THE RATIONALE BEHIND TURKEY'S HIGH GASOLINE PRICES

Mehmet Efe Biresselioglu[a,*], Muhittin Hakan Demir[b] and Evrim Ozyorulmaz[c]

[a]Head of the Sustainable Energy Division and Associate Professor of Energy Security, Izmir University of Economics, Turkey

[b]Vice Dean of the Business School and Assistant Professor of Logistics and Supply Chain Management, Izmir University of Economics, Turkey

[c]Ph.D. Candidate and Research Assistant in the Department of Economics, Izmir University of Economics, Turkey

ABSTRACT

As oil prices increase, companies experience rising costs and falling profits, leaving governments to deal with the increasing interest rate, inflation and unemployment. However, on the consumer side, the key concern of increasing oil prices is their direct impact on the gasoline pump prices. Consequently, oil price rises have always been an important part of the public debate, especially in countries experiencing high prices for gasoline, such as Turkey. After decades of high prices, Turkey has the most expensive gasoline in the world, at 2.64 $/litre as of Quarter 2 of 2013. The aim of this paper is to reveal which factors are most important in determining gasoline pump prices in Turkey. In addition, a comparison of the periods with different pricing regimes is presented in order to demonstrate the actual effects of policy changes imposed by the government. The results show that, rather than the market variables, retail pump prices are primarily determined by variables that are more of a macroeconomic nature. This conclusion suggests that these market variables are utilized by companies in the market as tools for regulating prices that can be perceived an informal automatic price regulation mechanism.

Keywords: Gasoline pump price, Turkey, pricing regime, OLS, public policy, evaluation.

*Corresponding author. Tel: +90 232 488 9857 (work). Postal Address: Sakarya Cad. No:156 35330 Balçova, Izmir/TURKIYE

E-mail addresses: efe.biresselioglu@ieu.edu.tr (M.E.Biresselioglu), muhittin.demir@ieu.edu.tr (M.H. Demir), evrim.ozyorulmaz@ieu.edu.tr (E.Ozyorulmaz).

1. INTRODUCTION

It is well-known that the crude oil prices are of vital importance for the world economy. In the literature, there have been many studies on the relationship between the increasing oil prices and the economic performance of countries. Even though most of the studies primarily focus on the United States (US) [1, 2, 3]; the other countries have also been analyzed including developing and developed economies [4, 5, 6, 7, 8].

Previous studies in the literature suggest that oil prices have significant impacts on two main areas: The primary impact of high oil prices is on production. The amount of output that companies are able to produce with the similar amount of capital and labour decrease, and result in a reduction in productivity [9].

The secondary impact of the increasing oil prices is on the monetary policy of individual countries, because a decline in production decreases real wage growth and increases the unemployment rate, accelerating inflation [10]. The studies of Mory [11] and Mork et al. [12] also argued that the decrease in real wages triggers increased borrowing or reduced saving in the population as a whole, and this affects the equilibrium of the real interest rate, which results an increase in the real interest rate. Overall, these studies interpret that increasing oil prices have an impact on the production, real interest rate, inflation and unemployment of an individual country, and the globe. Hence, it can be concluded that oil prices are the primary indicator of the global economy.

Oil prices affect companies in terms of costs and profits; governments have to deal with increasing interest rate, inflation and unemployment. However, for consumers, meaning the taxpaying citizens, the real impact is rather different. Even though it does not directly affect the consumer spending, the key concern of increasing oil prices is its direct impact on gasoline pump prices rather than its long term impact over the other economic issues. Consequently, oil price increases have always been highlighted in the public debate. It is also topic of key interest for the news media, including TV channels, radio, newspapers and magazines since it has also a direct impact on daily life.

Accordingly, the discussion on high oil prices has also emerged as an important topic in academia during the past decades. There are many studies dealing with the relationship between the crude oil prices and pump price of gasoline, the formation of the gasoline prices, gasoline consumption, and the different tax regimes imposed by countries [13, 14, 15, 16]. The studies vary in terms of their scope, regarding the number of countries, the data period, time frequency, the price data, the independent variables (e.g. exchange rate, interest rate, inflation etc.) and the tax data. Especially, the difference in gasoline prices between countries have always been a primary concern for the countries experiencing high gasoline prices, such as Turkey.

2. DIFFERENT ASPECTS OF HIGH GASOLINE PRICES IN TURKEY

Turkey has been experiencing high gasoline prices over several decades, and has the highest price of a litre of gasoline in the world as of Quarter 2 of 2013, at 2.64 $/l, as demonstrated in Figure 1 [17]. It is followed by Norway at 2.63 $/l, Netherlands and Italy at 2.36 $/l and France at 2.25 $/l. Conversely, the price of a litre of gasoline is lower in neighbouring countries, such as Iran, Bulgaria and Greece is 0.57 $, 1.71 $ and 2.22$ respectively. In order to make a more comprehensive analysis on the

relatively high price of a litre of gasoline in Turkey, this study uses data from the IMF database [18] for Gross Domestic product per capita in US dollars of 2012. According to the data, Turkey's GDP per Capita is 10.609 $, similar to Argentina, Malaysia and Mexico with 11.576 $, 10.304 $ and 10.247 $, respectively. However, the price of a litre of gasoline in these countries varies significantly. As mentioned, price of a litre of gasoline in Turkey is 2.64 $/l, much higher than in Argentina, Malaysia and Mexico, where the price is 1.38 $/l, 0.61 $/l and 0.90 $/l, respectively.

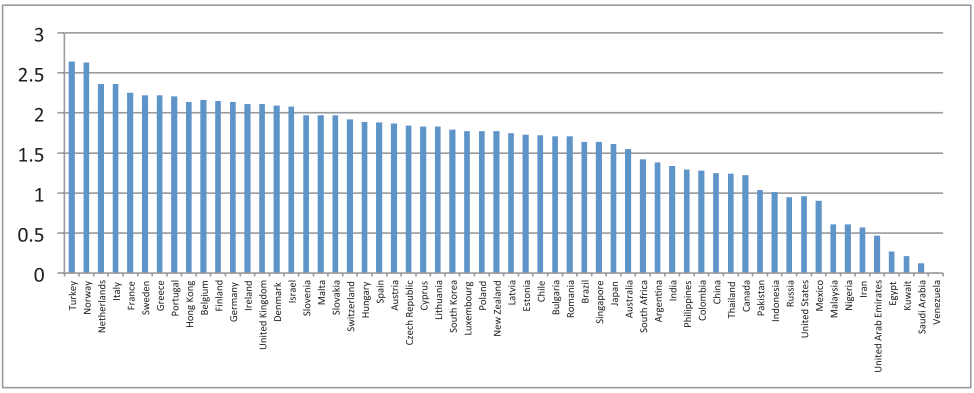

Figure 1. The price of a litre of gasoline ($) in 60 selected countries.
Source: Bloomberg, Report on Gasoline Prices by Country [19]

