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INTERNATIONAL DISPERSION OF RETAIL DIESEL FUEL PRICES AND THE ESTIMATION OF NORMAL PRICE VALUES

For the large majority of goods, the price dispersion between countries does not exceed 1:10. Diesel fuel stands out, with a dispersion which exceeds 1:100. Given a constant oil price the difference in diesel fuel prices between countries is caused by the different taxes. The average share of taxes in the price determines the normal price. An estimation of the normal price of diesel fuel is made using an econometric model (using 79 countries, 1998-2008 by even years). Of greatest interest to economic policy are normal prices for countries with economies in transition and developing countries.

This paper is organized as follows. In the introduction a definition of the term "normal price" and why it is important are presented. The first chapter is devoted to the notion of "price level" both international and national. The normal price is calculated using an econometric model. The estimation of the normal price of goods is determined by the international component and deviation of the normal price by the national one. In the second chapter the results of evaluating the parameters of the econometric model and the values of normal prices are given. In the third chapter price deviations in Russia and Kazakhstan are discussed and it is concluded that they have reached the maximum value, above which mass protests may result.

Key words: budget revenue; diesel fuel price; motor fuel tax; mass protests; normal price; oil rent; price level

JEL Classification: C23; D49; E37; Q48

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0 Introduction

The word “estimation” in the title indicates the price, using the econometric model. “Prices” (without definitions preceding this word) are understood to be the retail prices.

Motor fuel taxes are compulsory payments imposed by the authorities, per 1 liter of motor fuel. They can be collected directly (excise tax, value added tax or sales tax) and indirectly by taxes imposed on oil as a commodity from which diesel fuel is produced. In the model under consideration taxes are the main reason for the differences in prices between countries for each year.

In the literature on motor fuel in general and on diesel fuel in particular, one can emphasize some tendencies in which the differences between countries are shown. The most important are as follows.

First, what is happening with the motor fuel prices in countries is given by the German company GTZ (2009). They give the gasoline and diesel prices in more than 170 countries from 1991 until 2008. Since 1998, compared to 1991 increased the number of countries for which there is data on retail prices of diesel. The price values are at the beginning of November. The reviewers divide prices into four levels, the reference points of which are:

1. Oil price> Actual retail fuel price (AFRP); Oil price -Fuel price =Subsidy
2. Oil price<AFRP≤ AFRP in the U.S.A. ; the minimum tax level required to maintain the road network
3. AFRP in the U.S.A.<AFRP≤ AFPR in the Spain; the European tax level on motor fuel
4. AFPR in the Spain < AFRP.

In our second chapter, countries are divided into nine clusters depending on the difference between diesel fuel prices and the normal price estimates for these countries. We assume that in each cluster government policies with respect to motor fuel taxes are similar since they lead to similar deviations from the normal prices.

The second important point is the orientation of changes in fuel prices between countries, and in large countries such as the USA, between the states. Price convergence to the normal prices is understood as reducing over time the gap between the prices of the goods and the estimates of the normal price for them. Divergence is understood as the opposite process. This is a special case of the law of one price. Wolszszak-Derlacz (2008) classified the conditions for the law of one price as economic, structural and political.

Dreher and Krieger (2010), studying the convergence of wholesale and retail prices of diesel fuel, found that in Europe the convergence of retail prices is faster than the convergence of producer prices. Among the factors that favor the convergence of retail prices, they mention the harmonization of motor fuel taxes announced in the European Union and "fuel tourism" (Banfi et al. 2003).

Bentzen (2003) investigated the convergence of gasoline prices in 20 countries of the OECD (15 European countries and Canada, the U.S.A., Japan, Australia and New Zealand). He writes, "There is very little or no support to the notion of absolute convergence in gasoline prices in the OECD countries when testing for convergence towards a geographical group-mean of gasoline prices. At most, some catching-up processes - i.e. diminishing differences in gasoline prices seem to be a common feature in a few cases" (ibid pp. 12-13).

The third point from the literature is motor fuel taxes. Hammar et al. (2004) identified a number of constraints affecting the tax policy: a high consumption of fuel which forces the government to restrict taxes on it. Tax policy is also affected by low population density, especially when combined with poor public transport. They point to the use of motor fuel taxes as an anticyclical measure: taxes go down if the oil price decreases on the world market.

Voter influence on tax policies has been the subject of research by Goel & Nelson (1999). A number of studies state that the voter's relation to the fuel taxes depends on whether he or she is or not a motorist. Dunkerley et al. (2010) have shown that as long as the median consumer is not a motorist, he or she favors increasing motor fuel taxes, but as soon as he becomes a motorist, he or she favors reducing taxes by 20%.

Decker & Wohar (2005) in their analysis of diesel fuel tax for the U.S.A. have shown that taxes are lower in those states in which the share of road transport workers is high.

Rietveld & Waundenberg (2005) gave a detailed argumentation of the impact of motor fuel taxes on the differences in retail prices between countries.

Davoust (2008) noted the difference in taxes on motor fuel between Europe and North America. He also drew attention to the role of the anti-cyclicity of those taxes. Countries with lower taxes than Europe are not only in North America. Most of these countries are located on the Pacific coast. Sterner (2007) describes the high motor fuel taxes as an instrument for the reduction of greenhouse gas emissions. He also points to the factors impeding their increase.

These points can be considered as a problem formulation about the determination of the normal price which intuitively, is understood as a mean price

The main differences between market price and normal price are as follow[3]s:

> Market price is the price which prevails in the market at, any particular moment due to the temporary equilibrium of the forces of demand and supply. The normal price on the other hand, is the price which tends to prevail in the market in the long run. It is the result of long run equilibrium between demand and supply.

Some points are developed as follows in our report.

1. The long period of time over which price changes are monitored in different countries is determined, depending on comparable data availability, in a large number of countries differing by their economic development level. For the countries of average level of economic development this enhances the accuracy of supply and demand estimation over the long term.

2. To describe "persistent and permanent causes in the long run" GDP per capita, world market oil prices, and the amount of net oil exported (equal to difference between exports and imports) are used. In our investigation the notion of diesel oil price is referred to as retail prices. Price values are fixed at the beginning of November (GTZ, 2009).

In those countries where markets are competitive, prices are normal. A breach of competition provisions results in a deviation of prices from their normal value. One of the reasons for that breach are indirect taxes and subsidies. These cause changes in demand for goods and through cross elasticity, changes in demand for other goods. A breach of equilibrium in a specific product causes equilibrium deviations in other products, the deviations become

[3] http://economicsconcepts.com/distinction_between_market_price_and_normal_price.htm

weaker when transferring from product to product through interindustry relations. Therefore even a significant price deviation for specific product, e.g. by $1 per litre of motor fuel does not burst all the commodity markets.

For determining the parameters of the econometrical model when valuing normal prices it is necessary to assign countries where prices may be considered normal. Deviations in these countries are not allowed and here *dummy* is introduced in the model. A country in which the diesel fuel price is considered normal must:

1) be a large country with a developed economy where all the consumable oil is imported which excludes rent in oil and related issues.

2) have an economy that is not dependent on oil and petroleum product tax.

3) have a diversified economy where government revenue is not dependent on a single or minimum number of taxes.

4) not have protests against high fuel prices, this being the evidence of the market normal operation.

Further research has indicated that Germany best meets these terms.

0.1 Two methods of price determination

We can talk about two methods of normal price determination: selective and constructive. The selective method is aimed at finding the countries where prices (diesel fuel price in our case) are free from peculiarities distinguishing the prices in one country from another especially in neighboring countries. Availability or otherwise of oil and the tax policies of authorities are the main reasons for price differences between countries.

With the constructive method the normal price is calculated by specific components each being based on a theoretical point of view and then the normal price is calculated using available data.

Parry & Small (2005) developed the method of optimal tax calculation on motor fuel and they also calculated the tax on gasoline for the USA and Great Britain. Parry & Strand (2011) used the same method for calculating the prices on gasoline and diesel fuel for Chile. Ley &

Boccardo (2010) used Parry & Small's method for calculating optimal taxes for 35 countries. In this section the calculation of suboptimal prices is considered. Three countries are taken as a model and in the section 2.4 a comparison of suboptimal price values is given based on optimal taxes calculated by Ley & Boccardo for OECD countries.

The calculation of motor fuel prices by replacing common taxes for optimal ones is called suboptimal, emphasizing the limitation of tax optimization on motor fuel only or for example on crude oil. Thus, suboptimal price is calculated as follows: the price under survey minus current taxes on the product plus the optimal taxes on the product.

Table 0.1

Suboptimal price, U.S. cents / liter

№		UK Gasoline 2000	USA Gasoline 2000	Chile Gasoline 2006	Chile Diesel 2006
1	The Price	117[1/]	47[2/]	113[3/]	84[3/]
2	The Tax	74[5/]	11[5/]	62[3/]	55[3/]
3	The Optimal Tax	35[5/]	27[5/]	39[4/]	10[4/]
4=1-2+3	Suboptimal price	78	63	137	129
5=4-3	Difference of the prices	-39	16	24	26

*Source:*1/GTZ 2009 tab.2.4.3; GTZ 2009 tab.2.2.3; 3/ Parry & Strand (2011) tab.1; 4/ Parry & Strand (2011) tab.2; 5/ Parry & Small (2005) p.1284;

Table 0.1 draws attention to the small differences in the optimal gasoline tax in the three countries and is clearly lower for diesel fuel in Chile. They reflect differences in the major consumers of gasoline (passenger transport) and diesel fuel (freight). It should be noted there are significant differences between actual and optimal taxes in different countries. In UK the optimal taxes are almost half the actual ones, but in the U.S.A. they are, by contrast, almost twice as large. The values of gasoline optimal taxes in Chile do not differ in general from those of the U.S.A. and the UK.

For all the merits of the constructive way, we note that its use requires specific information that can be obtained only from developed countries. For this reason, many countries,

for which the normal price is interesting are deprived of the possibility to calculate it by this method.

0.2 The usefulness of normal prices

Estimations of normal prices are important for solving four problems. The first problem is the assessment of the current situation in a country in relation to the prices of goods and services which are considered unreasonably high or low. The standard for comparison with such a country is taken from the prices for goods which can be considered normal. Roubini & Mihm, (2011, p.23; in Russian) noticed that most crises start when asset prices are increased above a fundamentally justified level. To measure the level of the price the normal price is used.

The second problem is the use of normal prices as shadow ones in the evaluation of situations where normal prices can be assumed to be significantly different from market prices.

The third problem is an assessment of the share of indirect taxes in the price of goods in comparison with countries taken as a standard. In Venezuela, Turkmenistan, and Persian Gulf countries fuel taxes are absent or low, and in 1998 the UK was a champion among developed countries in exceeding the normal motor fuel price, which ultimately encouraged the mass protests of September 2000 (see McMahon, (2006)).

The fourth problem is the forecasting of commodity prices on the basis of the level of development of a country. This price forecast is required for an estimation of major investment projects which have a strong impact on the economic life of the country. In Kossov (2005) this problem formulation was discussed using the example of industrial electricity prices.

