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Abstract

The world's most expensive motor fuel (gasoline, diesel and LPG) is sold most likely in the Republic of Turkey. This paper investigates the key issues related to the motor fuel prices in Turkey. First of all, the paper analyses the main reason behind high prices, namely motor fuel taxes in Turkey. Then, it estimates the elasticity of motor fuel demand in Turkey using an econometric analysis. The findings indicate that motor fuel demand in Turkey is quite inelastic and, therefore, not responsive to price increases caused by an increase in either pre-tax prices or taxes. Therefore, fuel market in Turkey is open to opportunistic behaviour by firms (through excessive profits) and the government (through excessive taxes). Besides, the paper focuses on the impact of high motor fuel prices on road transport associated activities, including the pattern of passenger transportation, motorization rate, fuel use, total kilometers travelled and CO_2 emissions from road transportation. The impact of motor fuel prices on income distribution in Turkey and Turkish public opinion about high motor fuel prices are also among the subjects investigated in the course of the study.

Keywords: Model construction and estimation; fiscal policy; motor fuel prices

JEL Classification: *C51, D72, E62, H23, Q43*

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1 Introduction

With a gross domestic product (GDP) of $794.5 billion in 2012 and a population of 80.7 million people, Turkey is the 17th largest economy of the world (CIA, 2013). As can be seen in Table 1 (IEA, 2013b), Turkey is heavily dependent on fossil fuels to meet its energy requirements, with oil (27%), natural gas (32.7%), and coal (30.2%) being the predominant primary energy sources, accounting for a significant majority (90%) of the total primary energy supply. They also account for approximately 72.4% of the country's total final energy consumption. Turkey's domestic energy resources, especially those of oil and natural gas, are very limited; so its dependence on the imports is very high. Turkey imported 78.7% of its primary energy consumption in 2011.

Table 1. Energy balances of Turkey in 2011 (ktoe)

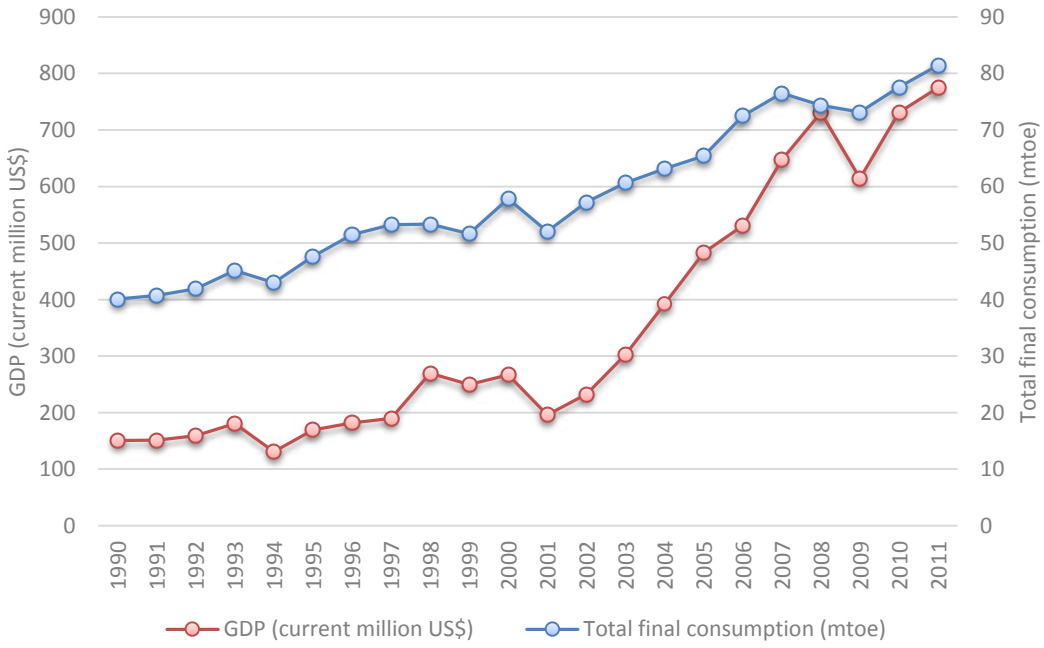
Flow / Product	Coal	Natural gas	Oil	Hydro	Other renewables	Electricity	Other	Total
Production	17,840	625	2,342	4,501	6,751	0	5	32,064
Imports	15,533	36,115	36,484	0	0	392	0	88,524
Exports	0	-588	-7,467	0	0	-313	0	-8,369
Other changes	553	625	-939	0	0	0	0	239
Total primary energy supply	**33,925**	**36,778**	**30,420**	**4,501**	**6,751**	**78**	**5**	**112,459**
% share	*30.2*	*32.7*	*27.0*	*4.0*	*6.0*	*0.1*	*0.0*	*100.0*
Power plants	-18,208	-17,753	39	-4,501	-1,118	19,728	1,216	-20,598
Losses	0	-4	0	0	0	-2,784	0	-2,787
Other	-2,623	-1,359	-2,230	0	-189	-4,001	0	-10,403
Total final energy consumption	**13,094**	**17,666**	**28,229**	**0**	**5,445**	**15,805**	**1,221**	**81,458**
Industry	6,939	7,877	1,559	0	0	7,366	1,216	24,957
Transport	0	219	14,557	0	11	58	5	14,849
Residential	5,786	7,225	1,275	0	5,434	3,807	0	23,528
Commercial and public services	278	2,040	0	0	0	4,131	0	6,449
Non-energy use	0	252	5,944	0	0	0	0	6,196
Other	90	52	4,894	0	0	443	0	5,479

Turkey's economy is increasingly driven by its industry and service sectors, although its agriculture sector is still responsible for about 25% of employment. An aggressive privatization program has reduced state involvement in infrastructure, industry, banking, transport, and communication sectors. Oil began to flow through the Baku-Tbilisi-Ceyhan pipeline in May 2006, marking a major milestone that will bring up to one million barrels per day from the Caspian to international oil markets. Several gas pipelines projects also are moving forward to help transport Central Asian gas to Europe through Turkey, which over the long term will help address Turkey's dependence on imported oil and gas to meet 97% of its energy needs. Turkey remains dependent on often unstable, short-term investment to finance its large trade deficit. The stock value of foreign direct investment stood at $117 billion at the

end of 2012. Turkey's relatively high current account deficit and political turmoil within Turkey's neighborhood leave the economy vulnerable to destabilizing shifts in investor confidence (CIA, 2013).

Rapid population growth and economic development in the country have resulted in rapid increases in energy demand in recent years. Figure 1 presents the development of gross domestic product and total final consumption in Turkey over 1990-2011 period (IEA, 2013b; World Bank, 2013b). As shown in Figure 1, Turkish total final consumption has increased by an average annual growth rate of 3.6% in the last two decades while average annual growth rate of GDP was 9.7% in the same period. Turkey's per-capita energy consumption has remained low compared to EU and OECD countries. In 2011, per capita primary energy consumption was 4.1 and 4.8 toe in EU-27 and OECD countries, respectively; however this figure for Turkey was just 1.6 toe in the same year, indicating potential for further growth and need for additional investment in Turkish energy sector (EIA, 2013). Similarly, per capita electricity consumption is an indicator commonly used to measure the level of a country's economic development. Electricity consumption per capita in Turkey is below the world average. Despite increasing demand, Turkey's per capita gross consumption was still very low at 2,776 kWh compared to the OECD average of 8,382 in 2010 (IEA, 2012b).