Moreover, in a comparison of the cost of a litre of gasoline as a proportion of the daily wage between 60 selected countries as of Quarter 2 of 2013, Turkey is ranked in 6th place, with 8.56 per cent following India with 30.69 per cent, Pakistan with 29.11 per cent, Philippines with 16.16 per cent, Nigeria with 13.29 per cent and Indonesia with 9.69 per cent, as shown in Figure 2 [20]. Therefore, from every perspective, it is clear that the Turkish public is experiencing very high gasoline prices .

One of the main reasons of this high price is the high proportion of taxes in retail gasoline prices. For instance, the share of Special Consumption tax (SCT) is 46.72 per cent and Added Value Tax (AVT) is 15.25 per cent, totalling 61.97 per cent of the price of Unleaded Gasoline 95 Octane, the most consumed gasoline, as shown in Figure 3 [23].

In addition to the share in pump price, Turkey's tax burden in terms of euro per litre is the highest in the world, at 0.82 €/l, as shown in Figure 4, followed by Italy at 0.73 €/l, United Kingdom at 0.7 €/l, the Netherlands at 0,67 €/l and Germany at 0.65 €/l [24]. It is important to note that oil exporter countries have more tax than oil producer countries. Since it is an important tool to decrease the oil consumption. This could later reflect to decrease the oil dependency of the individual countries.

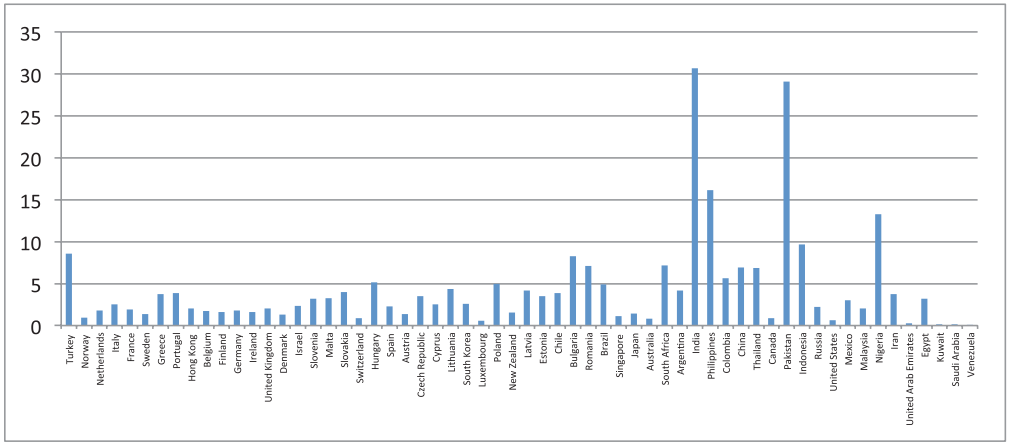

Figure 2. Rate of a day's wages needed to buy a litre of gasoline (%) in 60 selected countries. Source: Bloomberg, Report on Gasoline Prices by Country [21]

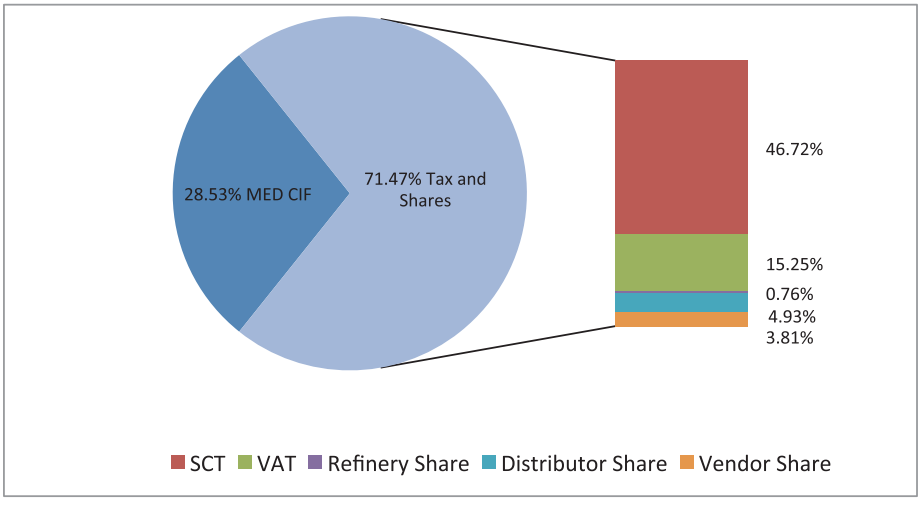

Figure 3. Share of Tax and Sales Channels in Unleaded Gasoline 95 Octane Price Source: EMRA, Petrol Sector Report 2012 [22]

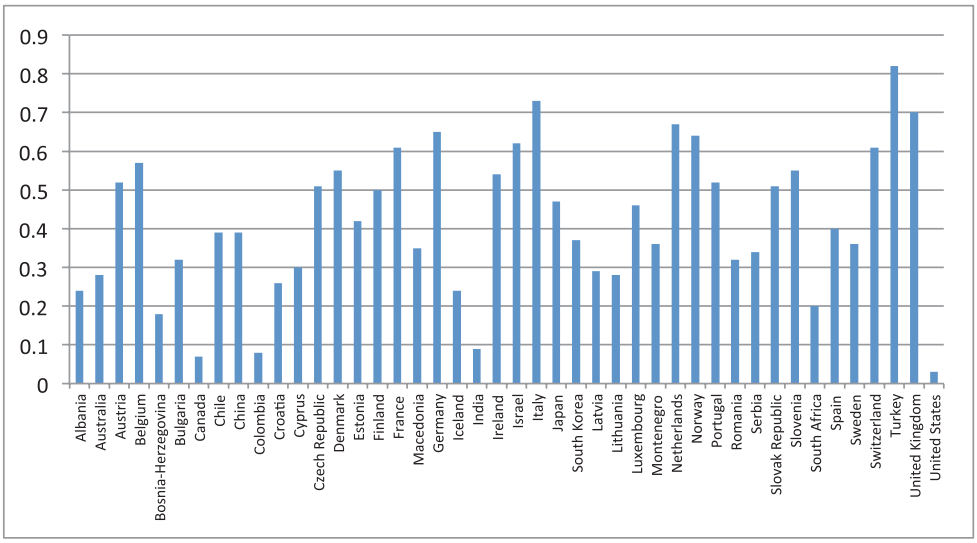

Figure 4. Tax Rates in Euro per litre of Unleaded Gasoline in various countries (2012) Source: European Environment Agency [25]