1. The price level and its place in the system of economic indicators

A price level (z) is the tool for estimating the normal price. It indicates the relationship between the price of goods (p) and the GDP per capita (Y). It should be emphasized p and Y are expressed in current prices, they do not need to divide in the consumer price index.

$$z = p/Y \qquad (1)$$

Such a definition of *z* represents the price of item as that part of GDP per capita which should be paid for commodity unit. This is the price of goods on the demand side, it is measured in shares

of income. Price on supply side is cost plus profit. In the competitive market both prices come into balance, resulting in the normal price.

Price level (z) is determined based on the following considerations. Denoted by:

p_i - the price of goods;

q_i - the consumption of goods per capita;

h_i - the share of the cost of goods in total spending all goods and services, hereinafter - goods.

Then

$$h_i = \frac{p_i * q_i}{\sum_i p_i * q_i} = \left(\frac{p_i}{\sum_i p_i * q_i}\right)(q_i) \qquad (2)$$

The numerator in (2) is the cost of goods sold as the product of the price of goods on the volume of purchased goods, and the denominator, the cost of all goods. Thus, it means the proportion of the cost of certain goods in the total expenditure on all goods. The expression in brackets on the right hand side of (2) is the ratio of the price of goods to the amount of expenditure on all goods.

The use of (2) suggests that the data on prices and purchased goods refer to the same period of time, usually a year. The volumes of purchased goods in countries, q_i, are defined as the apparent consumption equal to the production plus imports minus exports. The above stated applies to individual commodities. Much more difficult is the case with the assessment of costs for all commodities. Official statistics do not give such information. The information source about the costs on industries is the data on the Input-Output Table. (OECD, 2011)

The volume of the national economy characterizes the country's GDP, the size of which can be found in national and international statistics. The GDP includes the acquisition of goods by the population and the state for current consumption, the acquisition of goods for investment purposes, the export value minus imports, which constitute a part of the gross turnover, $\sum_i p_i * q_i$. The analysis shows that the GDP is about half the gross turnover of goods and services in a country as follows from the table below

Table 1.1

Value added in the gross turnover, %

	1995	2000	2005
Brazil	51	49	49
Germany	52	50	50

India *	53	53	50
Japan	54	51	53
Russia		51	51
S. Africa	50	50	43

*1993/1994; 1998/1999; 2003/2004

Source: OECD Input - Output Tables/ OECD 2011

http://www.oecd.org/document/3/0,3746,en_2649_34445_38071427_1_1_1_1,00.html

A remarkable feature of the data represented in the Table 1.1 is that they cluster around 50%. The only noticeable difference is the figure for South Africa 2005, which is likely related to the peculiarities of the year.

The relation of the per capita GDP and gross turnover can be written as

$$Y = \mu * \sum_i p_i * q_i \qquad (3)$$

where μ is the share of GDP in the gross turnover of goods in the country. Substituting (3) into (2), we obtain:

$$h_i = z_i * q_i \qquad (4)$$

whence

$$z_i = \frac{h_i}{\mu * q_i} \qquad (5)$$

Formula (5) means that the price level (z) is a function of the share of costs for the commodity in total costs for all commodities. An important part of (5) is the dimension of the indicator: the price level is a relative value. The coefficient value μ, as shown in Table 1.1, may be taken as 0.5. It means that the price level is the share of costs for purchase of a commodity unit in total costs for all commodities with a correction factor.

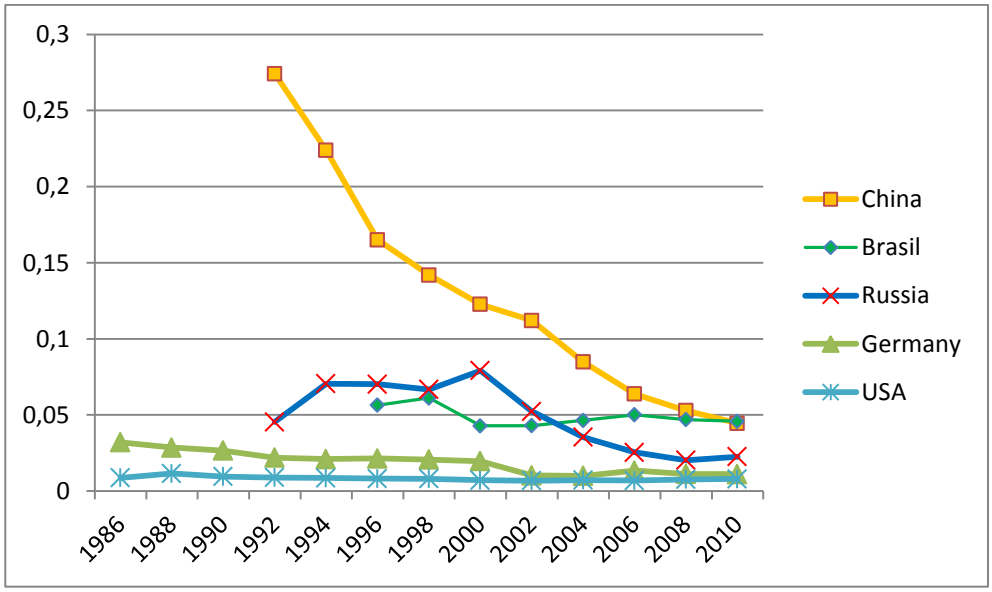
1.1 Rationale price level (z) and its dynamics

The dynamics of the share of expenses for specific goods in the total expenses (h) is determined by the position of the commodity on the life cycle curve. After a new product enters the market, the dynamics are intensified for around five years, and then they decline, as new

commodities enter the market. A typical example to consider is food expenses which are much lower when the country is rich. The figure "five years" is adopted as an approximate limit separating the new commodities from old ones. In a developing economy the share of commodity expenses for the majority of goods aged not less than five years is declining while consumption per capita is not declining. This means that with the development of the economy the commodity price level is declining. This determines the negative inclination of the price level over time and with the economy scale. It is supposed that materials for producing commodities are available. Commodities produced from scarce resources may become more expensive as demand outstrips the supply of natural resources.

Let's analyze the price trends for the Big Mac Index for Brazil, China, Germany and the USA from 1986-2010[4]. Each of the points in Figure 1.1 is the ratio of the price of Big Mac in national currency to the per capita GDP in the same country in a given year.

Fig. 1.1 Big Mac price as percentage of GDP per capita



The points in Figure 1.1 show that in less developed countries (China, Brazil, Russia) the price level is much higher than in developed countries (Germany, USA). Figure 1.1 illustrates a general rule: the lower the level of economic development of the country is, the greater the part of the revenue has to be used for purchasing a commodity unit.

[4] Big Mac Index Data//http://bigmacindex.org/

The example illustrates the general inverse relationship between the price level and the level of economic development. This relationship is evident in the presentation of the price level, not as a function of time (Figure 1.1), but as a function of the size of the economy (Figure 1.2). The size of the economy is expressed by a per capita GDP in constant prices in countries, in which a purchasing power parity (PPP) is used.

Fig. 1.2 Big Mac price as percentage of GDP per capita

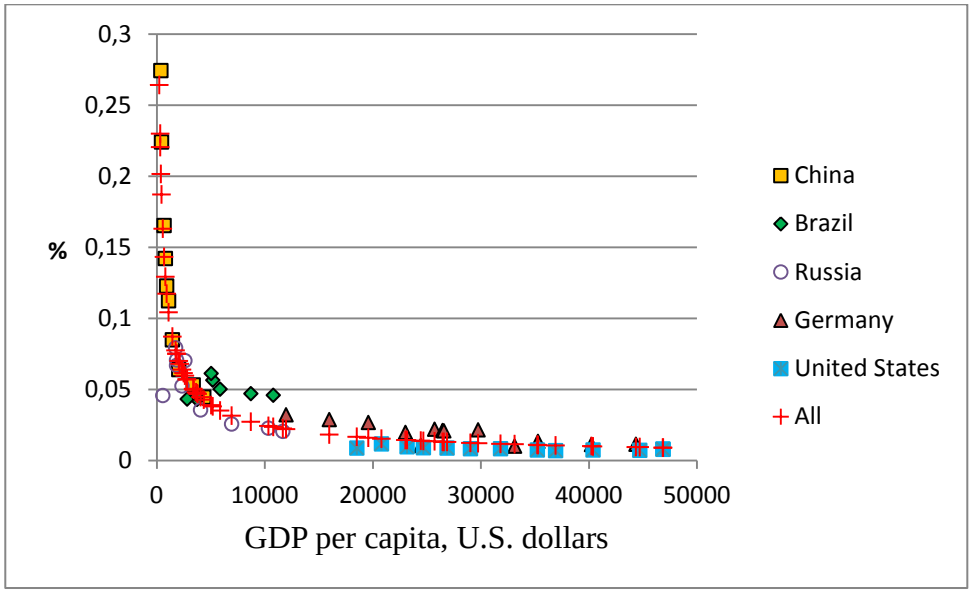


Figure 1.2, except for the data for each of five countries, which were discussed above, shows the theoretical regression line, "All" (red pluses), by which theoretical points of regression are marked, represent a trunk on which the price level movement occurs in an emerging economy. The trunk property to connect widely scattered points breaks through the characteristics of certain countries. It becomes especially noticeable when comparing data in countries with very different levels of economic development.

From z=p/Y (1), it follows that if the price of fuel is the same in two countries, the price levels for those two states will be different if they have different GDPs per capita.

By definition,

Price level ≡ International * National (6)

or z = Int * Nat (6a)

The international component (Int) is designed to identify differences between the various countries by the econometric model. The national component (Nat) includes country-specific policy features of diesel prices for all countries and random error.

The identity (6) is the basis for the construction of the econometric model. Economic factors can explain the differences between countries in the international component (Int) which is represented as a function of the level of economic development and the oil market. To do this the actual taxes in the price of diesel fuel in every country have to be divided into two parts. The first part of the total amount of taxes on goods, which are proportional to all of the factors included in the ln(Int), and the second part in the ln(Nat). Factors included in the model to explain the differences in price levels form the explanatory variables of the model. It is important to emphasize that these variables apply to all the countries (common variables).

The second group of independent variables indicates the logarithm of the national component of the diesel price level (ln(Nat)) and underlines individual specifics for each country . The second part of (6), the difference between ln(z) and the first part, ln(Int), defined as ln(Nat). The national component is described in the econometric model using the dummy for countries that make it a deterministic element, called the feature of the country. The particular case of these features are fixed effects by country. The national component includes the residual of the regression.

Let us call the product of the international component multiplied by GDP per capita in current prices (national or international) as the normal price.

$$NPrice \equiv Int * Y \qquad (7)$$

The normal price is assumed to be a reference point for analyzing price differences between countries.

1.2 The explanatory variables of the model

1.2.1 Explanatory variables for estimation of the international component of the retail prices level of diesel fuel (Int)

The diesel price level is a dependent variable in the model. The independent variables are presented using three groups of explanatory variables: macroeconomics, oil market and time. The variables in the models are expressed in logarithmic form (except for the time variable).

