010)	(0.018)
Mar	-0.082***	-0.068***	-0.142***	-0.071***	-0.119***	-0.078***	-0.065***	-0.127***
	(0.017)	(0.011)	(0.016)	(0.011)	(0.016)	(0.022)	(0.010)	(0.017)
Apr	-0.131***	-0.132***	-0.139***	-0.134***	-0.127***	-0.129***	-0.130***	-0.134***
	(0.017)	(0.011)	(0.016)	(0.010)	(0.015)	(0.022)	(0.010)	(0.018)
May	-0.020	-0.014	-0.005	-0.014	-0.006	-0.018	-0.012	-0.010
	(0.017)	(0.010)	(0.016)	(0.010)	(0.015)	(0.022)	(0.010)	(0.018)
Jun	-0.024	-0.039***	-0.029*	-0.037***	-0.033**	-0.028	-0.041***	-0.039**
	(0.017)	(0.010)	(0.016)	(0.010)	(0.015)	(0.022)	(0.010)	(0.018)
Jul	0.011	0.007	0.002	0.009	-0.007	0.002	0.003	-0.016
	(0.017)	(0.010)	(0.016)	(0.010)	(0.015)	(0.022)	(0.011)	(0.018)
Aug	0.018	-0.018*	-0.022	-0.017	-0.029*	0.003	-0.023**	-0.040**
	(0.017)	(0.010)	(0.016)	(0.010)	(0.015)	(0.022)	(0.011)	(0.018)
Sep	0.028	0.029***	0.009	0.030***	0.003	0.015	0.025**	-0.009
	(0.017)	(0.011)	(0.016)	(0.010)	(0.015)	(0.022)	(0.011)	(0.018)
Oct	0.040**	0.039***	0.019	0.040***	0.013	0.030	0.036***	0.005
	(0.017)	(0.011)	(0.016)	(0.010)	(0.015)	(0.022)	(0.011)	(0.018)
Nov	-0.029	-0.061***	-0.064***	-0.058***	-0.068***	-0.036	-0.064***	-0.069***
	(0.017)	(0.010)	(0.016)	(0.010)	(0.015)	(0.022)	(0.010)	(0.017)
Constant	-0.870	1.167	7.449**	0.400	-6.731*	2.578	1.665	1.535
	(1.360)	(1.479)	(2.833)	(1.264)	(3.543)	(1.581)	(1.159)	(2.231)
Observations	61	61	61	61	61	61	61	61
R^2	0.881	0.904	0.848	0.911	0.867	0.807	0.906	0.821
Adjusted R^2	0.848	0.878	0.806	0.887	0.830	0.753	0.880	0.771

Residual Std. Error (df = 47)	0.027	0.017	0.025	0.016	0.024	0.034	0.016	0.028
F Statistic (df = 13; 47)	26.686***	34.169***	20.124***	37.054***	23.539***	15.103***	34.829***	16.580***
Note:								*p**p***p<0.01

	Nov 75-Nov 80	Mar 01-Mar 06	Jan 11- Jan16
	(9)	(10)	(11)
Jan	-0.060***	-0.053***	-0.103***
	(0.017)	(0.011)	(0.015)
Feb	-0.002	-0.008	-0.087***
	(0.018)	(0.011)	(0.016)
Mar	-0.082***	-0.068***	-0.133***
	(0.017)	(0.011)	(0.016)
Apr	-0.131***	-0.132***	-0.133***
	(0.017)	(0.011)	(0.016)
May	-0.02	-0.014	-0.004
	(0.017)	(0.01)	(0.015)
Jun	-0.024	-0.039***	-0.030*
	(0.017)	(0.011)	(0.016)
Jul	0.011	0.007	-0.002
	(0.017)	(0.011)	(0.016)
Aug	0.018	-0.018*	-0.028*
	(0.017)	(0.011)	(0.016)
Sep	0.028	0.029***	0.002
	(0.017)	(0.011)	(0.016)
Oct	0.040**	0.039***	0.013
	(0.017)	(0.011)	(0.016)
Nov	-0.029	-0.061***	-0.067***
	(0.017)	(0.011)	(0.015)
Constant	-0.918	1.175	4.974*
	(2.056)	(1.505)	(2.912)
Observations		61	61
R^2	61	61	61
Adjusted R^2	0.881	0.904	0.864
Residual Std. Error (df = 47)	0.844	0.875	0.822
F Statistic (df = 13; 47)	0.027	0.017	0.024