



The economics of fuel prices

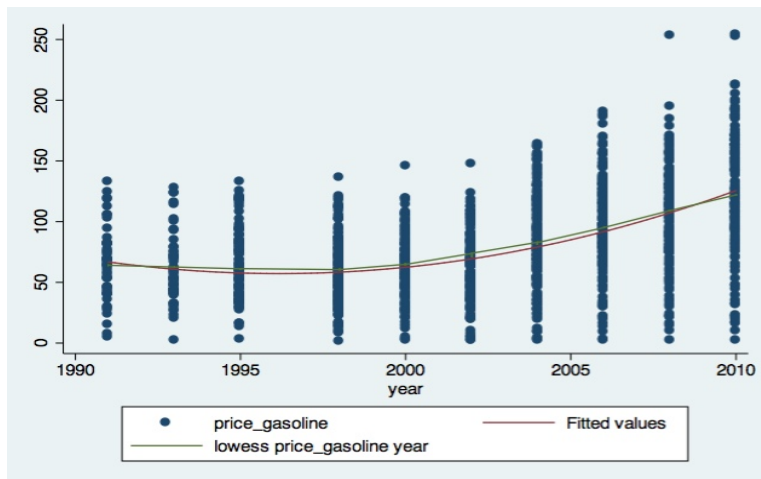
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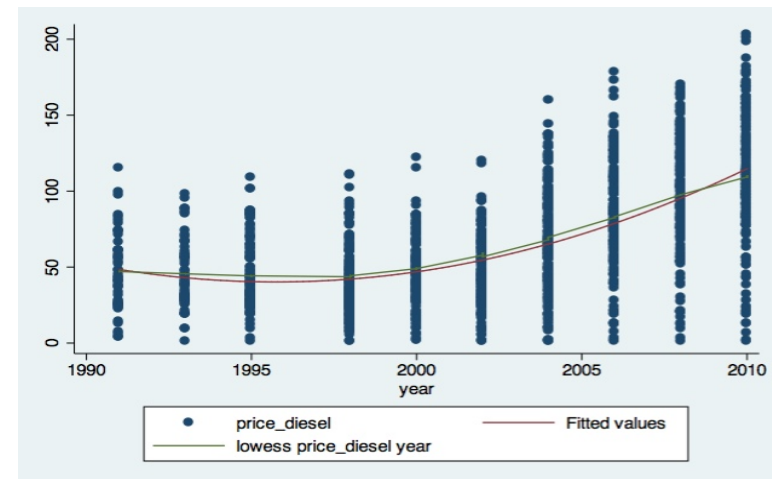
Large variation in gasoline and diesel prices among countries

- We observe large differences of fuel prices across countries.
- For instance, while in 2006 the price of super gasoline in Turkmenistan was 2 US cents per liter, it was 190 US cents in Eritrea.

and these difference among prices increased overtime



(a) Overall variation: Gasoline prices



(b) Overall variation: Diesel prices

So...

- So why are fuel prices so different across countries?
- Why do some countries tax fuel consumption while others substantially subsidize it?
- This work investigates these questions, among others, and identifies some key factors that affect fuel prices.

Our analysis suggests

- Politics matters:
 - Fragile states use fuel prices to bribe local population into compliancy.
- But so does economics:
 - While countries abundant in oil set low fuel prices those that traditionally import oil set taxes.

The empirical strategy

- We develop an empirical linear regression model that draws from the following four themes:
 - non-renewability and international trade,
 - environmental awareness,
 - fiscal and equality considerations, and
 - political survival.

Non-renewability and international trade

- Non-renewability suggests differences in fuel prices because of
 - Varying levels of proven reserves among countries

- The optimal export tax model and the optimal import tariff model suggest differences in fuel prices because of
 - Varying degrees of market power in international crude-oil markets

Environmental awareness

- Countries above a certain GDP level value the environment and are willing to pay for reducing pollution.
- What is the implicit tax these countries are willing to pay?

Fiscal and equality consideration: Oil-wealth sharing

- The increase in global demand of crude oil from 2000 to 2008, coupled with an increase in the price of crude oil, led to significant increase in revenues from oil-exports.
- Fiscal budgetary systems create large incentives for government to spend money on subsidies; it stimulates the political process to focus on ways to capture and spend these non-tax based revenues.

On the other hand,

- many countries--especially countries that import fossil resources--view fuel as an attractive base for taxation.
- Countries use fuel taxes because the fuel tax is a simple way for governments to raise revenue.

Political survival

- Politicians want to stay in power, and policies that provide subsidies help achieve this goal.
- These subsidies are used extensively because they are a visible way of delivering benefits to various groups in exchange for political support.
 - For instance, agriculture is India's top employer, while about 90% of subsidies in the power sector in India go to farmers.

Gasoline versus diesel

- When comparing gasoline prices with diesel, systematic differences are observed.
- These differences stem from differences in the composition of demand of the two fuels.