Macroeconomics

The price is the dependent variable of the model. To explain the differences in prices between countries, it would seem logical to choose as an explanatory variable, GDP per capita in purchasing power parity (PPP). It is the most general characteristic the economic development of a country.

(a) **V** - Gross domestic product based on purchasing-power-parity (PPP) per capita GDP Current international dollar. We used data of the International monetary fund about GDP per capita.[5]

Combining in one model data for countries with different levels of economic development allows us to consider data from developed countries as benchmark for countries with economies in transition, as well as a benchmark for developing countries. A prerequisite for this is the independence elasticity of price level from GDP per capita at PPP, which requires verification.

(b) The PPP conversion factor to the market exchange rate ratio is defined as **I** =V/Y. Y is GDP per capita at current prices in U.S. dollars[4]. In developed countries, the **I** values are close to one. Balasa (1964) was the first to point out the need to adjust the estimations for the comparison of data across countries using GDP at PPP. Volkonsiky & Kuzovkin (2002) used this variable to measure the disparity in prices.

[5] World Economic and Financial Surveys / World Economic Outlook Database http://www.imf.org/external/pubs/ft/weo/2012/02/weodata/index.aspx

On the website of the World Bank[6] there is a ready indicator "PPP conversion factor (GDP) to market exchange rate ratio" which represents the ratio of GDP at PPP to GDP at the current exchange rates. Since the values of GDP in the databases of the World Bank and the International Monetary Fund are different, in this work the ratio of exchange rates is determined according to the IMF, from which the values of per capita GDP are taken.

The oil market

The impact of the oil market on diesel fuel prices is described by two parameters: the oil price on the world market and its net export (export minus import) per capita. They determine the oil rent which net oil-importing countries pay to exporting countries. Net oil exports have a strong influence on the normal diesel fuel price – in the exporting countries it is generally lower than in the importing countries. The model includes the price of oil on the world market (**Oil**). For all countries, the price of oil in one year is expected to be equal. The price of oil on even years (1998-2008) were ($ per barrel): 11,5 ; 19.7; 26.0; 42.8; 60.2; 48.0.(Source: GTZ)

The difference in the taxes on diesel fuel between countries depends significantly on whether the country is an oil exporter or importer. The independent variable "net exports of oil" (**NetExp**) is included in the model to account for this fact. It is the difference between exports and imports of oil. Positive values of the difference referred to as "net exports" and labeled **NetExp**[7]. Net oil imports was not statistically significant, and therefore excluded from the model.

Features of years.

Six years, data on which is used to evaluate the parameters of the model, were quite different. For example, the first (1998) and last years (2008) are marked by crisis. To identify the

[6] http://www.worldbank.org

[7] EIA International Energy Statistics/ http://www.eia.gov/cfapps/ipdbproject/IEDIndex3.cfm#

characteristics of the individual years, in the model for each year, the dummies **Year$_t$** are introduced, in which the model takes the value 1 for the year *t* and 0 for other years. As oil prices are assumed constant for each year, the values of variables **Year$_t$** are dependent on them.

The five variables (**V, I, Oil, NetExp** and **T**) determine the theoretical value of the price level, an international component, which is based on the estimation of the normal price of diesel fuel

1.2.2 Variables across countries determining the value of international component of the retail price level of diesel fuel (Nat)

The second group of independent variables determine the logarithm of the national component of the diesel price level and underlines features of each country.

An extremely large variety of prices for diesel fuel show three groups of the countries with high, normal or low diesel fuel prices. A dummy variable is incorporated into the model for the selection of countries with high and low diesel fuel prices. However for this purpose it is necessary first of all to set the countries which have normal prices. Four countries of old Europe, not having significant stocks of oil, are used as a base: France, Germany, Spain and Sweden. For these four countries the deviation of the prices from normal is accepted as random.

For the 75 countries for which prices may differ by ln(Int) two dummy variables, C and C*T, are introduced. Dummy C_i take the value 1 for country *i* and 0 for the rest of the world.. In describing the characteristics of individual countries, the time (T) is defined as -2, 0, 2, 4, 6 and 8 (for the model built on the even-numbered years from 1998 to 2008). In the model the time for the countries connected with the dummy for the country and is designated as $C_{i*}T$. For each of the two dummy variables C_i and $C_{i*}T$ in the model the value of the two regression coefficients β_1 and β_2 for C_i for $C_{i*}T$ are estimated.

This assumes a uniform tax policy change for motor fuel in the country throughout the period. If this policy has not significantly changed, then $\beta_{2i} = 0$ and the coefficient b_{1i} is a fixed effect. If the policy is changed with respect to taxes, for example, they are increased , then $\beta_{2i} > 0$ defines a linear trend of increase in taxes. By reducing taxes $\beta_{2i} < 0$. Thus the national component (Nat) takes into account only two differences in the dynamics of the price level in relation to other countries:

1) A constant difference between the price level in the country and the ln(Int) is a fixed effect for country $\beta_1 \neq 0,\ \beta_2 = 0$;

2) For a move to or from ln(Int) with a constant growth rate , $\beta_2 \neq 0$.

The model does not provide for more complex cases .

Except $b_{1i}*C_i$ and $b_{2i}*(C_i*T_i)$, the national component also contains a residual of the regression - random error ε_{it}. It is assumed that random error has a normal distribution with mean zero and the same variance for all observations and the errors in various observations are independent.

1.3 Two models for the estimations of normal prices

The following are the two models to determine the normal prices which differ primarily in the dependent variables. The price level is the dependent variable in the first model, and prices in the second.

The model of the price level of diesel fuel (8) consists of two parts, the international component in square brackets and the national component in parentheses

$$\ln(z_{it}) = [(a_0 + \sum \alpha_t Year_t) + \alpha_v \ln(V_{it}) + \alpha_I \ln(I_{it}) + \alpha_{Oil} \ln(Oil_t) + \alpha_{Ex} \ln(NetExp)] + (\beta_{1i} C_i + \beta_{2i} C_i * T + \varepsilon_{it})$$

(8)

By tradition the model price equation is constructed with respect to the logarithms of the common variables which allows us to interpret the coefficients of the variables as elasticity. In the model (8) the dependent variable is the level of prices, but it is easy to see that it can be reformulated so that the dependent variable will be the price.

$$\ln(p_{it}) = [(a_0 + \sum \alpha_t Year_t) + (\alpha_v + \alpha_I) \ln(V_{it}) + (1 - \alpha_I) \ln(Y_{it}) + \alpha_{Oil} \ln(Oil_t) + \alpha_{Ex} \ln(NetExp)] + (\beta_{1i} C_i + \beta_{2i} C_i * T + \varepsilon_{it})$$

(9)

The hypothesis of the independence of the price from (Y) is equivalent to the hypothesis H = 1. The hypothesis of the independence of prices from V is equivalent to the hypothesis H = 0. The hypotheses about the significance of the remaining coefficients are the same for both models.

It is important to note that in (8) and (9) the values of the national components of the same. The differences between the models are associated only with the international component. section 2.6 shows a virtually identical estimation of normal prices to these models.

The benefits of the form of the model (8) with the price level as the dependent variable to the model (9), in which the dependent variable is the price of goods are:

- the dependent variable in (8) contains a specific inflation (for diesel fuel) as the dependent variable in (9) is subject to general inflation;
- values of the price level are significantly more homogeneous compared to the actual price, thus avoiding the problem of the heteroskedasticity of random error;
- model (8) has a much weaker multicollinearity of variables. Since the value of the correlation coefficient for the pair (ln(V), ln(I)) is equal to 0.58, and for couples (ln(V), ln(Y) is equal to 0.97;
- a graphical representation of the data in the model (8) differs significantly offering greater clarity in comparison with the model (9).

It should be noted that the use of the dependent variable, the logarithm of the price level, does not result in a spurious correlation, which can be proved by the proximity of R^2 models (8) and (9)

These differences relate to the evaluation of the same parameters in models (8) and (9). In section 2.6 we show that model (8) has a significant advantage over model (9) as a tool to forecast prices for years to come .

2. Estimation of model parameters

An estimation of the model parameters begins with the definition of the composition of the countries, the data on which allow not only stable estimates of the parameters, but results credible in terms of the economy. Initially, it was decided to include 95 countries with a population of at least 1 million people, with the exception of oil-producing countries. Hong Kong, Singapore, Gibraltar were not included in the model due to the fact that they are city-states.

In the model, made up of 95 countries, the price dispersion between minimum and maximum was 1:170. The exclusion of Iran, Turkmenistan and Venezuela allowed the price dispersion to be reduced more than tenfold. This reduces the number of countries to 92. In countries which the per capita GDP at PPP does not exceed US dollars 1000, the economy is marked by a considerable proportion of subsistence sector, the monetary valuation of which poses a problem. For this reason, the data on many Africa countries to the south of Sahara have been excluded from the sample. As a result, estimations were made for 79 countries.

Models (8) and (9) are based on the hypothesis that the values of elasticities ln(z) and ln(p) on the common variables are the same for all countries, which is especially important for predicting prices for the years ahead. To test this hypothesis the sample was divided into three parts. The hypothesis of the structural stability of the model for all three parts was tested (see section 2.6).

The value of the national debt per capita is chosen to divide the sample into three parts. The necessity for payment on the national debt pushes governments to increase taxes, among which the motor fuel taxes have a distinct advantage as easily collectable. For this reason, we can expect that in countries where national debt is only a few percent, the diesel fuel prices will be low, and in countries with a large national debt, they will be high. In accordance with this fact, the elasticities of these groups of countries will be different.

The sample was divided into three parts according to the data for 2006, the last year in the sample before the crisis year 2008:

1) countries, the national debt of which does not exceed 30% of GDP. These 30 countries and their list are provided in Appendix 1;
2) an intermediate group of 24 countries whose national debt is in the range of 31% to 50%;

3) countries, the national debt of which is more than 50% of GDP. There are 25 such countries, and their list is also provided in Appendix 1.

The division of countries into three parts suggests that the values of the coefficients for each of 10 common variables (ln(V), ln(I), ln(Oil), ln(NetExp) and six dummies by years) differ by groups of countries. Within one model by dividing the sample into three groups, it is sufficient to enter additional variables for the first and third groups, since the role of the variables in the second group is fulfilled by the common variables of the model. The values of the additional variables for the first and third groups are amendments to the values of the common variables, which fulfill the role of the variables of the second group.