In a study on this aspect of gasoline prices, Davoust [26] examined fuel prices and tax levels in industrialized countries, the members of the Organisation for Economic Co-operation and Development (OECD) within a comparative perspective where gasoline and diesel has been analyzed. The results of the study show that within the industrialized countries, the final price of regular unleaded gasoline can be divided in three groups, according to the tax policy of the country: 1. Moderate price countries due to low taxes (Canada, North America, Mexico and US) 2. High price countries (Europe including Turkey), and 3. Intermediate price countries (Asia-Oceania; Japan, South Korea, Australia, and New Zealand). Since 1995, Turkey has greatly raised fuel prices in order to compensate for decrease in actual tax revenue caused by excessive inflation [27].

The literature on the impact of a change in global crude oil prices on retail gasoline prices in Turkey is currently underdeveloped in terms of number of studies. Typically, studies do not specifically focus on the gasoline prices in Turkey, but rather consider it as a side issue while investigating other topics [28, 29, 30, 31]. According to the studies and daily life experiences, the common criticism is that the domestic gasoline prices respond more slowly to the decreasing world crude oil prices, while they have a more rapid response to increasing prices. Bacon [32] explains this phenomenon as "Rockets and Feathers" impact, as the gasoline prices increase at rocket speed, but fall as slowly as a feather.

Galoetti et al. [33] has revisited Bacon's [34] study within the case of the European gasoline market, using 15 years (1985-2000) monthly data for the countries France, Germany, Italy, Spain and the U.K. The study reveals a price asymmetry between of "retail gasoline and spot gasoline", and also between "spot gasoline and crude oil" for

these 5 European countries. A study for the same countries for a more recent time period (1985-2003) conducted by Grasso and Manera [35] provides a detailed comparison of the three most popular models designed to describe asymmetric price behaviour. Using different models, some of their findings, suggest that all the European countries are affected by asymmetries, while other findings are mixed.

The previous studies in the existing literature on the relationship between the crude oil prices and gasoline prices in Turkey focused on the asymmetrical relationship. The study of Alper and Torul [36] was is the first to investigate this issue for Turkey. The study investigates empirically the response of Turkish gasoline prices to the increasing world crude oil prices, and identifies a significant relationship, using a structural-VAR analysis and monthly data; however, this is relationship was not found in the case of decreasing world prices. In the result of the study, it is argued that Turkish fiscal authorities tried to maximize tax revenues rather than levelling the impact of volatility in world crude oil prices on gasoline prices. Bor and İsmihan [37] also argues that the Turkish government was successful in imposing an exceptionally high tax burden on gasoline over the longer term, by adjusting non-salient excise tax amounts on gasoline price.

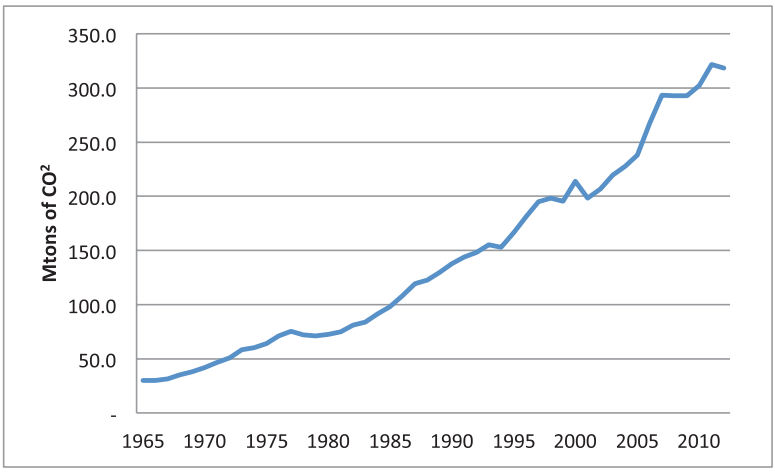

Figure 5. Turkey's Carbon Dioxide Emissions (1965-2012)
Source: BP Statistical Review of World Energy 2013 [38]

Over the last 50 years, Turkey's carbon dioxide emission has been increasing rapidly parallel to its rapid economic development, as shown in Figure 5 [39]. According to the World Bank data, Turkey's CO_2 emissions per capita has increased from 0,88 metric tons in 1965 to 2,70 metric tons in 1990, and to 4,13 metric tons in 2011 [40]. This points to a 370% increase within a 46-years period (1965-2011) and a 53% increase within the more recent 21-years period (1990 to 2011). Turkey's CO_2 emissions are much lower still, when compared to the per capita CO_2 emissions of USA (17,5 metric tons), Japan (9,18 metric tons), Germany (9,11 metric tons), UK

(7,92 metric tons) and China (6,19 metric tons) [41]. Therefore, reducing CO_2 emissions has not yet been a priority item in Turkey's agenda.

Globally, transportation sector is the second largest emitter of greenhouse gases accounting for approximately 22% of emissions, following energy sector which accounts for 41% of emissions [42]. Eurostat data reveals that this is also true for Europe [43]. All models of transportation contribute to climate change due to emitting greenhouse gases, road transport being the largest emitter among all [44]. As shown in Figure 6 [45], transportation sector is responsible for more than 20 per cent of the greenhouse gas emissions for almost all European countries. And among all, road transport is almost responsible for about three quarters.

Figure 6. The Share of Transportation Sector in Total Greenhouse Gases of the EU members and Turkey (2011)
Source: Eurostat [46]

However, the situation in Turkey is again rather different from its European counterparts. Transportation sector is only responsible of 11 per cent of the total greenhouse gas emissions, well below the EU average and the lowest compared to all European countries (Figure 6 [47]). Similar to trends in the EU, road transport is still the largest contributor. As displayed in Figure 7, more than 85 per cent of transport related greenhouse gas emissions in Turkey are from road transport [48].