Figure 1. Total final energy consumption and GDP in Turkey, 1990-2011



The foreign trade and current account balances are among the main indicators used to assess a country's economy. The trade balance refers to the amount a country receives for the export

of goods and services minus the amount it pays for its import of goods and services. On the other hand, the current account is the trade balance plus the net amount received for domestically-owned factors of production used abroad. Table 2 presents current account balance table of Turkey for 2012 (TurkStat, 2012, 2013b). In 2012, total Turkish imports amounted to $219.3 billion while total exports were $148.4 billion, resulting in approximately $65.2 billion foreign trade deficit. Since June 2011, official statistics regarding natural gas and crude oil import costs are not published by Turkish Statistical Institute (TUIK) at the request of BOTAS, the main public natural gas import company; instead, the total cost of natural gas and crude oil imports are classified as "confidential data" under the heading of "Mining and Quarrying" in Turkish current account balance tables (Milliyet, 2011). In 2012, "confidential data" item representing oil and gas imports was $39.5 billion, meaning that oil and gas imports accounted for about 18% of merchandise imports, 60.6% of trade deficit and 82.7% of current account deficit. Therefore, dependence on energy imports, persistent current account deficit and fuel consumption are among major public policy issues in Turkey. Especially, Turkey's dependence on imported oil makes it vulnerable to changes in world oil prices emanating from disruptions in the world oil market.

Table 2. Current account balance table of Turkey (2012)

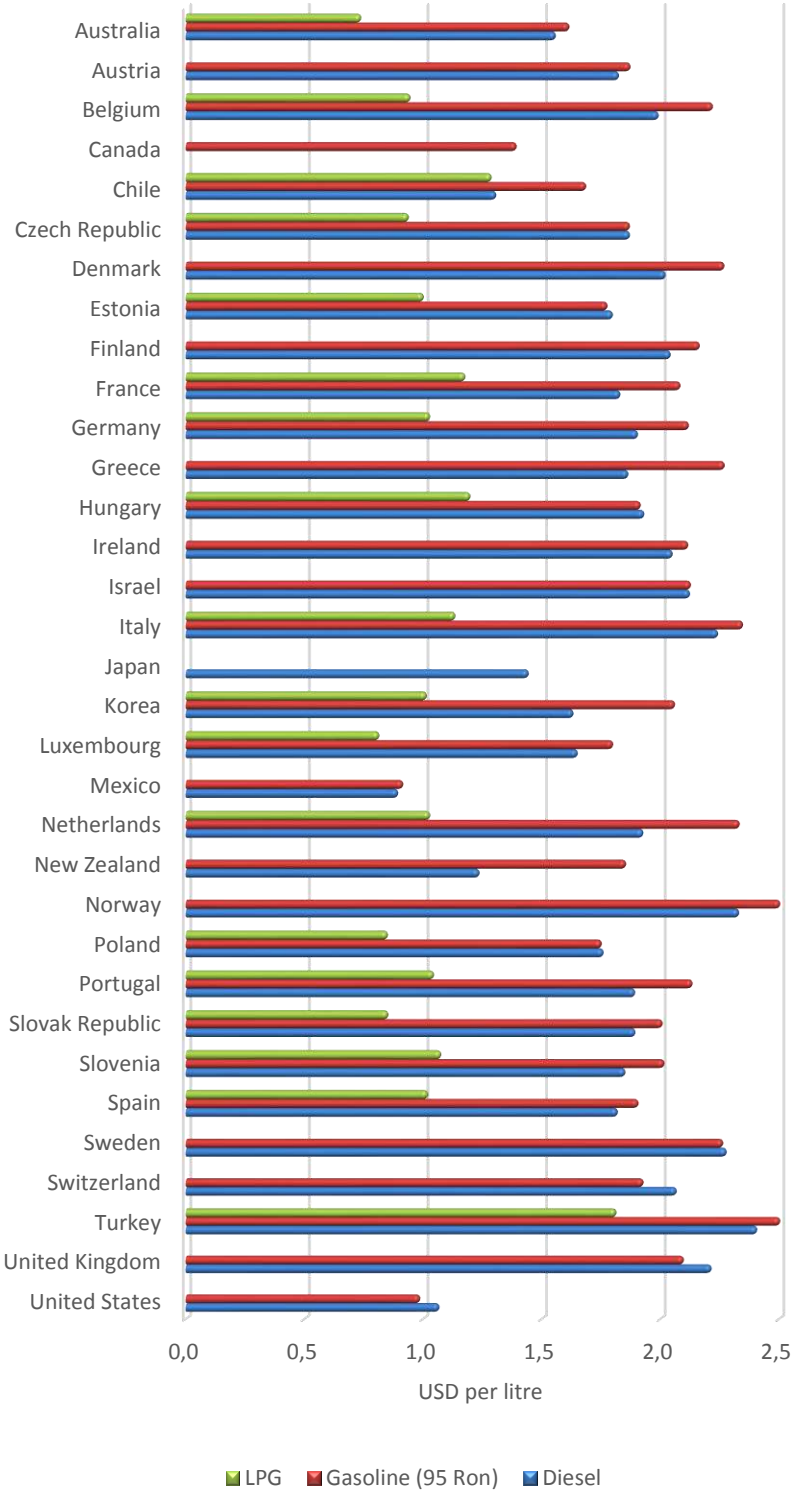
Item	**million $**
Merchandise exports (f.o.b.)	148,433
Merchandise imports (f.o.b.)	-219,323
- Confidential Data (mainly natural gas and crude oil)	*-39,470*
Non-monetary gold (net)	5,709
Foreign trade balance	**-65,181**
Services balance	22,912
Investment income balance	-6,483
Current transfers	1,383
Other	-360
Current account balance	**-47,729**

Within this framework, Turkey has one of the highest fuel prices in the world. Figure 2 presents motor fuel prices in some of the OECD countries in 2013. Figure 2 clearly shows that Turkey has the highest prices for gasoline, diesel and LPG among OECD countries (IEA, 2013c).

In 2011, the total energy used for transport in Turkey was 14,850 ktoe (IEA, 2013b). Diesel (64.2%), LPG (18.5%) and gasoline (12.8%) accounted for 95.5% of the total energy used for transport in that year. The remaining fuels consisted of jet fuel (2.2%), natural gas (1.5%),

electricity (0.4%) and fuel oil (0.4%). Hence, in this study, the term "motor fuels" refers only to diesel, liquefied petroleum gas (LPG) and gasoline.

Figure 2. Motor fuel prices in OECD countries in 2013



The paper is organized in six sections. Following the introduction in this section, the Turkish motor fuel taxes are examined in Section 2. Section 3 presents an econometric analysis on the

elasticity of motor fuel demand in Turkey, which is one of the most important determinants of the impact of fuel price policy on the general public. Section 4 focuses on the impact of high motor fuel prices on road transport associated activities, including the pattern of passenger transportation, motorization rate, fuel use, total kilometers travelled and CO_2 emissions from road transportation. The impact of motor fuel prices on income distribution in Turkey and Turkish public opinion about high motor fuel prices are investigated in Section 5. The final section concludes.