This means that 20 additional variables must be entered into the model, by (10) into the first and third parts. Model (10) is called "long", as opposed to the "short" model (8) without additional variables. Dummy (D1 and D3) were introduced into the first and third parts of model. The model taking into account possible differences in the coefficients for three parts should follow the Wald test.

$$\begin{aligned}\ln(z_{it}) = [(a_0 + \sum \alpha_t Year_t) + \sum \alpha_{t1} D_1 Year\ ) + \sum \alpha_{t3} D_3 Year_t) + \alpha_v \ln(V_{it}) + \\ + \alpha_{v1} D_1 \ln(V_{it}) + \alpha_{v3} D_3 \ln(V_{it}) + \alpha_I \ln(I_{it}) + \alpha_{I1} D_1 \ln(I_{it}) + \alpha_{I3} D_3 \ln(I_{it}) + \\ + \alpha_{Oil} \ln(Oil_t) + \alpha_{Oil1} D_1 \ln(Oil_t) + \alpha_{Oil3} D_3 \ln(Oil_t) + \alpha_{Ex} \ln(NetExp) \\ + \alpha_{Ex1} D_1 \ln(NetExp) + \alpha_{Ex3} D_3 \ln(NetExp)] + (\beta_{1i} C_i + \beta_{2i} C_i * T + \varepsilon_{it})\end{aligned} \quad (10)$$

The hypothesis of equality of the coefficients to zero can be written as:

$$H_0: \quad a_{01} = a_{03} = \alpha_{v1} = \alpha_{v3} = \alpha_{I1} = \alpha_{I3} = \alpha_{Oil1} = \alpha_{Oil3} = \alpha_{Ex1} = \alpha_{Ex3} = 0,$$
$$\alpha_{t1} = \alpha_{t3} = 0 \ \ for\ any\ t = 1998, 2000, 2002, 2004, 2006, 2008$$

The results of testing this hypothesis are presented in the Appendix 2.

2.1 Estimation of parameters for the model with the price level

The characteristics of the distributions of the logarithms of the basic variables of the model are presented in table 2.1:

Table 2.1

Descriptive statistics for the model with the price level

Variable	Mean	Std. Deviation	Min	Max	Observations.
ln (Z)	-4.29	1.58	0.08	-7.74	474
ln (V)	8.88	1.28	10.88	1.28	474
ln (I)	0.61	0.47	1.64	-0.57	474
ln(Y)	8.26	1.67	11.45	1.67	474
Ln(P)	3.97	0.71	5.15	0.71	474
ln (Oil)	3.40	0.57	4.10	0.57	474
Ln(NetExp)	1.04	1.92	6.98	-2.83	474

The total number of observations are 474 (we use data on 79 countries for 6 years). The main variable of the model is ln (V). The total number of independent variables in the model are 160. The 10 common variables (4 explanatory variables ln(V), ln(I), ln(Oil), ln(NetExp) and 6 dummy for years) apply to all countries and explain the value of ln(Int), and 150 country variables: two variables (C_{1i} and C_{1i}*T_i) belong to 75 out of 79 countries for which the exception of the price level features of diesel fuel: 4 countries (France, Germany, Spain and Sweden) have been used as a standard and therefore do not have deterministic features .

2.1.1 The estimations of variables to determine ln(Int).

The estimations of variables in the "long" and "short" models are presented in Appendix 2. Table 2.2 contains the regression coefficients for estimation the first component of the price level, ln(Int).

Table 2.2

The parameters for calculating the ln(Int) – the logarithm of the international component of the diesel price level

The dependent variable is ln(price level); 79 countries, 6 years

Variable	Coefficient	Standard Deviation	t(418)	p-level
Intercpt	1.33	0.22	6.06	0.00
ln(V)	- 0.80	0.02	- 37.38	0.00
ln(I)	0.74	0.05	16.16	0.00
ln(Oil)	0.38	0.02	19.14	0.00
ln(NetExp)	- 0.18	0.01	- 24.06	0.00
Y 2002	- 0.14	0.03	- 5.10	0.00
Y2008	0.18	0.03	6.22	0.00
Adjusted RI	0.82			
F-statistic (50;423)	327			
Prob(F-statistic)	$<10^{-5}$			

The model produce 55 significant regression coefficients 6 of 10 for ln(Int), and 49 out of 150 for ln(Nat). The coefficients of the equation are reliable.

With 1% increase in GDP, PPP price level decreases only 0.8%,meaning an overall increase of 0.2% ceteris paribus.

Of special note in the results is the coefficient of ln(I), equal to 0.74. It shows a significant rise in the cost of diesel fuel in developing countries compared with developed ones. The reason for this is the use of motor fuels in developing countries as a major source of budget revenues.

The elasticity of the price of oil of 0.38 means that a change in the prices of diesel fuel of 62% is behind the change in the price of oil. This is due to the fact that changes in taxes on motor fuel do not directly depend on the price of oil. In some cases the authorities, if there is a sharp increase in oil prices, cut taxes on fuel, smoothing the sticker shock

Elasticity of net oil exports per capita -0.18 reflects the feature of net oil exporters. In most of these countries, the price of diesel is below the normal price. It indicates that the more oil a country exports, the lower diesel fuel prices.

The coefficients of the dummy for years in our model are a refinement to the oil price. As already noted, prices (for diesel fuel and oil) are at the beginning of November, when the GTZ is collecting data. But GDP per capita and oil exports are for the whole year. Because of sharp changes in oil prices in 2008, there is a need to make some corrections. In our calculations, such amendments are introduced for 2002 and 2008.

2.1.2 The estimation of variables to determine ln(Nat).

Regression coefficients related to ln(Nat), are given in Appendix 2. Out of 150 dummy variables, 49 are statistically significant (28 β_1 and 21 β_2) in 37 countries, for 12 countries both coefficients are statistically significant . In 38 countries $\beta_1 = \beta_2 = 0$.

2.2 The clusters - eight groups of countries surrounding the country with normal prices.

The coefficients β_{1i} are the fixed effects for the countries (b_{2i}=0), and the coefficients of β_2 determine the linear trend in the change in fuel taxes. Combinations of these factors form nine groups, which we call *clusters*. The number in the name of the cluster points to one of three groups, which include signs of the coefficient β_1, and the letter, the group to which the signs of the coefficient β_2. We can assume that countries that were in the same cluster are similar with respect to policies on taxes on fuel.

One of the preconditions of the model is the hypothesis that in four countries (France, Germany, Spain and Sweden) retail diesel prices are normal. These four countries form the center of the clusters in which by definition, $\beta_1 = \beta_2 = 0$.

Table 2.3

The features of the clusters.

	A) $\beta_2<0$	B) $\beta_2=0$	C) $\beta_2>0$
$\beta_1<0$	Divergence of further declines in prices, which are therefore lower than normal	Price is less than normal	Convergence: an approximation to the normal price below
$\beta_1=0$	Divergence: price reduction below normal	Normal price: the price difference from the normal is random	Divergence: Growth in prices higher than normal - a tax increase over the normal level
$\beta_1>0$	Convergence: an approximation to the normal price above	Price exceeds the normal	Divergence: a further rise in prices, which are already higher than normal

2.2.1 The distribution of countries to the clusters.

The analysis showed a large disparity in the distribution of the countries to the clusters, as reflected in the table 2.4.

Table 2.4

The number of countries in the cluster

	A	B	C	Total
1	4	12	6	22
2	3	38	6	46
3	2	4	0	6
Total	9	53	12	75

The countries with normal prices do not constitute the majority, it is only 50%. The authorities of the other countries, for various reasons, deviate the prices from normal levels by means of diesel fuel taxes.

The degeneracy of the cluster 3C (upward deviation from prices, exceeding normal ones, with constant velocity) is symbolic: nobody aims for increasing already high prices.

The fact that the half of all countries have the prices that are close to normal means that the authorities of these countries appreciate it as a prerequisite for the harmonious economic development of their countries. Deviations from normal prices are caused by exceptional circumstances, among which it should be mentioned in the first place the export of natural resources. This brings in export revenue, which allows exporting countries to have lower prices in the domestic market.

By geographical location, countries can be divided into two groups: "maritime" and "continental". In the "maritime" countries, bulk cargo is carried by cheap marine transport. These countries might have high taxes on motor fuel without significantly lowering competitiveness. Great Britain, Denmark and Norway are examples of such countries. In "continental" countries, such as Kazakhstan and Uzbekistan, the bulk of cargo is carried by expensive land transport, and therefore the motor fuel prices need to be low.

Cluster 1A shows a further decline in prices, which are already below normal, which is the opposite of cluster 3C. Cluster 1A forms countries are associated with oil: Bahrain, Egypt, Libya, Saudi Arabia. In Libya and Saudi Arabia, with net oil exports exceeding domestic consumption 5-6 times. Egypt is a notable exception in this group, where there is a rapid decline in net oil exports.

Cluster 1B has diesel fuel prices which are steadily lower than normal ones: **Australia, Chile, Ecuador**, Dominican Republic, **Malaysia, New Zealand**, Syria, **Taiwan**, Thailand, Tunisia, **United States**, Uruguay. Among the 12 countries forming this cluster, only two countries, Malaysia and Syria, are net oil exporters, in which the volume of oil exports is comparable with the domestic consumption. In the cluster, two facts stand out. The first one is the absence of European countries and the prevalence of oil-importing countries located on the shores of the Pacific Ocean, whose names are boldfaced. The principal feature of net oil-importing countries in the cluster 1B is lower diesel fuel taxes practiced by these countries. Authorities prefer to have lower diesel fuel taxes for the competitiveness of domestic producers. The second is the geographical location of the low tax countries. Australia, Malaysia, New Zealand and Taiwan are located on islands, and Chile is stretched along the ocean. The predominance of maritime transport in the transport of goods unites these countries with

Denmark and Norway. However the tax policies on motor fuel in the two groups of countries are very different. These lower motor fuel taxes, different from European ones, will be called "American".

Cluster 1C is a convergence to normal prices from downward. In the cluster, there are six countries: Belarus, Ghana, Indonesia, Israel, Paraguay, and Uzbekistan. Significantly among these countries Paraguay and especially Uzbekistan are located far from the sea, and the increase in diesel fuel prices is undesirable for them. We can assume that there are reasons that force their governments to sacrifice long-term goals for the current benefits. A price convergence to normal prices for coastal countries is explained by the secondary role of land transport in the transportation of cargo.

Cluster 2A is a divergence from the normal prices downward. In the cluster, there are three countries: Bolivia, Japan, and Kuwait. This orientation of changes in prices is understandable for oil producing countries, but not for Japan. Countries like Japan are a part of the cluster 1B. One can assume that after some time Japan will join to them.

Cluster 2B has normal prices. Among the 38 countries, half are in Europe mostly in Western Europe. For these 38 countries there are 228 observations showing a deviation (ln(Nat)) from the theoretical value of the normal price. Analysis of deviations determines a robust estimate of the normal price.

Table 2.5

Distribution of logarithms of ln(Nat) for 228 normal prices

The intervals ln(Nat)		Number of observations
	<-0.40	10
-0.4	-0.3	12
-0.3	-0.2	17
-0.2	-0.1	30
-0.1	0	39
0	0.1	51
0.1	0.2	33
0.2	0.3	26
0.3	0.4	10
Total		228

90 observations or 43% are between -0.1 and 0.1, i.e. within 10% of normal prices. Two thirds of all observations are ± 0.2. In countries, the situation is as follows:

for 21 countries of the 38 for which price peculiarities are not revealed, (Angola , Argentina, Austria, Azerbaijan, Belgium, Canada, Finland, Greece, Honduras, India, Ireland, Korea, Mexico, Netherlands, Peru, Portugal, Romania, Slovenia, South Africa, Switzerland, United Arab Emirates) the mean deviation of ln(z) from ln(Int) is within ± 0,1, which can be considered a variation that can be ignored in the price analysis;

10 countries ranged from 0.1 to 0.2: positive deviations (Croatia, Czech Republic, Italy, Morocco, Poland) and negative (China, Colombia, Pakistan, Ukraine, Vietnam).

deviation from 0.21 to 0.3 are revealed in the following countries: positive (Bulgaria, Cambodia, Hungary, Kazakhstan) and negative (Brazil, Philippines, El Salvador), and the average for Brazil is -0.33. For a robust estimate of the normal prices take ln(Nat) $\leq|0,2|$.