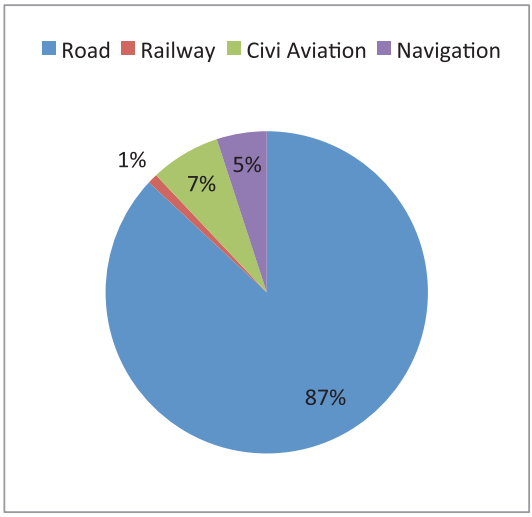

Figure 7. Greenhouse Gas Emissions from Transport, by mode of Transport in Turkey (2011)
Source: Eurostat [49]

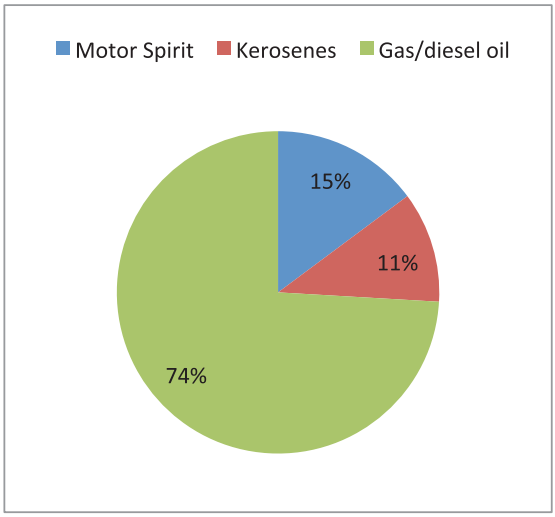

Figure 8. Final Energy Consumption in Transport, by fuel (2011)
Source: Eurostat [50]

When types of fuel are concerned, gas and diesel oil have the major share with 74 per cent in Turkey's total final energy consumption in transport, as demonstrated in Figure 8 [51]. Therefore, gas and diesel oil consumptions are among the main contributors to total greenhouse gas emissions of Turkey.

Globally governments implement policies to decrease the adverse affects of gas and diesel oil consumptions on the environment. One of the common tools is to encourage lesser through pricing policies. In some instances, these policies and other taxes are the primary drivers in the formation of gas prices. However for Turkey, as discussed, this is not exactly the case. That is, environmental considerations are not yet a primary concern for setting the gas pricing policies for the governments. This is mainly because Turkey's CO_2 per capita level is well below EU average. For that reason, current study does not include CO_2 emissions or environmental regulations as a variable, since these are not included in the price formulation rationale in Turkey.

To this end, the aim of this paper is to reveal which factors significantly influence gasoline pump prices in Turkey. A further aim is to identify the practical effects of CIF Mediterranean product prices, exchange rates, distributors' margins, inflation rate,

transportation costs and, naturally, taxes on gasoline pump prices through a regression analysis. Finally, a comparison of periods with different pricing regimes will be presented in order to demonstrate the actual effect policy changes imposed by the government.

3. FORMATION OF FUEL PRICES IN TURKEY

Two different periods can be marked in the identification, and implementation and control of fuel product prices (gasoline, diesel, kerosene, heavy fuel oil, heating oil and LPG) in Turkey, namely the Automatic Price Mechanism (APM) period, and the Free Market Model period. Responsibilities for these periods were held first by the General Directorate of Petroleum Affairs for the years between 1998-2005, and then by the Energy Market Regulatory Authority (EMRA) from 2005 until the present.

To give a historical perspective, the Act (Act No. 79[1]) dating back to 1960 was amended by Act No. 3571[2] in 1989. The more recent act gave importers, refining and distribution companies and gas stations the authority to set their own prices for crude oil and petroleum products. However under this provision in the same Act, the Council of Ministers was given "the authority to establish the principles on trading and distribution of crude oil and petroleum products taking into consideration the developments in international markets, if necessary" (Act No. 3571, 1989). This allowed continuing government intervention over determining the refinery prices of petroleum products while during this period, distribution companies were able to freely determine retail prices. Prices and distribution costs were taken by all companies from those determined by Petrol Ofisi AS, which used to operate as a public institution before privatization.

The APM period starts with the Decree No. 98/10745[3] dated as 02/23/1998, whereby determination of prices of petroleum products has been *automated*. In this period, changes in prices were determined based on changes in the world prices of petroleum products and dollar exchange rate by refineries and distribution companies (within the framework of the Decree). With the transition of the APM in 1998, the refining sector began to work in accordance with world prices. One other outcome of this decree was that the total profit of distributors and dealers was to be determined in US dollar terms.

---

[1]Act No. 79, (1960). The Act Regarding to the Amnesty National Protection Offenses, Liquidation of National Protection Organisation, Capital and Fund Accounts, and Formation of Certain Provisions (Repealed).

[2]Act No. 3571, (1989). The Act Regarding to the Amendments on Dock Official Act No.827, Corporate Income Tax Act No.5422, Income Tax Act No.193, Value Added Tax Act No.3065, Fuel Consumption Tax Act No.3074, and The Act Regarding to the Amnesty National Protection Offenses, Liquidation of National Protection Organisation, Capital and Fund Accounts, and Formation of Certain Provisions; and Repealing Some of the Articles of the Act No. 3074 and dated as 11/07/1984, Act No. 2985 and dated as 03/02/1984, Act No. 3238 and dated as 11/07/1985, and Acts No. 3294 and dated as 05/29/1986.

[3]Decree No. 98/10745, (1998). Decree on the Principles about Buying, Selling and Pricing Decisions of Crude Oil and Petroleum Products.

Other developments in the legal framework concerning the APM period were as follows:

- In 2000, "lump-sum tax" system was launched (Article 6. of Act No. 4503[4] published in the Official Gazette No. 23948 dated as 01/29/2000).
- In 2002, "Fuel Price Stabilization Share" and "Fuel Consumption Tax" was abolished; and the tax known as "Special Consumption Tax (SCT)" was implemented. (Excise Tax Act No. 4760[5] published in the Official Gazette No. 24783 dated as 06/12/2002).