2 The motor fuel taxes in Turkey

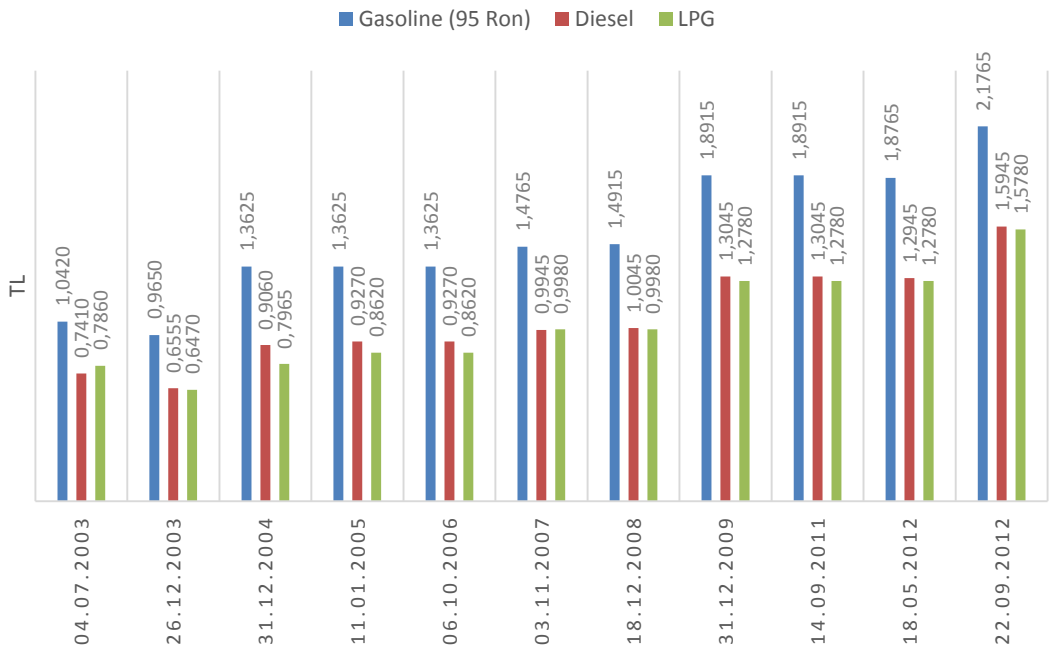
As many other developing countries that are faced with huge domestic debt and budget deficits do, Turkey uses motor fuel taxes to raise revenue to bridge the financial gap. So, despite the fact that in theory motor fuel tax policy may serve numerous purposes (e.g. a fuel tax may internalize external costs, such as noise, road safety, air pollution and traffic congestion), the main reason for relatively high fuel taxes in Turkey has mostly been purely fiscal; that is, revenues are needed for fiscal consolidation, and fuel taxes are relatively difficult to evade compared with Turkey's income tax system.

Value added tax (VAT) was introduced into Turkey in 1985. It is similar to the European Union's VAT system, requiring re-calculation and payments to the tax authorities at each transaction point in the onward sales chain. With a view to simplifying and harmonizing the indirect tax system with the EU's, a special consumption tax (SCT) was put into effect as from 1 August 2002, abolishing 16 different indirect taxes and funds (including petroleum consumption tax, liquid fuel price stabilization fund, motor vehicle purchasing tax, environment fund, supplementary motor vehicle purchasing tax, supplementary VAT and so on). The SCT is structured as a single tax levied equally on both domestic production and imports of products such as alcoholic beverages, cigarettes, motor vehicles, and petroleum products. When the special consumption tax came into force, the high level VAT rates were decreased to a maximum of 18%. In Turkey, the Automatic Pricing Mechanism, which operated between July 1998 and the end of 2004, set a ceiling on the prices of almost all fuels. In the beginning of 2005, the government decided to remove the price caps, which led to an increase in pre-tax prices. Since then, pre-tax fuel prices have been set by the market. At present, Turkey levies an 18% VAT on all energy products. In addition to this, a SCT is levied on motor vehicle fuels. SCT is a fixed sum per liter or kg for each type of fuel and

adjusted by government from time to time for inflation. The Council of Ministers may increase the taxes on motor fuels by 50% and may reduce them to zero[2] (Erdogdu, 2011).

Figure 3 shows the development of SCT levels in Turkey since 2003. As of December 25, 2013, the SCT for regular gasoline (2.1765 TRY per liter) is higher than that for diesel (1.5945 TRY per liter) and LPG (1.5780 TRY per kg) (CoM, 2012). SCT in Turkey are identical for both commercial and non-commercial consumers. Here, it is important to note that VAT is levied on the sum of pre-tax price (including the income share of the market regulator, EMRA[3]) and SCT in Turkey, meaning that consumers pay a value added tax not only for the fuel they consume but also for the special consumption tax levied on this fuel. That is, consumers pay the tax of the tax (Erdogdu, 2011). Figure 4 presents the components of end-user fuel prices in Turkey[4]. In Turkey, total taxes (SCT and VAT) correspond to 59.1% of gasoline price, 51% of diesel price and 45.5% of LPG price.

Figure 3. Special consumption tax levied on fuels in Turkey since 2003 (per liter or kg)

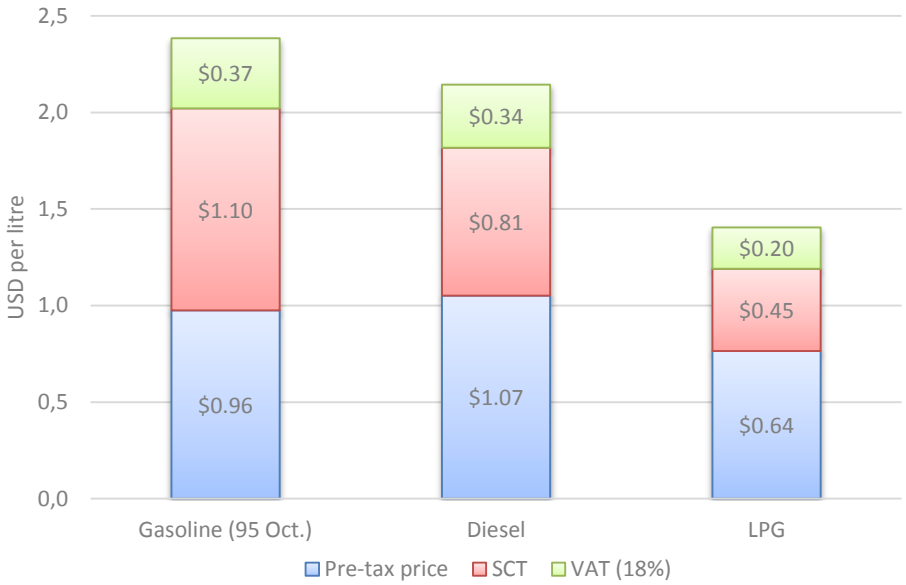


[2] Article 12 of SCT Law No.4760, dated 6.6.2002.

[3] Energy Market Regulatory Authority

[4] Although the SCT on LPG is quoted in kilogram, the price is quoted in liter. So, while calculating the amount of SCT on LPG, the SCT in kilogram is converted into liter by multiplying with intensity ratio of 0.56.