This means that a price deviation from the normal price which does not exceed 20% in absolute value can be considered normal.

Cluster 2C is a divergence from normal prices upward: Benin, Nigeria, Russia, Senegal, Slovakia, and Turkey. The diversity of the cluster indicates its temporary: three African countries with common problems; Slovakia and Turkey, importing oil. Turkey, as a maritime country has a policy of high taxes on motor fuel. For Slovakia it is a necessary measure. Concern for budget revenues and the desire to reduce emissions into the atmosphere are two reasons for this behavior.; Russia is mavericks in the cluster. All large exporters of hydrocarbons, with the exception of Norway, have a policy of low fuel prices in the domestic market. This policy means the transfer of part of hydrocarbon rents to motor fuel consumers in kind. The exceptional position of Norway will be explained below.

Cluster 3A. In the two countries the prices converge to the normal from higher one. Norway is a net exporter. The case of the United Kingdom is instructive. In 1993, the authorities introduced an automatic tax indexation of inflation, fuel prices became the highest in Europe in 1998. The price rise on the imported oil from 18 to 28 dollars per barrel in 2000 plus another tax indexation of inflation caused a leap in motor fuel prices in the domestic market, which led to mass protests that shook the country. During the same increase in oil prices, the French government extinguished emerging protests by means of lowering motor fuel taxes, which is a standard anticyclical instrument of economic policy [see McMahon, (2010)]. In 2008, diesel fuel prices in Great Britain dropped to normal levels. Note that these two countries are maritime ones.

Cluster 3B represents prices steadily exceeding normal ones. It comprises of two African countries **Cameroon** and Kenya and two European countries Albania, **Denmark**. The names of the net oil exporting countries are boldfaced. For Cameroon, with its underdeveloped economy, the motor fuel taxes are an important source of revenue for the budget of the country. High diesel fuel prices are understandable in the case of Denmark, which is a "maritime" country. However, next to three other countries of the cluster, Denmark looks like a maverick.

Denmark and Norway are cases of particular note. They are located in the neighboring clusters of 3A and 3B. In Denmark oil exports are comparable with domestic oil consumption, in the Norway oil exports exceed domestic consumption. The ratio of oil exports to domestic oil consumption in Norway is twice as high as in Libya and Saudi Arabia, but the motor fuel tax policy is different. The authorities in Denmark and Norway are not afraid to take all the oil rent in the budget. This can be explained by high public trust in the government, which is based on developed civil society institutions, which allow the monitoring of the government actions. The tax diesel fuel rate in these countries is higher than normal: a high income level allows citizens to pay for the expensive motor fuel in the belief that the oil revenue will be used for the public ends.

Let's give a brief summary. Normal prices occur in half of the countries (38 out of 75), half of which are in Europe (18 out of 38). This gives grounds to call the fuel tax level, taken as a standard, "European".

The opposite of the European taxation system is the "American" system. It is used in 12 countries (cluster 1B), eight of which are located on the Pacific coast.

The existence of two approaches to fuel tax, European (higher) and American (lower), make it necessary to compare the benefits and drawbacks associated with each of them.

2.3 Estimation of normal price

The values of the normal prices are given in Appendix 3. The characteristics of the distributions of two sets of prices - retail and estimations of normal are given in table 2.6

Table 2.6

The characteristics of the distributions of retail prices and estimations of normal prices, U.S. cents per liter.

		1998	2000	2002	2004	2006	2008
Median	Normal Price	39	47	47	68	82	96
	Retail price	35	47	43	66	84	96
Average	Normal Price	42	51	50	73	88	105
	Retail price	42	73	73	96	111	124
Maximum	Normal Price	77	94	90	133	153	178
	Retail price	111	122	120	160	173	170
Minmum	Normal Price	13	18	17	26	34	41
	Retail price	7	6	8	8	7	9
Maximum/ Minmum	Normal Price	5.7	5.3	5.2	5.0	4.4	4.4
	Retail price	15.9	20.9	15.0	20.0	24.0	18.9

The values of the medians of two arrays (retail prices and normal prices) by years, in contrast to the values of the averages, are almost the same. This indicates that a significant difference between retail prices and normal prices exists in a few countries. The comparison of the maximum and minimum values of two arrays shows that significant price changes are primarily explained by an increase in the values of minimum prices. The reason for these changes is the inclusion of diesel fuel taxes in the estimations of the normal price by the same rules for all countries. As a result, the ratio of maximum to minimum estimates of the normal prices is reduced by about three times compared to the same ratio for retail diesel fuel prices.

Let's go back to the prices of Big Macs. The highest price (in U.S. dollars) were recorded in Iceland and Norway 6.67and 6.06 respectively. The two countries with the lowest prices is China and Qatar 1.30 and 0.68 respectively. Price ratio for a pair of Iceland / Qatar is 9.8, for a pair of

Norway / China is 4.7. As the first pair is represented by countries with a very small population, as a benchmark should take the data to the second pair of countries. The ratio of prices for the same goods across countries within 5-1 can be considered normal.[8]

2.4 Testing the hypothesis of the price correspondence to the normal prices for France, Germany, Spain and Sweden

To estimate the parameters of the model, it was assumed that in four countries (France, Germany, Spain, and Sweden) the prices are normal. The formal sign is ln(Nat) = 0. From a practical point of view, this condition should be considered as too rigid: there are no countries where it held for all six years. For this reason, we shall limit ourselves to revealing where in the list these 4 countries ranked by the removal of retail prices from normal prices.

To estimate the removal of the retail price from its normal values, we calculate the distance:

$$dis_i = (\sum\{[(\ln(Nat))_{it})\text{^}2]/6\}\ \text{^}0.5 \qquad (11)$$

In the list of countries ranked by the increase of distances from the normal prices, the mentioned countries take the following places: Germany 1, France 3, Sweden 8, and Spain 14. For Spain the retail price is different from the normal price by an average of 13% (for Germany it is 4%). In the sample of 79 countries, such a placement of counties as the standard for normal prices can be considered acceptable. This suggests that the hypothesis of the normality in prices in France, Germany, Spain and Sweden is confirmed.

2.5 The normal prices as approximations of suboptimal prices

Here the proximity of the two approaches, constructive and selective, to the definition of the normal prices is demonstrated. Table 0.1 presented the prices calculated on the basis of optimal motor fuel taxes. For the same countries for the same years, we evaluated the normal prices.

[8] http://www.nationmaster.com/graph/eco_big_mac_ind-economy-big-mac-index

Table 2.7

Two set of prices: suboptimal and estimation of normal

Country	UK	USA	Chile	Chile
Fuel	Gasoline	Gasoline	Gasoline	Diesel
Suboptimal price	91	63	138	130
The estimation o f normal price	90	90	112	103

The comparison of normal prices with the suboptimal ones shows that they are close to each other. Both prices are practically the same for gasoline in the UK, and the difference does not exceed 20% for gasoline in Chile.

Estimates of the normal prices differ from the retail prices by the difference between the taxes that are included in the composition of the normal prices and taxes on the goods in the retail price composition. A comparison of this difference with the difference between the optimal taxes and the taxes in the price composition allows us to understand to what extent the estimates of the normal prices can approximate the suboptimal prices. To solve this problem, we calculated estimates of the normal gasoline prices for 2007 as the average ones for 2006 and 2008. For the calculation model (8) was used. The results are presented in the table 2.8. The data in columns 1 and 2 are taken from table 3 of Ley & Boccardo. Column 3 of the table 2.8 shows the 95 RON gasoline taxes, calculated on the basis of the share of taxes in the price and prices shown in OECD/IEA Energy Prices and Taxes. Columns 4 and 5 of the table 2.8 show the difference between the optimal taxes and two values of actual taxes. Among the 23 countries listed in the table New Zealand, Sweden and the United Kingdom stand out with noticeable gaps between the optimal taxes and actual taxes. The data for these countries is boldfaced. Column 6 shows the difference between the estimates of the normal prices (NP) and the gasoline (P) prices for the same countries.

Table 2.8

A comparison of optimal tax with tax estimations in the normal price U.S. cents per liter

	Optimal Motor Fuel Taxes[a]/	Actual		The differences		
		L&B[a]/	95 RON[b/]	4=1-2	5=1-3	NP-P
0	*1*	*2*	*3*	*4*	*5*	*6*
Australia	28	41	42	-14	-14	40
Austria	57	82	87	-25	-30	-18
Belgium	75	99	115	-24	-40	-47
Canada	31	24	32	7	0	6
Czech Republic	53	73	82	-20	-29	-60
Denmark	73	102	110	-29	-37	-30
Finland	58	104	113	-45	-54	26
France	94	101	111	-7	-17	-31
Germany	82	107	119	-25	-37	-72
Greece	57	64	67	-7	-10	-44
Hungary	60	60	83	-1	-24	-8
Mexico	28	16	10	12	18	39
Netherlands	68	115	126	-47	-58	-35
Norway	48	106	125	-58	-77	-69
New Zealand	20	102	50	**-82**	**-29**	35
Poland	52	87	87	-35	-35	-42
Portugal	63	99	111	-36	-48	-26
Slovak Republic	46	86	87	-40	-41	-28
Spain	42	68	74	-26	-32	-33
Sweden	56	85	109	**-30**	**-54**	-73
Switzerland	34	83	71	-49	-38	56
Turkey	26	131	139	-105	-113	-65
United Kingdom	41	74	126	**-33**	**-85**	-37
USA	26	11	13	16	13	58
r- correlation coefficient between column (6) and				0.26	0.55	

columns (4 and 5)			
The observed value of t	1.36	3.87	

Source: [a/] Ley & Boccardo, tab.3, p,12; [b/] *International Energy Agency* ENERGY Prices & Taxes/*Quarterly statistics/2009/SECOND QUARTER //*OECD/IEA, 2009; pp.312 , 339.

The result of the analysis is shown in the last line of the table. At a significance level of 5% and 22 degrees of freedom, the critical value t = 2.07. It follows that the hypothesis about the presence of the correlation between the differences in taxes (columns 4 and 5 of table 2.8) and the differences in prices (column 6 of the table 2.8) is rejected for L&B and confirmed for RON 95 gasoline. This situation is largely in countries that are very different from the majority. The exclusion of these countries from the calculation causes the increase of the coefficient of correlation that indicates improving an ability of the differences between the price and the estimation of the normal price to explain the differences of the countries by taxes. Table 2.9 illustrates this.