4. DETERMINATION OF FUEL PRICES

In the APM period, the 3 components of the fuel prices are computed as follows:

a) Product Price: During the APM period, ex-refinery prices were linked to CIF Mediterranean product prices and official exchange rates, whereby a ceiling price is adopted, based on the past 7 days' data. Refineries and distribution companies were permitted to freely adjust the price of products if the rolling seven day of import parity price resulted in a price that fell outside +/- 3% of the import parity price corridor. The *import parity price* was also calculated by multiplying the CIF price of the product with the Central Banks' selling exchange rate of the same day.

If the price fell outside of the price corridor, a new set of price became necessary. Calculation of the ceiling price was set by multiplying the average CIF MED price over the previous 5 days with Central Bank average dollar rate for the same period, which thus sets the mean value of the price corridor (+/- 3%).

b) Transportation and Distribution Share: Land and sea transportation fees (freight) are revised every 3 months, with resets to changes in the exchange rate and fuel prices. The distribution margin is a fixed amount with respect to US dollars (Communiqué No. 98/3[6], 1998).

[4]Act No. 4503. (2000). The Act Regarding to the Amendment in Value Added Tax Act, The Act of Duties, Financing Act, Fuel Consumption Tax Act, Corporate Income tax Act, The Tax Procedure Act and The Act No. 4481.

[5]Act No. 4760, (2002). Excise Tax Act.

[6]Communiqué No. 98/3, (1998). The Communiqué Regarding to the Principles about Buying, Selling and Pricing Decisions of Crude Oil and Petroleum Products and to the Implementation on the Decision of the Functioning of Fuel Price Stabilization Fund.

c) Taxes:

Table 1. Amount of Excise Duties

PRODUCTS	UNIT	SCT (as of 01/01/2005)	SCT (as of 12/31/2009)	SCT (as of 09/20/2012)
95-octane unleaded fuel	**TL/Lt**	1.6915	1.8915	2.1765
98-octane unleaded fuel	**TL/Lt**	1.8915	2.0135	2.2985
Doped 95-octane unleaded fuel	**TL/Lt**	1.6915	1.8915	2.1765
Rural Diesel	**TL/Lt**	1.0845	1.2345	1.5245
Diesel (Low-sulphur)	**TL/Lt**	1.1545	1.3045	1.5945
Kerosene	**TL/Lt**	0.7605	0.7605	0.9367
Fuel Oil No: 6	**TL/Kg**	0.2240	0.2240	0.2240
Autogas LPG	**TL/Lt**	0.6149	0.7157	1.2780
Other LPG	**TL/Kg**	1.0300	1.2100	1.2100
Natural Gas (home+industry)	**TL/m3**	0.2300	0.2300	0.0230
Natural Gas (motor vehicles)	**TL/m3**	0.6964	0.6964	0.6964

Source: Decisions of the Council of Ministers published in Official Gazette No. 2012/3735, No. 2009/15725, No. 2005/8414

Special Consumption Tax (SCT)*:* SCT is an indirect tax which was implemented in 2002 by the Act No. 4760. SCT is not calculated as a percentage, but it is determined as a lump-sum. The Council of Ministers has the authority to determine the monthly SCT rate. The Council of Ministers utilizes SCT to stabilize domestic oil prices, when there are sharp fluctuations in international oil prices and the USD/TL exchange rate. The values for different product types as of 2005 are shown in Table 1.

Value Added Tax (VAT): Value Added Tax Act No. 3065[7] entered into force on 1984 and was implemented at the flat rate of 18% for fuel products to the sum of product price, SCT, distribution and transportation share on all petroleum products.

[7]Act No. 3065, (1984). Value Added Tax Act.

5. PERIOD OF FREE MARKET MODEL (2005-CURRENT)

In accordance with the Petroleum Market Act No. 5015[8], this came into force as of 2005, superseding the APM period.

According to this Act, the previously state-owned refinery monopoly, TUPRAS, announces its ex-refinery ceiling price through the regulatory body EMRA. Based on this ceiling price, distribution companies determine their fuel pump ceiling prices. These prices are also announced online by EMRA, through a publicly accessible portal. Even though ceiling prices are set following the principles of a free market economy, dealers are free to sell above or below these prices. However, EMRA is authorized to take the necessary measures and to determine a binding ceiling price when actions aimed at blocking or restricting competition in the oil market create disturbances in the market. EMRA intervention of is permitted to last a maximum of 2 months.

6. RESEARCH DESIGN

The following analysis aims to reveal the actual drivers of gasoline pump price in Turkey, along with the type and magnitudes of the contributions of variables that are in effect. Hence, a functional defining relationship will be obtained. In addition to revealing the relative influences of the different variables on pump prices, the analysis will also make it possible to test various conjectures about oil prices, such as the degree to which refineries and distributors may practically impose their authority, and the extent to which tax policy influences prices. Through a comparison of the results of the analysis for the pre-2005 and post-2005 periods, the effects of the policy shift in 2005 will also be evaluated. Although the policy shift in 2005 aimed to create a functioning free market economy, it is still debated whether this has been actually achieved, and it is important therefore to assess how effectively the market economy is functioning.

6.1. Data

The data for the APM (Automatic Pricing Mechanism) period between the years of 1998-2005 used in this study is obtained from General Directorate of Petroleum Affairs. The daily pump price for the 2005-2012 periods is taken from Petrol Ofisi, the daily Europe Brent Spot FOB Oil Price is obtained from US Energy Information Administration, the currency exchange rate data is taken from Central Bank of Turkey, and the data corresponding to all other variables are from Deniz Investment databank.

6.2. Research Model

The functional relationship between the dependent variables and pump prices were investigated using regression models. Various models involving combinations, inclusions/exclusions of independent variables were constructed and analyzed using the EViews7 statistical analysis software, for each of the two periods. The models that best explain the pump prices were then chosen as the defining models for the 1998 - 2004 and 2005 - 2012 periods.

[8]Act No. 5015, (2003). Petroleum Market Act.

The 1998-2004 period is characterized by the ceiling price implementation. The components of pump prices are CIF Mediterranean product prices, exchange rates, distributors' margins, transportation costs and naturally taxes and other funds. The underlying regression model utilized in this study involves the aforementioned variables, as well as Brent oil prices, consumption, and inflation rate. The regression model allows the determination of the linear and logarithmic relationships between the independent variables and pump prices.