Figure 4. Components of fuel prices in Turkey as of December 25, 2013 ($1=2.0797 TL)



Between 1999 and 2001, the Turkish government encouraged the use of LPG by households for cooking purposes by removing both VAT and the special consumption tax. Those tax exemptions resulted in the price of LPG being below that of both gasoline and diesel. As regular motor engines cannot use LPG, the government expected its use in cars to remain limited. However, an industry soon developed to make gasoline engines compatible with LPG. With a payback period of about a year, the operation proved sufficiently simple and cheap for drivers to convert their vehicles to LPG use. Alerted by the resulting loss of tax revenue, the government began to phase out this tax expenditure since 2001. This provision nevertheless resulted in significant increases in LPG consumption in Turkey (Erdogdu, 2011).

In 2012, total net revenues of Turkish central government amounted to 323.2 billion TL and 15.7% of this figure came directly from the VAT and SCT levied on motor fuels (gasoline, diesel and LPG). In OECD countries, the share of the revenues from environmentally related taxes[5] in total tax revenue is in the order of 6-7% (OECD/EEA, 2013, p.30) but in Turkey

[5] OECD, IEA and the European Commission have agreed to define environmentally related taxes as any compulsory, unrequited payment to general government levied on tax-bases deemed to be of particular environmental relevance. The relevant tax-bases include energy products, motor vehicles, waste, measured or estimated emissions, natural resources, etc. Taxes are unrequited in the sense that benefits provided by government to taxpayers are not normally in proportion to their payments. OECD, 2006. The political economy of environmentally related taxes. OECD, Paris/France.

SCT alone was responsible for 12.8% of total tax revenues in 2012. Besides, the VAT levied on motor fuels accounted for 47.5% of total revenues from VAT in the same year, while SCT from motor fuels constituted 49.6% of total revenues from SCT (PetDer, 2012; TGNA, 2012). So, it is obvious that the revenue from taxes on motor fuels is an important and indispensable component of Turkish fiscal system and any change in them has very important repercussions for public finance and budget balance in Turkey.

3 Elasticity of motor fuel demand in Turkey

As we know, elasticity of demand is a measure used to show the responsiveness, or elasticity, of the quantity demanded of a good or service to a change in its price, income level or the price of its substitute. More precisely, it gives the percentage change in quantity demanded in response to a one percent change in its price, income level or the price of its substitute *ceteris paribus*. Elasticity of demand is especially important in measuring the impact of a tax on consumers.

In line with economic theory and a priori knowledge, we start with a single equation demand model expressed in linear logarithmic form linking the quantity of per capita demand for a specific motor fuel (gasoline, diesel or LPG) to the real price of this specific fuel, real income per capita and the real prices of two substitute fuels.

The simplest model can be written as:

$$\ln F_t = \propto + \beta_1 \ln P_t + \beta_2 \ln Y_t + \beta_3 \ln P_t^1 + \beta_4 \ln P_t^2 + u_t \quad (1)$$

where F_t is per capita demand for a specific motor fuel, P_t is the real price of this fuel, Y_t is real income per capita, P_t^1 is the real price of the first substitute fuel, P_t^2 is the real price of the second substitute fuel, u_t is the error term, the subscript t represents time, α is intercept term; β_1 and β_2 are the estimators of the price and income elasticities of demand for this specific fuel, respectively; and finally β_3 and β_4 represent the cross-price elasticities.

This simple *static* model (1) does not make a distinction between short and long run elasticities. Therefore, instead of this static one, a dynamic model is used in this study to capture short-run and long run reactions separately. The dynamic model assumes that motor fuel demand cannot immediately respond to the change in fuel prices and real income; but

gradually converges toward the long run equilibrium. Suppose that F_t' is the desired or equilibrium motor fuel demand that is not observable directly but given by:

$$\ln F_t' = \propto + \beta_1 \ln P_t + \beta_2 \ln Y_t + \beta_3 \ln P_t^1 + \beta_4 \ln P_t^2 + u_t \quad (2)$$

and the adjustment to the equilibrium demand level is assumed to be in the form of

$$\ln F_t - \ln F_{t-1} = \delta(\ln F_t' - \ln F_{t-1}) \quad (3)$$

where δ indicates the speed of adjustment (δ>0). Substituting equation (2) into equation (3) gives:

$$\ln F_t - \ln F_{t-1} = \delta(\propto + \beta_1 \ln P_t + \beta_2 \ln Y_t + \beta_3 \ln P_t^1 + \beta_4 \ln P_t^2 + u_t - \ln F_{t-1}) \quad (4)$$

$$\ln F_t = \delta\propto + \delta\beta_1 \ln P_t + \delta\beta_2 \ln Y_t + \delta\beta_3 \ln P_t^1 + \delta\beta_4 \ln P_t^2 + \delta u_t - \delta \ln F_{t-1} + \ln F_{t-1} \quad (5)$$

$$\ln F_t = \delta\propto + \delta\beta_1 \ln P_t + \delta\beta_2 \ln Y_t + \delta\beta_3 \ln P_t^1 + \delta\beta_4 \ln P_t^2 + (1-\delta)\ln F_{t-1} + \delta u_t \quad (6)$$

where $\delta\beta_1$ and $\delta\beta_2$ are the short-run price and income elasticities respectively and $\delta\beta_3$ and $\delta\beta_4$ indicate the short-run cross-price elasticities. The long-run price and income elasticities are given by β_1 and β_2 correspondingly while β_3 and β_4 represent long-run cross-price elasticities. Since the error term δu_t is serially uncorrelated, consistent estimates of α, β_1, β_2, β_3, β_4 and δ can be obtained by OLS (Ordinary Least Squares).

In our analysis, we use quarterly data from the second quarter of 2006 to the last quarter of 2010. The availability of LPG price data limits our dataset. In total, we have 19 observations. The data on per capita demand for gasoline, diesel and LPG (in tonnes per thousand people) are calculated using data on "fuel used in road vehicles" from IEA (2012a) and population data from World Bank (2013c). The nominal prices of fuels and consumer price index are taken from IEA (2013c) and nominal prices are converted into real prices (in TL per litre at 2005 prices) using consumer price index. The data on real income per capita (in TL at 1998 prices) are provided by World Bank (2013c).

We estimate three models by OLS and the estimation results are summarized in Table 3. Table 4 shows calculated elasticities of gasoline, diesel and LPG demand in Turkey based on

the results. When we look at the results, as expected, we see that income elasticities of all three fuels are positive, meaning that people tend to consume more fuel as their income increases. Besides, we see that long run elasticities are always higher than the short run elasticities, implying that consumers are more responsive to price and income changes in the long run. Price elasticity of gasoline is negative both in the short and long run. However, contrary to our expectations, we detect positive price elasticities for diesel and LPG both in the short and long run. This result underlines the fact that demand for diesel and LPG increases even if their prices rise. Probably, the main reason for not getting a similar result for the gasoline is the fact that gasoline-fuelled car owners easily convert their car into LPG-fuelled one and therefore an increase in gasoline prices translates into a decline in gasoline consumption. As expected, we detect positive diesel-price elasticity for gasoline demand meaning that as the price of diesel increases so does the demand for gasoline.