Table 2.9

The coefficients of correlation after successive elimination of countries

L&B		RON 95	
24 countries	0.26		0.55
New Zealand	0.42	Finland	0.62
Sweden	0.56	Sweden	0.67
Finland	0.65	New Zealand	0.70
Turkey	0.70	United Kingdom	0.73

Table 2.9 shows the countries whose exclusion from the calculation increases the coefficient of correlation. The initial level is shown for all 24 countries; it repeats the last line of the table 2.8. Countries are excluded sequentially. The exclusion of New Zealand from the tax analysis on L&B has increased *r* from 0.55 to 0.42. The exclusion of Finland from the tax analysis on 95 RON increased *r* from 0.26 to 0.42. The exclusion of New Zealand, Sweden and Finland from the tax analysis on L&B increased *r* from 0.55 to 0.65. The exclusion of Finland, Sweden and New Zealand from the tax analysis on 95 RON increased *r* from 0.55 to 0.70. Among four

countries that are excluded from two calculations, three countries are the same: Finland, New Zealand, and Sweden. The exclusion of these three countries makes equal two differences from the point of view of the closeness of their correlation with the differences in prices. The exclusion of these countries from the calculation explains 40% of the difference between the retail price and the estimation of the normal price, the difference between the optimal and observed taxes on the same countries. The result points to the consistency of two approaches, constructive and selective, in estimating normal prices.

2.6 Testing the hypothesis of identity of solutions on models for the price and the price level

Section 1.3 showed that the models for the price level (8) and the price (9) are two different forms of the same phenomena. We shall prove that these models lead to almost identical results, both in terms of coefficients and in terms of fit. Thus, the transformation of the model form does not cause a spurious correlation. Table 2.10 gives the values of the elasticities of the common variables, obtained two ways: when estimating the model for ln(p) and the model for ln(z). In the second case, the elasticity's are recalculated by (9). Since, as follows from (9), the values of the variables on countries are the same in two models, they are not given.

Table 2.10

The parameters for the model with ln(p).

Common variables	Elasticity		ln(p)
	ln(p).	ln(z)	
Intercept	1.33		0.00
ln(V)	-0.07	-0.07	0.31
ln(Y)	0.30	0.26	0.00
ln(I)			
ln(Oil)	0.38	0.38	0.00
ln(NetExp)	-0.18	-0.18	0.00
Y 2002	-0.14	-0.14	0.00
Y 2008	0.18	0.18	0.00
Adjusted RI	*0.918*		

F(55,418)	*97*
P	$<10^{-5}$

The main feature of ln(p) is a statistically insignificant diesel fuel price by GDP at PPP. In this model, the macroeconomic variable is only per capita GDP at current prices. It is not important for the statistical data analysis, but it is important for forecasting, because all the macroeconomic information is concentrated in one indicator, not in two as in the model with ln(z).

To predict the prices the two models require information on macroeconomics from different sources. For the model where the dependent variable is the price, ln(p) information on GDP per capita from the Ministry of Economy is required[9]. For the model where the dependent variable is the price level, ln(z), as well as information on GDP per capita, information on the national currency against the dollar is necessary. There are two sources of information for forecasting prices, the Ministry of Economy and the Central Bank, rather than a single ministry of economy

The data of table 2.10 confirms the hypothesis that between the values of the model, the dependent variables in which are the price and the price level, there is a one-to-one correspondence. For this reason, it can be argued that in terms of quality, both models are identical. On this point, the model with the price level as the dependent variable has a number of advantages, which were mentioned in section 1.3 in relation to parameter estimation and to the use of the results for forecasting.

3. Russia and Kazakhstan - what next?

The purpose of this chapter is to analyze the policy of the Russian and Kazakhstani authorities with respect to diesel fuel taxes. Russia is closely connected to Kazakhstan by the Customs Union. Belarus, the third country of the Customs Union, is a net oil importing country. Among 79 countries, for which the estimates of the normal diesel fuel prices are made, 26

[9] In different countries, these agencies have different names but this does not change the substance of their work, for example oriented to keeping the unemployment at an acceptable level for the society. Economic growth is the best way to accomplish this task.

countries are net oil exporting countries, among which 9 countries have the prices below normal, 13 counties have the normal prices, and only 4 countries have higher than normal prices. Kazakhstan is a country with normal prices.

Russia diverges from normal prices at a constant velocity. The same policy is conducted by another oil exporting country, Nigeria, which has, like Russia, a strong budget dependence on oil, but, unlike Russia, the country has security problems. This forces the Nigerian government to focus on easily collected taxes, which include a motor fuel tax. Prices exceeding normal ones were noted in three oil exporting countries: Norway, Denmark, and Cameroon. Cameroon is characterized by the problems, which are inherent for African countries. "In most African States appeared bloated, unprofessional and inefficient bureaucracy and amorphous social structures"[10] It differs much from Russia and Kazakhstan.

Since Kazakhstan and Russia are net oil exporters, as a background for comparing retail diesel fuel prices, we shall use data on other oil exporters Norway, Denmark, Canada and Mexico that are culturally closer to Russia and Kazakhstan, than, for example, Persian Gulf and African countries. Normal prices in these countries are given in table 3.1 (for all countries see Appendix 3); it also shows data on the average oil exports for 1998-2008 per 1000 inhabitants in barrels per day: the higher it is, the lower the estimation of the normal price is.

Table 3.1

Estimation of normal diesel fuel prices.

	Net exports of oil per 1000 capita, barrels per day	Normal prices. U.S. cents / liter					
		1 998	2 000	2 002	2004	2006	2008
Canada	28	37	47	44	65	75	85
Denmark	8	59	48	46	67	82	102
Kazakhstan	41	21	22	22	32	41	51
Mexico	12	29	39	37	51	63	77
Norway	567	22	28	28	41	51	62
Russia	34	21	25	25	37	47	59

[10] Problems and difficulties of African States// http://bemoli.info/probafrstates.html

First of all, two things should be noted:

1) a doubling of the normal prices from 1998 to 2008 in all countries except Norway, in which they have tripled;

2) an increase in the normal prices from year to year in Kazakhstan, Russia and Norway despite oil prices fluctuations.

Differences in normal prices between countries in principle repeat the differences in the per capita GDP at PPP, which is especially noticeable when comparing prices in three countries with similar volumes of oil exports per capita: Canada, Kazakhstan and Russia. The obvious exception is Norway: due to the significant oil exports per capita, normal prices in Norway are lower than in Mexico, and the excess of prices in relation to Russia is insignificant compared with the differences in the per capita GDP. The comparison of normal prices in the countries in the Table 3.1 shows that between them there are no significant differences, and existent ones are easy to explain. So, the paired correlation coefficients between the estimates of normal prices in these countries are positive and the lowest coefficient is 0.91.

A substantially different picture appears in the deviations of the actual prices from normal price estimates. The general direction of the price behavior for each country with peculiarities is prescribed by the coefficient β_2 - the price ratio of growth for the year.

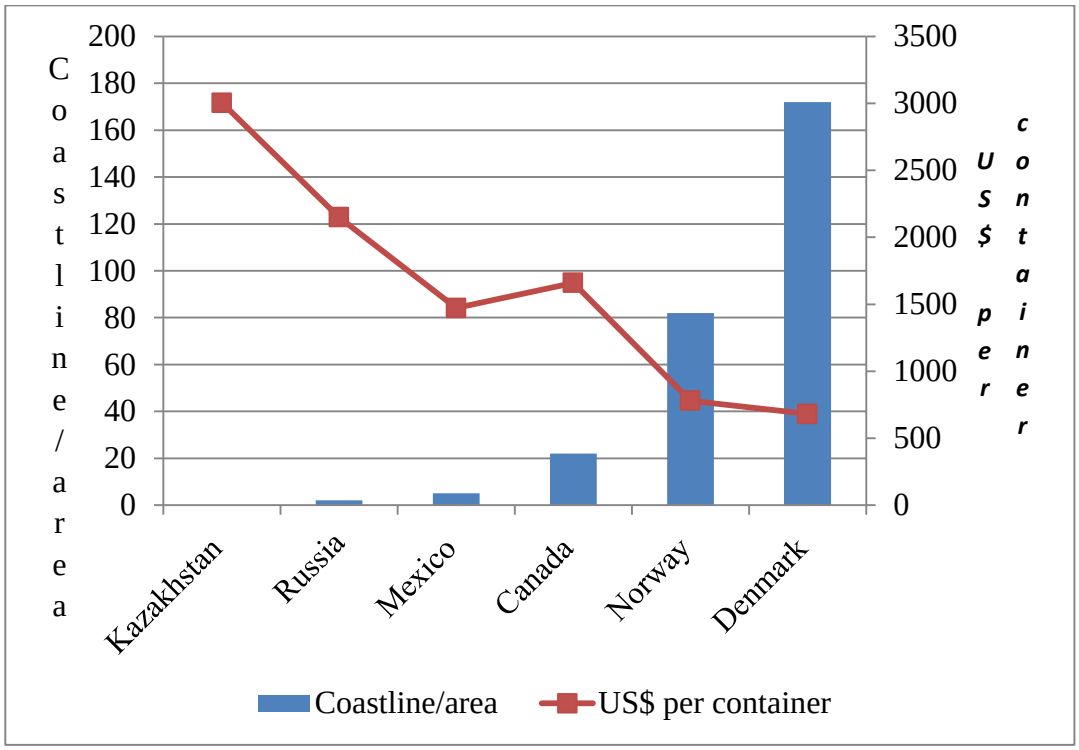
So far, each country has been treated as a point in the diesel fuel price analysis. The example of the influence of the country's size on prices is "fuel tourism", where small countries attract buyers with the lower motor fuel prices.

The geographical location of the country and its area have a significant impact on motor fuel prices, according to which all countries can be divided into "maritime" and "continental". As said before the maritime countries have access to the world's oceans, and therefore use cheap marine transport for cargo. The transportation of a large part of goods by marine transport allows the authorities of these countries impose high motor fuel taxes, which is one of the factors to curb emissions of CO_2. The total costs for transporting goods is moderate and does not affect their economic competitiveness. Typical examples of such countries are Denmark and Norway. "Continental" countries lose out to "marine" ones in the price of goods transportation.

Figure 3.1 shows the cost of 20-foot container, for maritime countries compared for the propagation of the countries of continental. These benefits are enhanced by the fact that the smaller the value of container, the quicker its turnover.

Fig.3.1

Coastline / area[11] and the cost of 20-foot container[12]



To reduce the gap in costs for transportation, the authorities of "continental" countries are forced to set lower motor fuel taxes. "Maritime" countries with lower taxes, included in the cluster 1B, increase their competitive advantages in the markets by the use of cheap motor fuel. A table of the observed price deviations from the normal price estimates for each year is given below. To compare countries by their geographical location, the table 3.2 has a column "ratio of coastline to country area".