Hence, the 1998-2004 periods, the regression model is obtained as follows:

$$PUMP\_PR= \beta_0 + \beta_1 BRE\_OIL + \beta_2 CIFMED + \beta_3 CONS + \beta_4 EXC\_RAT + \beta_5 INF \quad (1)$$

For the 'free market' period of 2005 – 2012, the regression model involves the variables that are more directly related with macro drivers of the economy and the oil market. The variables involved are the CIF Mediterranean product prices, consumption, inflation rate and exchange rates. An analysis of the data suggests that the 2008 global economic crisis also has both direct and indirect effects on pump prices. Therefore, the crisis is included in the regression model as an indicator variable. As with the model for the regression model corresponding to the 1998 – 2004 period, this model also allows the determination of logarithmic as well as linear relationships between dependent and independent variables.

The 2005 – 2012 model is constructed as follows:

$$PUMP\_PR= \beta_0 + \beta_1 CIFMED + \beta_2 CONS + \beta_3 EXC\_RAT + \beta_4 INF + DUM \quad (2)$$

6.3. Unit Root Test Results

There are various unit root tests which can rarely work through different results. In this paper, for the robustness check of the results, three different unit root tests; augmented Dickey–Fuller (ADF), Phillips–Perron (PP) and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) are employed respectively.

Unit root test result for all the variables are presented for both 1998-2004 and 2005-2012 time periods separately, in Table 2A and Table 2B.

For the 1998-2004 APM period, the results of ADF, PP, and KPSS tests indicate that the series BRE_OIL, CIFMED, EXC_RAT and INF are stationary in their first differences, namely they are I(1). However the consumption (CONS) series is I (0), namely they are stationary in levels for ADF and PP, whereas I(1) for KPSS. Since the two tests yield the same results, we accept these series I(0).

For the 2005-2012 Free Market Model period, the series EXC_RAT and CIFMED are I(1), stationary in first difference by ADF, PP,KPSS. For series CONS and INF, ADF and PP indicate the series is I (0), but also stationary in their first difference. KPSS indicates it is I (1). So, it is accepted as I (1).

Table 2A. Unit Root Test Results (1998-2004)

Variables	ADF-test	PP-test	KPSS-test
Panel A: Level (Intercept and Trend)			
BRE_OIL	-2.459 (0)	-2.47444 (4)	0.578*** (39)
CIFMED	-2.007081 (0)	-2.028375 (8)	0.495340*** (39)
CONS	-5.05505*** (0)	-5.29072***(10)	0.149347** (39)
INF	-1.60081(0)	-1.51267(11)	1.326204*** (39)
EXC_RATE	-0.290253 (0)	-0.278103 (11)	1.318745*** (39)
Panel B: First difference (Intercept and Trend)			
BRE_OIL	-48.10500*** (0)	-48.10298*** (2)	0.048 (0)
CIFMED	-48.70993*** (0)	-48.70994*** (6)	0.060877 (6)
CONS	-48.6949***(0)	-48.6949***(0)	0.011369(0)
INF	-49.1324***(0)	-4.92115***(12)	0.013347(12)
EXC_RATE	-49.07440*** (0)	-49.07504*** (11)	0.099323 (11)

Notes to Table: The null hypothesis is the existence of unit root for ADF, PP, and tests, whereas the stationarity for KPSS test. In the table superscripts ***, **, *denote the rejection of the null hypothesis, and the significance at 1%, 5% and 10% critical levels respectively. Lag lengths are in parentheses, along with lag selection criteria SIC. ADF, PP critical values are sourced from MacKinnon (1996). KPSS critical values are from Kwiatkowski et al. (1992).

Table 2B. Unit Root Test Results (2005-2012)

Variables	ADF-test	PP-test	KPSS-test
Panel A: Level (Intercept and Trend)			
CIFMED	-2.03336 (0)	-2.05525 (1)	0.351912*** (40)
CONS	-3.51123**(0)	-3.54261** (6)	0.293191*** (41)
INF	-3.47042**(0)	-3.33179* (1)	0.845708*** (41)
EXC_RATE	-2.629320 (0)	-2.508659 (20)	0.616954*** (42)
Panel B: First difference (Intercept and Trend)			
CIFMED	-4.84607*** (0)	-48.4521*** (5)	0.055804(4)
CONS	-51.412*** (0)	-51.412*** (1)	0.024753 (1)
INF	-54.0536*** (0)	-54.2903*** (15)	0.018315(16)
EXC_RATE	-55.53680***(0)	-55.65133 *** (21)	0.035105 (22)

Notes to Table: The null hypothesis is the existence of unit root for ADF, PP, and tests, whereas the stationarity for KPSS test. In the table superscripts ***, **, *denote the rejection of the null hypothesis, and the significance at 1%, 5% and 10% critical levels respectively. Lag lengths are in parentheses, along with lag selection criteria SIC. ADF, PP critical values are sourced from MacKinnon (1996). KPSS critical values are from Kwiatkowski et al. (1992).

6.4. Descriptive Statistics

Table 3A and Table 3B present descriptive statistics for all observations containing mean, median, standard deviation, minimum and maximum value of all variables.

Table 3A. Descriptive Statistics (1998-2004)

Variables	Mean	Median	Standard Deviation	Minimum	Maximum
PUMP_PR	13.696	13.997	0.759	12.156	14.645
BRE_OIL	-1.867	-1.799	0.353	-2.860	-1.112
CIFMED	-1.477	-1.441	0.318	-2.333	-0.902
CONS	15.371	15.393	0.288	14.652	16.229
EXC_RAT	13.711	14.093	0.605	12.492	14.362
INF	4.972	5.183	0.656	3.612	5.774

Table 3B.Descriptive Statistics (2005-2012)

Variables	Mean	Median	Standard Deviation	Minimum	Maximum
PUMP_PR	1.191	1.170	0.192	0.820	1.590
CIFMED	6.620	6.610	0.276	5.780	7.120
CONS	8.859	8.850	0.152	8.530	9.230
EXC_RAT	0.385	0.390	0.126	0.140	0.650
INF	6.084	6.110	0.182	5.750	6.390

7. RESULTS AND FINDINGS

Results of the regression analysis concerning the pump prices for the 1998-2004 period can be seen in Table 4A and Table 4B.

The high value of R-square shows that the regression model is capable of explaining the relationship between the dependent and independent variables. The underlying model suggested by the regression needs to be evaluated using the significance level values. The significance levels identify the variable 'CONS', that is, the natural logarithm of total consumption in litres, as statistically insignificant. The remaining variables are statistically significant: 'BREN_OIL', the natural logarithm of Brent oil prices in USD per litre, 'CIFMED', natural logarithm of CIF Mediterranean prices in USD per litre, 'EXC_RAT', the official currency exchange rate USD/TL, and 'INF', natural logarithm of the inflation rate.