Table 3. Estimation results

	Gasoline	**Diesel**	**LPG**
$\delta\alpha$	0.851 *(0.901)*	0.1 *(0.769)*	0.643 *(0.87)*
$\delta\beta_1$	-0.213 *(0.35)*	0.067 *(0.295)*	0.279 *(0.387)*
$\delta\beta_2$	0.132 *(0.397)*	0.71 *(0.418)*	0.152 *(0.437)*
$\delta\beta_3$	0.642 *(0.303)* [for diesel]	-0.184 *(0.338)* [for gasoline]	-0.217 *(0.337)* [for diesel]
$\delta\beta_4$	-1.215 *(0.39)* [for LPG]	-0.42 *(0.296)* [for LPG]	-0.409 *(0.395)* [for gasoline]
(1-δ)	0.557 *(0.166)*	0.567 *(0.185)*	0.706 *(0.128)*
Note: Standard errors are shown under the coefficients in parenthesis.			
Number of obs.:	*19*	*19*	*19*
Prob.>F:	*0.0000*	*0.0141*	*0.0000*
R^2:	*0.8751*	*0.6305*	*0.8742*
Adj. R^2:	*0.8271*	*0.4883*	*0.8258*

Table 4. Calculated elasticities of motor fuel demand in Turkey

	Short-run			**Long-run**		
	Gasoline	**Diesel**	**LPG**	**Gasoline**	**Diesel**	**LPG**
Price elasticity	-0.213	0.067	0.279	-0.481	0.155	0.949
Income elasticity	0.132	0.71	0.152	0.298	1.64	0.517
Cross-price elasticity (gasoline)		-0.184	-0.409		-0.425	-1.391
Cross-price elasticity (diesel)	0.642		-0.217	1.449		-0.738
Cross-price elasticity (LPG)	-1.215	-0.42		-2.743	-0.97	
Speed of adjustment (δ)	0.443	0.433	0.294			

Our analysis in this section clearly shows that motor fuel demand in Turkey is quite inelastic and not responsive to price increases caused by an increase in either pre-tax prices or taxes. Therefore, fuel market in Turkey is open to opportunistic behaviour either by firms (through excessive profits) or by the government (through excessive taxes). Although opportunistic behaviour of the firms may be prevented by efficient regulation, opportunistic policies of the government are much more difficult to prevent and may only be limited by the pressure imposed on the government by civil society institutions.

4 The impact of motor fuel prices on road transport associated activities

As expected, motor fuel prices have many impacts mostly originated from road transport associated activities, including the pattern of passenger transportation, motorisation rate, fuel use, total kilometres travelled and CO_2 emissions from road transportation. This section focuses on the impact of motor fuel prices on these variables.

Eurostat (2013) provides data on the percentage share of each mode of transport in total inland transport in Turkey, expressed in passenger-kilometres (pkm). It is based on transport by passenger cars, buses and coaches, as well as trains. The data are based on movements on the national territory, regardless of the nationality of the vehicle. Figure 5 presents these data together with data from IEA (2013c), showing diesel, gasoline and LPG prices in Turkey for the period 1999-2011.

Figure 5 clearly indicates that the shares of buses & coaches and trains in total transportation have declined during the last decade. On the other hand, the share of passenger cars and real fuel prices increased in the same period. So, the increases in real fuel prices did obviously not result in a decline in private transportation and an increased tendency to use public transportation. On the contrary, Turkish citizens have increasingly preferred private cars over public buses and trains in the last decade despite the fact that real diesel and gasoline prices increased by 94% and 44%, respectively, in this period. However, it may be argued that the rapid increases in motor fuel prices have prevented further increases in the share of passenger cars in Turkey.

Figure 5. Motor fuel prices and mode of transport in Turkey

Motorisation rate is usually measured by the number of passenger cars or motor vehicles per 1,000 inhabitants. A passenger car is defined as a road motor vehicle, other than a motorcycle, intended for the carriage of passengers and designed to seat no more than nine persons (including the driver). Motor vehicles include cars, buses and freight vehicles, but do not include two-wheelers. World Bank (2013a) provides data on motor vehicles and passenger cars per 1,000 people in Turkey for the period 2004-2010. Figure 6 presents these data together with data on motor fuel prices in Turkey for this period.

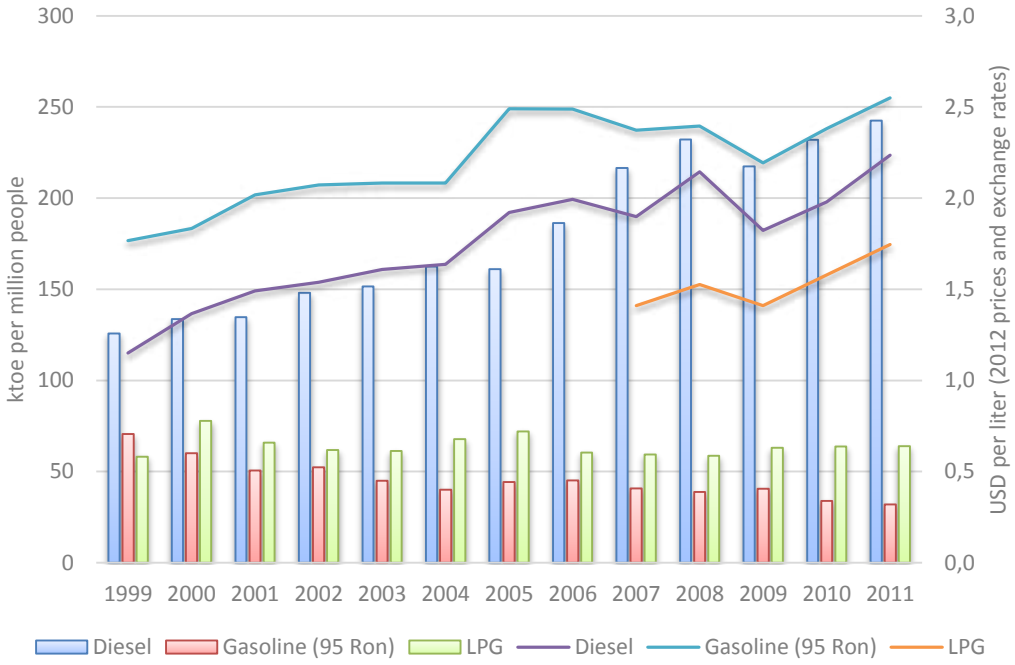
Figure 6 shows that number of passenger cars and total motor vehicles per thousand people increased during 2004-2010 period in Turkey. In the same period, diesel, gasoline and LPG prices also increased. Therefore, it can be concluded that the increases in prices did not result in a decline in motorization rate in Turkey in this period. Quite the opposite, motorization rate in Turkey increased during 2004-2010 period in spite of the fact that the motor fuel prices increased 22%-36% in the same period. Again, it may be the case that the increases in motor fuel prices prevented further increases in motorization rate. These results underline that fuel price elasticity of motor vehicle demand is low in Turkey.

Figure 6. Motor fuel prices and motorization rate in Turkey

The price of a good influences the demand for that good and motor fuels are not an exception. So, it is expected that the most important impact of the increases in motor fuel prices is observed on the demand for motor fuels. IEA (2013b) provides data on diesel, gasoline and LPG use and population in Turkey for 2000-2010 period. Figure 7 shows diesel, gasoline and LPG consumption per million people and motor fuel prices in Turkey in this period.