[11] http://en.wikipedia.org/wiki/List_of_countries_by_length_of_coastline

[12] World Bank Doing Business 2009 , pp.95, 100, 113, 120, 125 and 130

Table 3.2

Deviations of prices from the estimations of normal prices, percentage

	Coastline / area country [/]	1998	2000	2002	2004	2006	2008
Canada	22	7	1	-1	4	4	6
Denmark	172	43	89	104	101	76	51
Kazakhstan	0	14	30	34	18	9	40
Mexico	5	-3	16	26	-12	-17	-30
Norway	82	391	315	326	248	223	163
Russia	213	-16	16	0	21	39	46

A peculiarity of the data in table 3.2, compared to table 3.1 is the well-marked differences between countries in terms of deviations from the normal prices. The undisputed leader in all the years is Norway, despite the fact that the excess of the diesel fuel price over the estimates of the normal prices decreased from 391% to 163%. Denmark and Norway are the "maritime" countries. In Denmark, the excess of prices over the normal price estimates in 2008 returned almost to the level of 1998. Note that there are similar values of net oil exports per capita in Denmark and Mexico, they differ greatly in the diesel fuel prices.

In Canada, diesel fuel prices are almost equal to the normal price estimates during the whole period. By the geographical location, climate, the nature of power, religion, Canada is not very different from Denmark and Norway; however, the government of this country have a policy of normal fuel prices. The explanation of the differences between these countries by policies with respect to motor fuel taxes requires special study. It can be assumed that the boarder with the USA forces the Canadian authorities to limit taxes on fuel to a comparable level.

Mexico, after a brief increase in the diesel fuel prices returned to a policy of reducing fuel prices to those typical for oil-exporting countries.

Kazakhstan is a typical "continental" country with no access to the world's oceans, which determines higher costs for cargo transport compared to the "maritime" countries and therefore

[13] ¼ of which accounts for Arctic Ocean

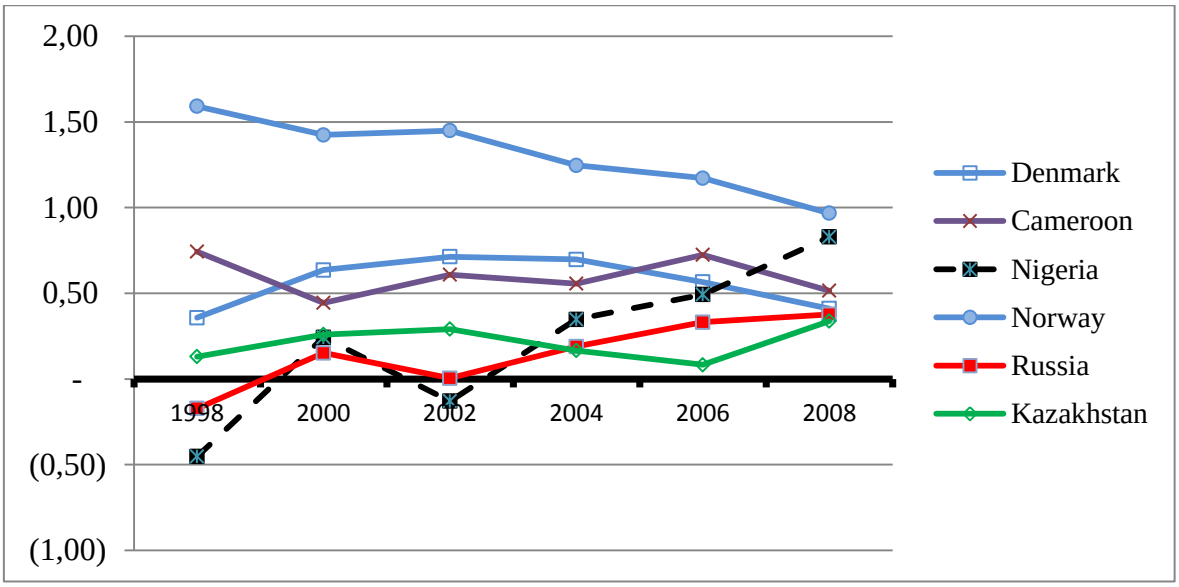
encourages the authorities to establish low motor fuel taxes. Any peculiarities in diesel fuel prices in Kazakhstan have not been identified. On average, for 1998-2008 the prices were higher than the estimates of normal prices by 17%, but in some years, the excess over normal prices was about 30%, Kazakhstan is included in the cluster 2B - normal prices.

Russia is included in the cluster 2C. The divergence from normal prices is at a constant rate of growth of 5% per year ($\beta_2 = 0.05$). The process cannot be infinite and will end with the access to the price level exceeding the normal one. As well as Russia, the same cluster includes Nigeria another net oil exporter. The UK example is instructive in this regard. The automatic tax indexation of inflation in this country has led to the 1998 diesel fuel price exceeding the normal one by 174%. Mass protests in 2000 forced the British authorities to revise this fiscal policy. As a result, in 2008 the excess of the diesel fuel price over the normal price dropped to 3%. However, it cannot be considered only as a consequence of the tax policy: in 2008, the country ceased to be a net oil exporter. Formally, Russia is even a more "maritime" country than Mexico; but economic activities on its ocean boarders, the Arctic and the Pacific are weakly developed. These factors make Russia an almost continental country. Long distances and a cold climate cause increased fuel consumption and make it necessary to maintain the lowest possible prices for goods transportation to maintain the competitiveness of products. Low motor fuel prices are an essential element for the long-term development of the country. Unfortunately, the authorities have decided on the diesel fuel tax increases in the 2000s.

In 2008, the following countries had an excess of retail prices over the normal price estimates higher than in Russia: (arranged in order of an increasing excess of the prices over their normal values) Denmark, Cameroon, Nigeria, and Norway. Fig. 3.1 shows the values of ln(Nat) for the countries mentioned above.

Fig. 3.2

The distance to the evaluation of normal price, ln(Nat)



The data presented in Figure 3.2 shows that increasing the price removal from their normal price estimates is characteristic only of Nigeria and Russia. Prices in Kazakhstan vary in the corridor, which allows them to be considered normal.

Diesel fuel prices depend on the nature of government. The Democracy Index of "The Economist" newspaper is used as a standard[14]. As 2008 was affected by economic crisis, the analysis was based on the data for 2006. In the five countries with the lowest value on the Democracy Index in 2006 (Libya, Uzbekistan, Saudi Arabia, Syrian Arab Republic, Angola) the diesel fuel prices were on average at 62% below the normal prices for these countries, and in the five countries with the highest value of the Democracy Index (Finland, Denmark, Norway, Netherlands, Sweden) were on average 37% above the normal price estimates for these countries. The authorities of democratic countries, relying on the support of the society, can afford higher diesel fuel taxes compared to the authorities of less democratic countries (on the Democracy Index, Russia is considered as having a hybrid system, and Kazakhstan is considered authoritarian), which have a policy of lower motor fuel prices.

[14] http://www.economist.com/media/pdf/DEMOCRACY_TABLE_2007_v3.pdf

The authorities of oil-exporting countries, as a rule, share the oil rent with buyers of diesel fuel by setting lower fuel taxes (compared to European ones). Russia till 2000 was included in the list of these countries.

For Russia, the continuity of the policy of increasing the share of taxes in the diesel fuel price means an inevitable transition to the cluster 3C, which turns out to be degenerate. This fact is not a contingency: the attempts of UK authorities to raise prices above the normal ones ended with mass protests that took place in September 2000, but did not happen in France, the authorities there, in response to the emerging protests, lowered motor fuel taxes. Stopping the growth of taxes on the diesel fuel price and keeping it at a high level means the transition of Russia to the cluster 3B, in which it will be the second maverick after Denmark. The presence of Denmark in this cluster is based on its membership in the "maritime" countries with a developed democracy that allows having the high motor fuel prices, but Russia does not have these features.

It has been said already that there is a danger in exceeding the normal prices for "continental" countries. The danger in the shorter term deals with the closeness to the critical point, when even small changes in the motor fuel price cause mass protests. Russia is clearly going this way, and Kazakhstan is on the verge of it.

Conclusions

1. The estimation of the normal price serves as a virtual level. In relation to it the prices of the commodity item can be divided into high, normal or low.

2. The econometric model was used for estimation the normal diesel fuel price.

3. The consistency of normal prices to the prices, obtained by replacing the actual taxes by optimal ones was shown.

4. It was established that with other things being equal:

- economic growth is accompanied by a rise in retail diesel fuel prices. The rate of growth of prices lag behind the rate of growth of the economy is about tenfold ;
- with a 1% increase in the oil price, the diesel fuel prices is increased by 0.4%.;
- with a 1% of increase in the net oil exports per capita, the diesel fuel price in the domestic market is decreased by 0.2%.

5. In net oil exporting countries normal retail diesel fuel prices are generally lower than in the net oil importing countries. The difference in the retail diesel fuel prices between the oil exporting countries and oil importing countries forms the rent. Buyers of diesel fuel in most oil exporting countries receive a part of this rent in kind by the cheap diesel fuel. The exception to this rule is Norway and Denmark, where high GDP, the dominant role of marine transport in freight transportation and full democracy assured the consent of the civil society to collect the whole rent in the budget.

6.Two types of the diesel fuel taxes are identified: European (high) and American (low). Germany is the most prominent representative of the European type, and the U.S.A. and New Zealand the American type. The benefit and loss analysis for the countries in the use of one or other type of tax requires a special study.

7. It has been shown that normal diesel fuel prices are observed in half of the countries (42 of 79). The prices below normal ones have been noted in 22 countries. In four countries (Bahrain, Egypt, Libya and Saudi Arabia), a trend of a downward divergence of price is observed, for which there are significant oil exports per capita. 10 net oil importing countries with "American" taxes take a special place among 22 countries. Most of these countries are located on the Pacific coast.

8. Six countries were identified in which diesel fuel prices steadily exceed normal ones. Among these countries are Norway and the United Kingdom (until 2008), in which the diesel fuel prices are dropped to normal ones. In the UK they reached normal values in 2008. In the other four countries, the authorities keep the diesel fuel prices higher than the normal ones. Albania, Cameroon, Kenya, next to which Denmark, looks like a maverick. Among the 79 countries, in no country with prices higher than normal ones were the prices rising.

9. The biggest discrepancy from the estimates of the normal prices was found in Norway and Denmark, and the lowest in Germany and Canada.

10. It has been shown that the share of taxes in the diesel fuel prices in Kazakhstan and especially in Russia is at the limit, the excess of which brought about mass protests in other countries. A significant excess of retail prices over normal prices in Norway and Denmark is based on the peculiarities of these countries that are absent in Russia and Kazakhstan.

11. Safe prices, from the point of view of peace in society, can be considered as lying in the corridor $\pm 20\%$ around of the normal prices. Above 20% increases the risk of massive protests.

12. The countries with normal prices have the best prospects for economic development. Deviation from normal prices requires a justification that the sacrifices will be counterbalanced up by benefits for society.