Table 4A. OLS Regression Results (1998 – 2004)

Dependent Variable: PUMP_PR	Model 1
BRE_OIL	0.180*** (0.016)
CIFMED	0.061*** (0.015)
CONS	- 0.006 (0.008)
EXC_RAT	0.429*** (0.009)
INF	0.671*** (0.009)
DUM	-
Observations (n)	2376
F-value	53597.49*** (0.000)
Average Adj. R-square	0.99

For the APM period of 1998 to 2004, the regression results justify the price model which states that fluctuations in pump prices arise from the joint effect of the changes in oil prices (Brent and CIF Mediterranean prices) in terms of USD/TL, and in changes in the USD/TL currency rates, the product of which actually defines the TL value of CIF Mediterranean prices, as shown in Table 4a. Coexistence of both Brent and CIF Mediterranean oil prices in the formulation point to the effect changes in freight and insurance premiums. In addition to these variables, changes in the inflation rate also affect the pump prices. Interestingly, the retail pump prices are primarily determined by variables that are more of a macroeconomic nature, rather than the market variables such as distributors' margins and land transportation rates. This conclusion suggests that these market variables are utilized by companies in the market as tools for regulating prices, within the context of an informal automatic price regulation mechanism. That is, for minor fluctuations in macroeconomic variables, the market variables are altered by, for instance, distributors accepting a reduction in profit, or by decreasing profits at the pump, in order to absorb these fluctuations, hence keep the changes at pump prices to a minimum.

For the 'free market economy' period, 2005 – 2012, results of the regression analysis for the pump prices can be seen in Table 4b.

Table 4B. OLS Regression Results (2005 – 2012)

Dependent Variable: PUMP_PR	Model 2
BRE_OIL	-
	0.287***
CIFMED	(0.007)
	- 0.012
CONS	(0.013)
	0.257
EXC_RAT	(0.018)
	0.601
INF	(0.019)
	- 0.007*
DUM	(0.004)
Observations (n)	2280
F-value	13936.51*** (0.000)
Average Adj. R-square	0.96

The R-squared value for this regression is at the level of 0.96 and points to the validity of the model. The significance level for the variable 'CONS' and the natural logarithm of the consumption show that this variable is statistically insignificant. The other remaining independent variables are statistically significant: 'CIFMED', the natural logarithm of CIF Mediterranean prices, 'EXC_RAT, the natural logarithm of the USD/TL currency exchange rate, 'INF', the natural logarithm of the inflation rate. The indicator variable corresponding to the global economic crisis in 2008 also turns out to be statistically significant.

Factoring out the effect of the 2008 crisis, it can be seen that the main determinants of the pump price for the 'free market' period are similar to those for the APM period. The effects and the magnitudes are, however, different. The Brent oil price is excluded from the functional relationship for the post-2005 period. The inflation rate has a very similar coefficient in both models. The effect of variations in the exchange rates has diminished for the post-2005 period, whereas the changes in the CIF Mediterranean prices have had a greater effect on the pump prices. Hence, in the 'free market' period, compared to the effect of Brent oil prices, pump prices have been much more sensitive to the domestic inflation rate and CIF Mediterranean prices, that is, the principal price of oil valued at ports close to Turkish ports. The market variables are not explicitly included in the functional model. The aforementioned informal regulatory mechanisms are still in effect, and therefore the components of a free market economy

are not clearly demonstrated. The exception is in the case of the economic crisis, when the market responded by raising pump prices beyond the level suggested by the CIF prices, inflation, or exchange rates.

8. CONCLUSION

High oil prices have frequently been the subject of discussions in the media, as well as in scientific research articles. With a pump price of 2.64 USD per litre for 95-Octane unleaded gasoline as of Quarter 2 of 2013, Turkey faces the highest gasoline prices in the world. High oil prices are clearly a natural outcome of scarce resources, the dependence of vital economic activities on oil products, and the well-known supply-demand relationship in economies. However, geopolitical trends, such as political instability in oil producing countries, ethnic conflicts, and nationalist backlashes also have a direct impact on oil prices. Therefore, oil prices are responsive to numerous global drivers.

When domestic gasoline prices are considered, there are other factors that add another level of complexity to the formation of prices. Governmental policies, taxes and funds, legislations, profit shares of actors such as distributors, refineries in the market, domestic inflation rates, and currency exchange rates all contribute to the formation of pump prices. Comment in the media and the public usually attribute fluctuations in pump prices to government policies, rather than the changes in the global crude oil market. One of the common tools is to encourage lesser use through pricing policies, including higher gasoline taxes or fees [52]. In some instances, these policies and other taxes are the primary drivers in the formation of gas prices. However for Turkey, as discussed, this is not exactly the case. That is, environmental considerations are not yet a primary concern for setting the gas pricing policies for the governments. This is mainly because Turkey's CO_2 per capita level is well below EU average as discussed [53]. While many scientific studies discuss the asymmetry between crude oil prices and gasoline prices, this study takes a different approach and aims to identify the factors that affect the fluctuations in gasoline pump prices through statistical analysis. The variables that are taken into consideration are consumption, crude oil prices, exchange rates and inflation. In addition, a comparison between the APM (Automatic Pricing Mechanism) period (1998-2004) and free market period (2005-2012) highlights the role of variables, such as Brent oil prices and inflation that, are more of a macroeconomic nature as drivers of the fluctuations in pump prices for both periods. The results make it possible to compare the actual formation of prices with the stated formulations that include crude oil prices, CIF prices, exchange rates, distribution costs, distributors' profit margins and taxes. This comparison shows how the free market operates in the case of oil prices by adjusting the profit margins within ranges defined by the government. Past data shows that these adjustments are generally made towards maintaining a stable price, therefore can be perceived as an auto regulatory mechanism implemented by players in the market.

REFERENCES

[1] Renshaw, E. Identifying no growth years in the US economy: Using increases in crude oil prices. *Energy Economics* 1992; 14(2), 132-135.

[2] Oladosu, G. Identifying the oil price-macroeconomy relationship: An empirical mode decomposition analysis of US data. *Energy Policy* 2009; 37(12), 5417-5426.