The data in Figure 7 confirm the finding that price elasticity of motor fuel demand in Turkey is quite low and even positive, supported by the fact that total fuel demand increases even if real prices increase. However, we see that although high prices did not result in a decrease in total motor fuel consumption, they changed the consumption patterns in Turkey. It is clearly seen in Figure 7 that gasoline prices are higher than diesel prices and, therefore, the consumption of gasoline declined steadily in the last decade in Turkey while diesel consumption increased in the same period. So, it seems that relatively higher gasoline prices caused gasoline to be replaced by diesel. This result provides a very good example of utilization of price policy to shape consumer preferences.

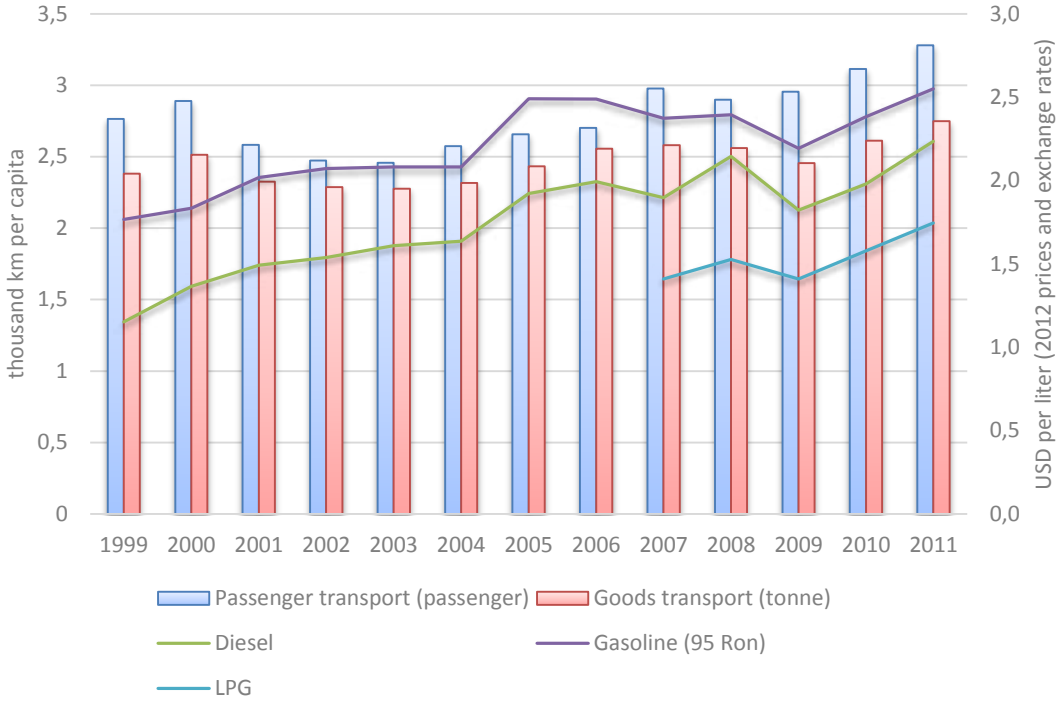
Figure 7. Motor fuel consumption and prices in Turkey



Another impact of real price increases is on the total kilometres travelled. OECD (2013) provides data on transport activity levels in Turkey regarding both passenger-kilometre and tonne-kilometre of goods transport. Passenger-kilometre is defined as the number of passengers transported by road times kilometres travelled while tonne-kilometre is the volume of goods transported by road, measured in metric tonnes times kilometres travelled. To make a meaningful analysis, we divide these data by population and get passenger-kilometre per capita and tonne- kilometre per capita for each year in 1999-2011 period. Figure 8 plots these data together with data on real fuel prices in Turkey.

The data plotted in Figure 8 show that passenger transport and goods transport increased by 18.6% and 15.4% respectively during the 1999-2011 period, while the increases in real diesel and gasoline prices were 94.2% and 44.4%, respectively, in the same period. So, despite huge increases in real prices (and therefore in cost of transportation), both passenger and goods transportation have increased since 1999.

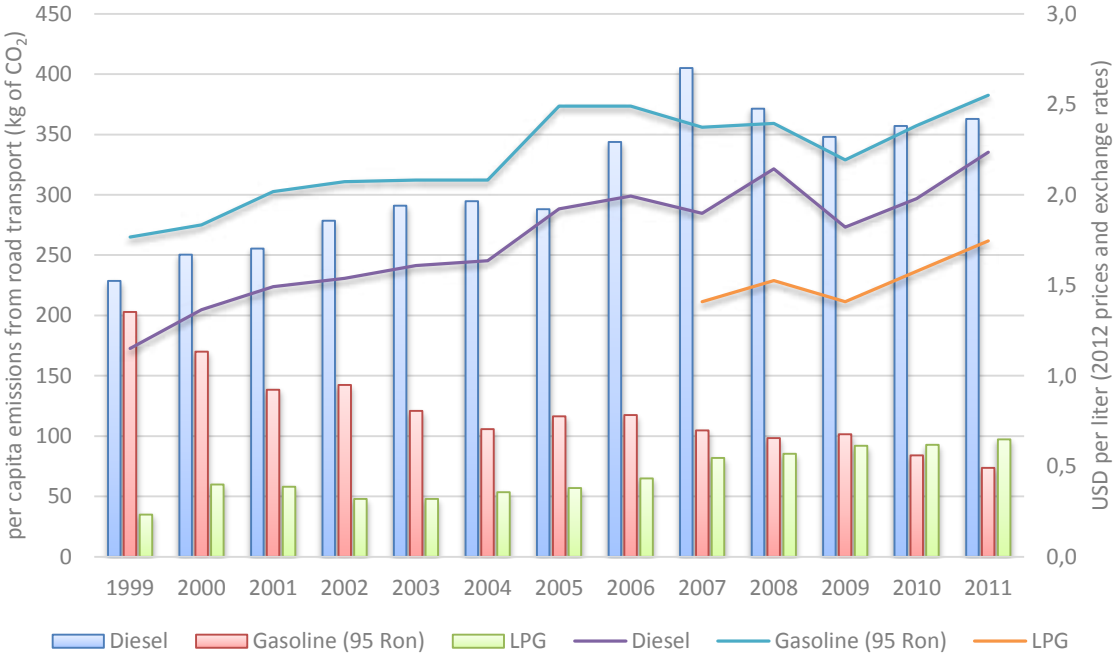
Figure 8. Motor fuel prices and transport activity in Turkey



Finally, we look at the correlation between motor fuel prices and CO_2 emissions from road transportation in Turkey. IEA (2013a) provides data on CO_2 emissions from road transportation in million tonne of CO_2. We divide these data by population and multiply the result with a thousand to get per capita emissions from road transport as "kg of CO2" for each year in 1999-2011 period. Figure 9 shows these data together with real motor fuel prices in Turkey.