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Appendix 1

Countries with the lowest (1) and the highest (3) public debt as percent of GDP

	1st	2nd	3d
	PD≤30%	30%<PD≤50%	PD<50%
1	Angola	Cambodia	Albania
2	Australia	Colombia	Argentina
3	Azerbaijan	Croatia	Austria
4	Bahrain	Denmark	Belgium
5	Belarus	Ecuador	Bolivia
6	Benin	El Salvador	Brazil
7	Bulgaria	Finland	Canada
8	Cameroon	Honduras	Egypt
9	Chile	Indonesia	France
10	China	Kenya	Germany
11	Czech Republic	Malaysia	Greece
12	Dominican	Mexico	Honduras
13	Ghana	Netherlands	Hungary
14	Ireland	Peru	India
15	Kazakhstan	Poland	Israel
16	Korea	South Africa	Italy
17	Kuwait	Spain	Japan
18	Libya	Sweden	Morocco
19	New Zealand	Syrian Arab Republic	Norway
20	Nigeria	Taiwan Province of China	Pakistan
21	Paraguay	Thailand	Philippines
22	Romania	Tunisia	Portugal
23	Russia	Turkey	Switzerland
24	Saudi Arabia	United Kingdom	United States
25	Senegal	Vietnam	Uruguay
26	Slovak Republic		

27	Slovenia		
28	Ukraine		
29	United Arab Emirates		
30	Uzbekistan		

*/The data on Algeria the date of calculation was absent.

Appendix 2

Estimating the coefficients of the "long" and "short" models for ln(z) and Wald test.

Country names without T have the coefficient β_1; country names with T have the coefficient β_2

1 and 3, with the variables indicate the first and third of the countries (Appendix 1; Eq.10)

"Long"	"Short"
Regression Summary for Dependent Variable:ln(z) R= 0.99; RI= 0.98; Adjusted RI= 0.97 F(67.406)=281.53 $p<10^{-5}$ Std.Error of estimate: 0.20557	Regression Summary for Dependent Variable:ln(z) R= 0.99; RI=0.98; Adjusted RI= .97 F(55.418)=337.69 $p<10^{-5}$ Std.Error of estimate: 0.20706

	"Long"			"Short"		
	The regression coefficients (RC)	St. Err of RC	p-level	The regression coefficients (RC)	St. Err of RC	p-level
Intercept	1.46	0.23	0.00	1.33	0.22	0.00
ln(V)	-0.81	0.03	0.00	-0.80	0.02	0.00
ln(I)	0.73	0.07	0.00	0.74	0.05	0.00
ln(Oil)	0.36	0.03	0.00	0.38	0.02	0.00
ln(NetExp)	-0.21	0.02	0.00	-0.18	0.01	0.00
Y2002	-0.10	0.05	0.04	-0.14	0.03	0.00
Y2008	0.15	0.05	0.00	0.18	0.03	0.00
ln(V 1)	-0.01	0.02	0.71			

ln(I 1)		-0.00	0.06	0.98			
ln(Oil 1)		0.04	0.05	0.46			
ln(NetExp 1)		0.02	0.03	0.50			
Y2002 1		-0.05	0.06	0.41			
Y2008 1		0.06	0.07	0.38			
ln(V 3)		-0.01	0.02	0.53			
ln(I 3)		-0.08	0.07	0.20			
ln(Oil 3)		0.02	0.05	0.60			
ln(NetExp 3)		0.06	0.03	0.06			
Y 2002 3		-0.05	0.07	0.50			
Y 2008 3		0.03	0.07	0.63			
β_1	Albania	0.28	0.09	0.00	0.21	0.09	0.02
	Australia	-0.47	0.09	0.00	-0.42	0.09	0.00
	Bahrain	-0.54	0.12	0.00	-0.55	0.12	0.00
	Belarus	-0.59	0.12	0.00	-0.54	0.12	0.00
	Cameroon	0.53	0.09	0.00	0.60	0.09	0.00
	Chile	-0.35	0.09	0.00	-0.29	0.09	0.00
	Denmark	0.65	0.12	0.00	0.56	0.09	0.00
	Dominican Rep.	-0.39	0.09	0.00	-0.32	0.09	0.00
	Ecuador	-0.14	0.11	0.20	-0.23	0.09	0.01
	Egypt	-1.18	0.12	0.00	-1.23	0.11	0.00
	Ghana	-0.31	0.12	0.01	-0.23	0.12	0.05
	Indonesia	-1.27	0.12	0.00	-1.27	0.11	0.00
	Israel	-0.41	0.12	0.00	-0.44	0.11	0.00
	Kenya	0.49	0.09	0.00	0.51	0.09	0.00
	Libya	-0.47	0.12	0.00	-0.48	0.12	0.00
	Malaysia	-0.48	0.10	0.00	-0.56	0.09	0.00
	New Zealand	-0.76	0.09	0.00	-0.70	0.09	0.00
	Norway	1.31	0.18	0.00	1.48	0.12	0.00
	Paraguay	-0.36	0.12	0.00	-0.30	0.11	0.01
	Saudi Arabia	-0.74	0.12	0.00	-0.77	0.12	0.00
	Syria	-0.59	0.10	0.00	-0.66	0.09	0.00
	Taiwan. Prov.	-0.49	0.09	0.00	-0.50	0.09	0.00
	Thailand	-0.39	0.09	0.00	-0.38	0.09	0.00

	Tunisia	-0.46	0.09	0.00	-0.45	0.09	0.00
	United Kingdom	1.03	0.14	0.00	0.96	0.12	0.00
	United States	-0.75	0.09	0.00	-0.78	0.09	0.00
	Uruguay	-0.21	0.09	0.01	-0.25	0.09	0.00
	Uzbekistan	-1.31	0.12	0.00	-1.23	0.12	0.00
β_2	**Bahrain T**	**-0.17**	**0.03**	**0.00**	**-0.16**	**0.02**	**0.00**
	Belarus T	0.06	0.03	0.03	0.06	0.02	0.02
	Benin T	0.04	0.02	0.04	0.06	0.02	0.00
	Bolivia T	-0.05	0.02	0.02	-0.06	0.02	0.00
	Egypt T	-0.08	0.03	0.00	-0.09	0.03	0.00
	Ghana T	0.06	0.03	0.03	0.06	0.02	0.02
	Indonesia T	0.09	0.03	0.00	0.08	0.03	0.00
	Israel T	0.07	0.03	0.00	0.07	0.02	0.00
	Japan T	-0.04	0.02	0.03	-0.04	0.02	0.02
	Kuwait T	-0.09	0.02	0.00	-0.09	0.02	0.00
	Libya T	-0.13	0.03	0.00	-0.13	0.02	0.00
	Nigeria T	0.08	0.02	0.00	0.09	0.02	0.00
	Norway T	-0.06	0.03	0.01	-0.06	0.03	0.02
	Paraguay T	0.05	0.03	0.05	0.05	0.02	0.03
	Russia T	0.04	0.02	0.02	0.05	0.02	0.01
	Saudi Arabia T	-0.13	0.03	0.00	-0.12	0.02	0.00
	Senegal T	0.06	0.02	0.00	0.08	0.02	0.00
	Slovak T	0.03	0.02	0.10	0.04	0.02	0.02
	Turkey T	0.06	0.02	0.00	0.06	0.02	0.00
	United Kingdom T	-0.09	0.03	0.00	-0.09	0.03	0.00
	Uzbekistan T	0.17	0.03	0.00	0.17	0.03	0.00

Regression Summary for Dependent Variable:ln(z)

	" Long"				"Short"			
	Sums of Squares	df	Sums of Squares	F	Sums of Squares	df	Sums of Squares	F
Regression.	797.08	67	11.90	281.53	796.32	55	14.48	337.69
Residual	17.16	406	0.04		17.92	418	0.04	
Total	814.24				814.24			

Wald Test

1	Residual "Short" -Residual "Long"/ (df Regress "Long" - df Regress "Short")	0.06
2	Residual Mean Squares "Long"	0.04
3=1/2		1.51
	F(1.51;12;406)	0.12

Appendix 3

The normal price of diesel fuel, U.S. cents per liter.

	1998	2000	2002	2004	2006	2008
Albania	33	43	44	68	80	96
Angola	13	18	17	26	34	41
Argentina	35	45	32	50	64	85
Australia	65	80	78	119	140	165
Austria	70	83	82	122	141	165
Azerbaijan	19	22	21	31	36	44
Bahrain	28	36	35	53	69	87
Belarus	37	41	43	66	84	103
Belgium	69	82	81	122	141	164
Benin	28	34	33	50	58	68
Bolivia	39	42	66	52	72	78
Brazil	50	56	50	74	94	114
Bulgaria	37	45	46	71	85	105
Cambodia	26	33	33	47	56	68
Cameroon	23	30	31	48	52	62
Canada	37	47	44	65	75	85
Chile	49	59	55	82	103	116
China	33	42	42	61	74	93
Colombia	27	32	33	49	60	71
Croatia	50	58	59	90	107	128
Czech Republic	49	59	61	93	111	135
Denmark	59	48	46	67	82	102
Dominican Republic	43	54	50	69	87	101
Ecuador	23	25	27	37	44	53
Egypt	28	36	36	54	85	104
El Salvador	41	51	50	70	82	94
Finland	70	83	83	124	143	167
France	70	82	81	122	140	163
Germany	70	83	81	121	139	162
Ghana	30	32	32	48	59	68
Greece	59	71	71	108	126	149

Honduras	34	43	42	59	69	80
Hungary	47	57	60	92	107	127
India	29	35	35	51	60	71
Indonesia	23	34	40	59	72	85
Ireland	68	84	86	130	151	173
Israel	65	81	76	107	123	146
Italy	67	79	79	118	136	157
Japan	73	94	86	124	137	156
Kazakhstan	21	22	22	32	41	51
Kenya	30	35	34	49	60	70
Korea	53	71	69	100	121	131
Kuwait	16	21	21	30	38	47
Libya	18	24	20	31	38	46
Malaysia	26	35	33	48	62	77
Mexico	29	39	37	51	63	77
Morocco	38	45	44	66	76	90
Netherlands	69	83	83	124	143	167
New Zealand	61	73	73	113	129	149
Nigeria	16	21	22	32	40	49
Norway	22	28	28	41	51	62
Pakistan	31	37	35	51	61	71
Paraguay	38	45	39	58	70	89
Peru	41	49	48	69	83	97
Philippines	34	42	41	57	69	82
Poland	47	57	57	84	102	124
Portugal	58	70	70	104	120	140
Romania	39	46	47	72	92	115
Russia	21	25	25	37	47	59
Saudi Arabia	18	23	23	32	40	47
Senegal	31	36	36	54	62	74
Slovak Republic	46	54	55	87	104	131
Slovenia	57	68	68	103	120	143
South Africa	44	53	48	79	92	102
Spain	61	74	74	113	132	153

Sweden	72	87	84	126	145	168
Switzerland	77	91	90	133	153	178
Syrian Arab Republic	20	26	26	38	48	63
Taiwan Province of China	59	75	70	99	114	127
Thailand	39	48	47	68	81	95
Tunisia	41	49	48	70	81	94
Turkey	48	57	53	82	99	118
Ukraine	33	37	39	59	76	95
United Arab Emirates	19	25	25	36	44	54
United Kingdom	41	48	50	74	103	160
United States	72	90	89	124	144	161
Uruguay	55	65	55	76	94	115
Uzbekistan	35	49	53	47	58	72
Vietnam	26	31	31	44	57	86

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