[3] Ahmed, H.J.A., Bashar Omar H.M.N. and Wadud I.K.M. Mokhtarul. The transitory and permanent volatility of oil prices: What implications are there for the US industrial production?. Applied Energy 2012; 92, 447-455.

[4] Dogrul, H.G. and Soytas, U. Relationship between oil prices, interest rate, and unemployment: Evidence from an emerging market. *Energy Economics* 2010; 32(6), 1523-1528.

[5] He Y., Wan, S., Lai, K.K. Global economic activity and crude oil prices: A cointegration analysis. *Energy Economics* 2010; 32(4), 868-876.

[6] Cunado, J. and Perez de Gracia, F. Do oil price shocks matter? Evidence for some European countries. *Energy Economics* 2003; 25(2), 137-154.

[7] Cunado, J. and Perez de Gracia F. Oil prices, economic activity and inflation: evidence for some Asian countries. *The Quarterly Review of Economics and Finance* 2005; 45(1), 65-83.

[8] Brown, S.P.A. and Yücel, M.K. Energy prices and aggregate economic activity: an interpretative survey. *Quarterly Review of Economics and Finance* 2002; 42(2), 193–208.

[9] Abel, A.B. and Bernanke B.S. *Macroeconomics* (4th Edition), Addison Wesley Longman Inc., 2001; page 213.

[10] Ibid 8.

[11] Mory, J.F. Oil Prices and economic activity: Is the relationship symmetric?. *The Energy Journal* 1993; 14(4), 151-161.

[12] Mork, K.A., Olsen, O. and Mysen H.T. Macroeconomic Responses to Oil Price Increases and Decreases in Seven OECD Countries. *The Energy Journal* 1994; Vol.15 (4), 19-36.

[13] Borenstein, S. and Shepard A. Sticky prices, inventories, and market power in wholesale gasoline markets. *RAND Journal of Economics* 2002; 33(1), 116–13.

[14] Hendricks, K. and McAfee, R. Measuring Industry Concentration in Intermediate Goods. *University of British Columbia Department of Economics* 2000; Discussion Paper 00-01.

[15] Taylor, C., Kreisle, N. and Zimmerman, P. Vertical relationships and competition in retail gasoline markets: empirical evidence from contract changes in Southern California: comment. *American Economic Review* 2010; 100(3), 1269–1276.

[16] Akarca, A.T. and Andrianacos, D. The relationship between crude oil and gasoline prices. *International Advances in Economic Research* 1998; 4(3), 282–288.

[17] Bloomberg, Report on Gasoline Prices by Country. *http://www.bloomberg.com/visual-data/gas-prices*

[18] IMF Database, Gross Domestic Product per Capita, Current Prices in Selected Countries.

http://www.imf.org/external/pubs/ft/weo/2013/01/weodata

[19] Ibid 17.

[20] Ibid 17.

[21] Ibid 17.

[22] EMRA, Turkey 2012 Petrol Market Report. *http://www.emra.org.tr/documents/petroleum/publishments/Ppd_EMRA_SectoReport_2012_sgJPfn2bF6Qg.pdf*

[23] Ibid.

[24] OECD and European Environment Agency, Data for Tax Rates of Environmentally Related Taxes. *http://www2.oecd.org/ecoinst/queries/index.htm*

[25] Ibid.

[26] Davoust, R. Gasoline and Diesel Prices and Taxes in Industrialized Countries. *The Institut Français des Relations Internationales (Ifri)* 2008; The "European Governance and the Geopolitics of Energy" Program.

[27] Ibid.

[28] Nazlioglu, S. and Soytas, U. World Oil prices and agricultural commodity prices:Evidence from an emerging market. *Energy Economics* 2011; 33(3), 488-496.

[29] Sterner, T. Gasoline Demand in the OECD: choice of model and data set in pooled estimations. *OPEC Review* 1991; 15(2), 91-102.

[30] Sterner, T. Fuel Taxes: An important instrument for climate policy. *Energy Policy* 2007; 35(6), 3194-3202.

[31] Metschies, G.P. International Fuel Prices 2010/2011' provided by GIZ 2011. *http://www.giz.de/Themen/en/29957.htm*.

[32] Bacon, R.W. Rockets and feathers: the asymmetric speed of adjustment of UK retail gasoline prices to cost changes. *Energy Economics* 1991; 13(3), 211-218.

[33] Galeotti, M., Lanza, A. and Manera, M. Rockets and feathers revisited: an international comparison on European gasoline market. *Energy Economics* 2003; 25, 175.

[34] Ibid 32.

[35] Grasso, M. and Manera, M. Asymmetric error-correction models for the oil-gasoline price relationship. *Energy Policy* 2007; 35(1), 156-177.

[36] Alper, C.E. and Torul, O. Asymmetric adjustment of retail gasoline prices in Turkey to world crude oil price changes: the role of taxes. *Economics Bulletin* 2009; 29(2), 775-787.

[37] Bor, Ö. and İsmihan, M. Gasoline Pricing, Taxation and Asymmetry: The Case of Turkey. *Turkish Economic Association* 2013; Discussion Paper 2013/7. *http://www.tek.org.tr/dosyalar/BOR-ISMIHAN-oil.pdf*.

[38] BP, Statistical Review of World Energy 2013. *http://www.bp.com/en/global/corporate/about-bp/energy-economics/statistical-review-of-world-energy-2013.html*.

[39] Ibid.

[40] The World Bank, Data on CO_2 emissions (metric tons per capita). *http://data.worldbank.org/indicator/EN.ATM.CO2E.PC*.

[41] Ibid.

[42] International Energy Agency, IEA Statistics 2012 Edition. *https://www.iea.org/co2highlights/co2highlights.pdf*.

[43] Eurostat, Pocketbooks, Energy, transport and environment indicators-2013 edition, *http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-DK-13-001/EN/KS-DK-13-001-EN.PDF*.

[44] Ibid.

[45] Ibid 43.

[46] Ibid 43.

[47] Ibid 43.

[48] Ibid 43.

[49] Ibid 43

[50] Ibid 43.

[51] Ibid 43.

[52] Morrow, W.S., Gallagher, K.S., Colloantes, G. And Lee, H. Analysis of Policies to Reduce Oil Consumption and Greenhouse Gas Emissions from the U.S. Transportation Sector. *Energy Policy* 2010; 38(3), 1305-1320

[53] The World Bank, Data on CO_2 emissions (metric tons per capita). *http://data.worldbank.org/indicator/EN.ATM.CO2E.PC*.