The data in Figure 9 suggest that total per capita CO_2 emissions from road transportation increased by 14.5% during 1999-2011 period in Turkey, meaning that the increase in real fuel prices did not result in a decline CO_2 emissions. Although high motor fuel prices failed to reduce CO_2 emissions in Turkey and prevented further increases in these emissions at best, they considerably changed the source of emissions. In 1999, diesel utilisation was responsible for 49% of total per capita emissions from road transportation and the remaining came from gasoline (43.5%) and LPG (7.5%). Relatively higher gasoline prices caused gasoline to be replaced by other substitute fuels (i.e. diesel and LPG) and therefore the share of gasoline in total emissions declined to 13.8% in 2011. In this period, the share of diesel increased and became 68% in 2011. Besides, starting from the end of 1990s, LPG emerged as another source of CO_2 emissions from road transportation and its share reached 18.2% in 2011.

Figure 9. Motor fuel prices and CO_2 emissions from road transport in Turkey



5 Income distribution and the public opinion

Motor fuel prices have distributional effects, which is the focus of the analysis in this section together with the public opinion about high motor fuel prices. A rise in fuel prices increases the cost of all goods and services in the production of which motor fuels are used as inputs; and this increase is passed on from the firm to the consumers in the form of higher prices for these goods and services. So, a possible concern with fuel prices is that the burden of the costs arising from fuel price increases could fall disproportionately on low-income households. That is, price increases could be regressive.

The Turkish Statistical Institute (TurkStat) does not provide detailed data on fuel expenditure alone by households; instead, it reports total expenditure on "transportation" that includes the purchase of motor vehicles, the cost of private transportation (including fuel costs) and the cost of public transportation. Since an increase in fuel prices rises the cost of transportation in general (including the cost of using a motor vehicle, private and public transportation), it is assumed that the expenditure on "transportation" may be used as a proxy for the expenditure on "motor fuels" (Erdogdu, 2011).

Figure 10. Household consumption expenditure by quintiles ordered by income, Turkey (2012)

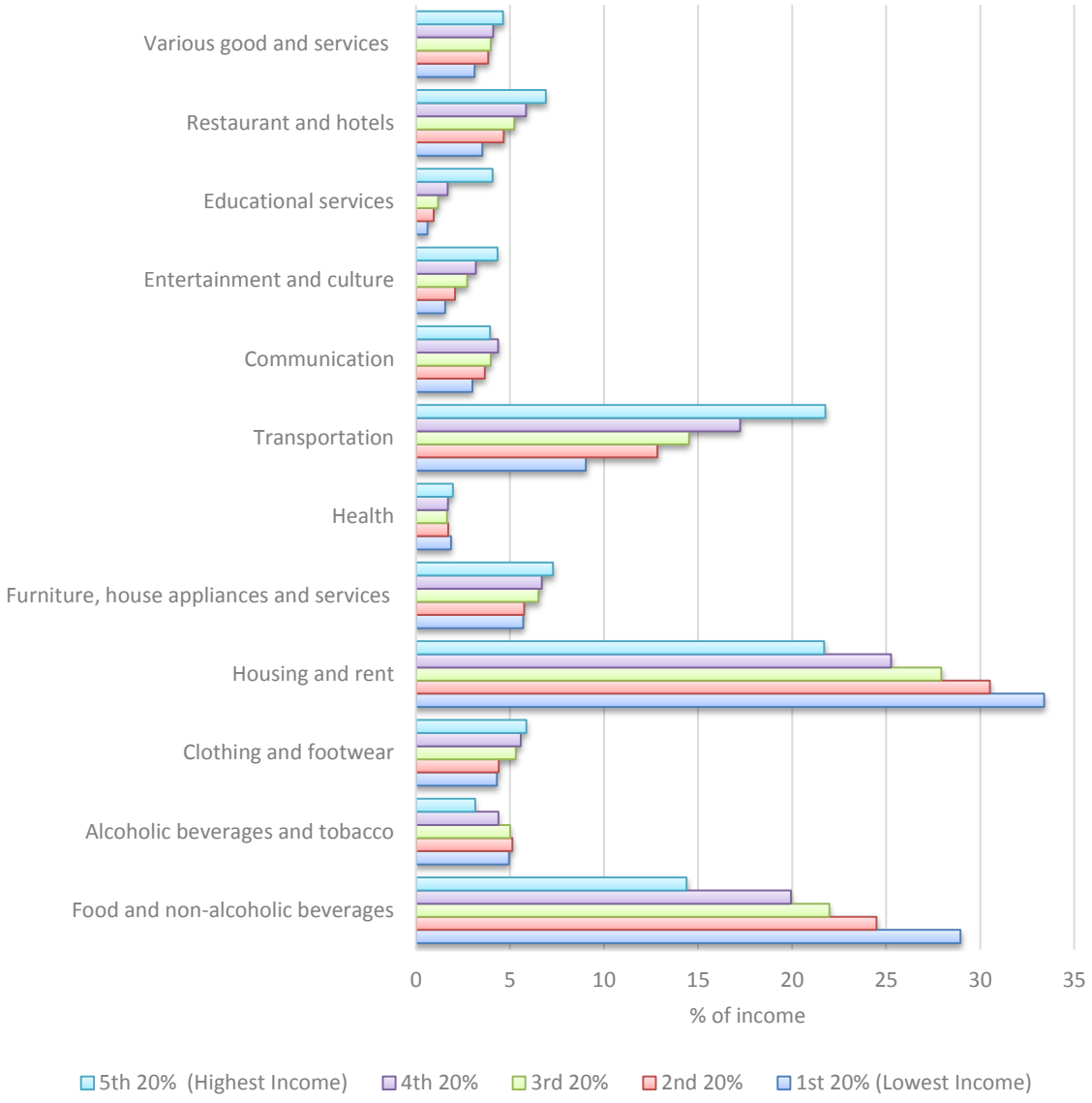


Figure 10 shows consumption expenditure of Turkish households in 2012 by quintiles ordered by income (TurkStat, 2013c). The data show that "transportation" was the third largest consumption expenditure group that was responsible for 17.2% of total expenditure[6] in 2012 after "housing and rent" (25.8%) and "food and non-alcoholic beverages" (19.6%). The income share for "transportation" is highest in the top income group (21.8%) and lowest in the bottom income group (9%). Hence, any increase in fuel prices (and therefore in transportation costs) hits the rich relatively much harder. In other words, the fuel prices in Turkey seem to be progressive. So, the evidence indicates that the increases in fuel prices do not contribute to income inequalities in Turkey, which may also explain why there is no specific measure taken in Turkey to compensate for income inequalities caused by high motor

[6] Total expenditure was 47.4 billion TL in 2012.

fuel prices. On the contrary, by increasing motor fuel prices through taxation, public authorities manage to "tax the rich" without much affecting low-income people. In short, our analysis reveals that high fuel taxes (and therefore prices) in Turkey have a direct progressive impact on the income distribution of households. However, it should be noted that our analysis here captures the direct impact of fuel price increases on income distribution. A full assessment of the income distributional effects of motor fuel prices should include the indirect effects from price increases, effects arising from the use of fuel tax revenues and/or compensational measures and the distribution of the benefits resulting from the fuel taxes.

Political acceptance of any policy by the general public can be built by creating a shared understanding of the problem at hand, its causes, its impacts, and the effects of possible instruments that could be used to address the problem. But, since the main reason for high motor fuel prices in Turkey has been the policy of raising revenue for the central government budget through taxation and not related to benevolent reasons (like reducing the dependency on imported energy, improving income equality or environmental concerns); building public acceptance has been the most challenging aspect of motor fuel pricing policy in Turkey and high fuel prices have always been seen as "unfair" by the general public (Erdogdu, 2011).

As mentioned before, end-use motor fuel prices in Turkey increase due to an increase in any of its three components: pre-tax price, value added tax (VAT), and the special consumption tax (SCT). The first two components of the end-use fuel prices are easy to justify politically and are usually not the main target of political criticism. The pre-tax fuel price is determined by free market forces and usually follows the trends in international oil markets. A VAT of 18% is the most common tax in Turkey so there is a common agreement that an 18% VAT on motor fuels is politically justified and acceptable. Although pre-tax fuel prices and the VAT on them constitute two important components of the relatively high fuel prices in Turkey, the governments are not directly held responsible for them, and any criticism related to the increases in pre-tax prices is usually addressed on the grounds that they originate from developments in international oil markets that cannot be controlled by the government. The politically problematic part of the end-use fuel prices is the SCT. For the last decade, Turkey has actually been in a static cycle. It begins with a pre-tax fuel price determined mainly by international oil markets, a proportional VAT (18%) and a given rate of the SCT. If pre-tax fuel prices increase due to the developments in international oil markets, so does the revenue from VAT and increased revenue is used to balance the public budget. However, when pre-tax fuel prices decrease or budget deficit increases, the government increases the rate of the

SCT, not only on motor fuels but also on many other products (e.g. cars, alcohol, tobacco and telecommunication). Then, the cycle continues with some protests, especially in large metropolitan areas. After a while, the people get used to new fuel prices with a new pre-tax fuel price level, a proportional VAT and a higher rate of the SCT. The cycle goes on like this (Erdogdu, 2011).

In Turkey, the Council of Ministers may increase the SCT at any time without a decision by the parliament, meaning that the process takes place exclusively within the government and the opposition does not have a say in it. After almost every tax increase, the Minister of Finance publishes an official statement indicating that SCT is adjusted for inflation, which is necessary to maintain the public budget balance.

Figure 11. SCT and inflation indices in Turkey

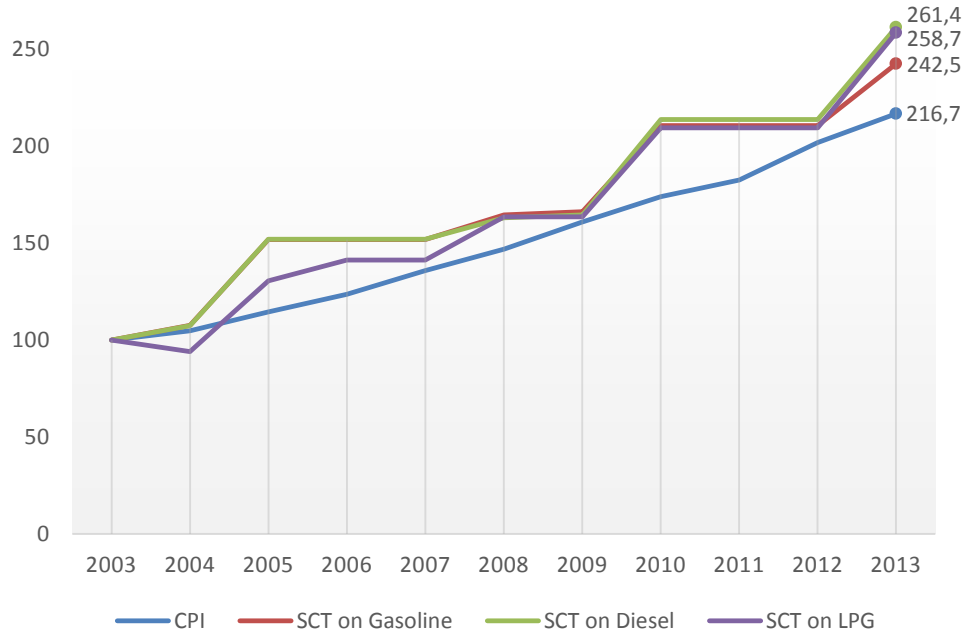


Figure 11 shows the development of the SCT and inflation (CPI, consumer price index) in Turkey during the last decade (RA, 2013; TurkStat, 2013a). The data indicate that although the increases in SCT do not closely follow the inflation rate in the short run, one can detect a common trend over the longer time periods. In some years, the tax rate increases a lot in real terms, but then this level is maintained in the following years to make sure that tax increases are not too above the inflation rate (Erdogdu, 2011).

Apart from the arguments that (i) SCT is just adjusted for inflation and not increased in real terms and (ii) this 'adjustment' is necessary to balance the public budget, no other substantial argument is used to defend or justify fuel tax increases and to address the opposition. In many occasions, even Turkish finance ministers admit in public that fuel end-use prices in Turkey are extremely high, mainly due to high taxes (Hurriyet, 2013); but they also underline the fact that the taxes on motor fuels are indispensable to meet the revenue requirement of the central government budget. Since the level of taxes on motor fuels has a very marginal importance in general Turkish politics, the tax increases have a negligible impact on the re-election of the ruling party in general or the finance minister in particular. Besides, it is a well-known fact in Turkey that it is impossible to reduce fuel taxes without solving the issue of the vast informal economy in the country. The amount of uncollected taxes in Turkey is huge. Without decreasing the size of the informal economy, the current government, nor any other, cannot cut fuel taxes. Even a small rate cut can cause the budget deficit to reach unexpectedly high levels, which could in turn trigger a substantial increase in the inflation or many other undesirable consequences. Therefore, it is not expected that the government will reduce any of the fuel taxes in the short term and maybe not in the long term, either. A reduction in fuel taxes is only possible if the government is able to bring the fraud rate down to the global average and start to collect taxes with more success (Erdogdu, 2011).

6 Conclusion

The paper focused on some key issues related to high motor fuel prices in Turkey. Following an examination of motor fuel taxes in Turkey, an econometric analysis is conducted on the elasticity of motor fuel demand in Turkey, which is one of the most important determinants of the impact of fuel price policy. The paper also covered the impact of high motor fuel prices on road transport associated activities, including the pattern of passenger transportation, motorization rate, fuel use, total kilometers travelled and CO_2 emissions from road transportation. The impact of motor fuel prices on income distribution in Turkey and Turkish public opinion about high motor fuel prices are also investigated in the course of the paper.

The most important issue related to motor fuel prices but not covered in this paper is motor fuel smuggling or "oil black market" in Turkey. Undeniably, the most important beneficiaries of high motor fuel prices in Turkey are oil smugglers. The huge margin between pre- and after-tax motor fuel prices has provided the main motivation for smugglers. At present, oil smuggling is a perennial problem on Turkey's borders with Iraq and Iran. Combined with

limited enforcement capabilities of the Turkish government, high taxes encourage oil smugglers to operate in almost every region in Turkey and a huge oil black market has already been set up (Erdogdu, 2011). However, there is still no academic or professional work on this important problem. Even, the size of oil black market in Turkey has not been estimated so far. Therefore, the first task for future researchers working on Turkish motor fuel market should be the estimation of the size of oil black market. Then, they should investigate the possible repercussions of the oil black market for Turkish economy. Finally, they need to formulate policy advises aiming at reducing the size of the black market.

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