The data I

- We use data on gasoline and diesel fuel prices taken from Metschies et al. (2007), and from the GTZ International Fuel Prices website.
- Data on reserves taken from the Oil & Gas Journal
- Data on oil consumption and production taken from BP Statistical Review.
- Data on various economic variables taken from the World Development Indicators data bank.

The data II

- So as to evaluate the importance of governance we use data collected by the World Bank (i.e., the Worldwide Governance Indicators)
- To evaluate the importance of political regimes and state fragility we use various indicators including Polity IV and State Fragility Index and Matrix.

The model

- We assume country-specific-effects and a linear regression model:

$$p_{f,c,t} = \alpha_c + \beta_1 \cdot X_f + \sum_i \beta_{2,i} \cdot X_{c,t_i} + \varepsilon_{f,c,t}.$$

The results

- We observe variability among countries with respect to supply and demand of crude oil:
 - 18% of countries that are importing in the current period will export in the next period, but
 - 23% of countries exporting this period will consume more than they produce in the next period.

The results: Gasoline and diesel prices

- Fuel prices are stable throughout most of the 1990s:
 - Gasoline and diesel prices grew on average from 1993 to 2000 by 3.2% and 1.8%, respectively.
- Fuel prices spiked in the 21st century, as did crude oil prices:
 - Fuel prices increased significantly from 2000 to 2008, with gasoline and diesel prices growing, on average, by 71.9% and 116.2%, respectively.

The regression results: Gasoline

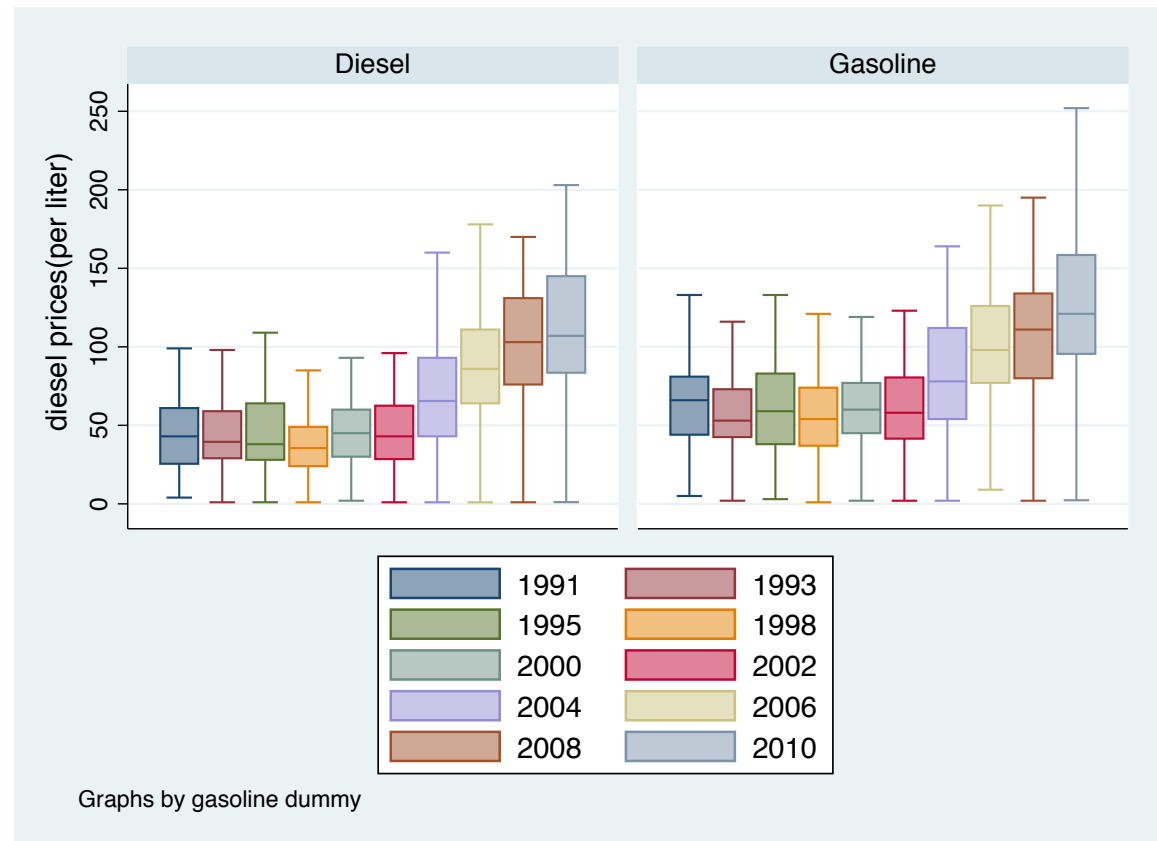
The regression analysis				
Variable	Pooled OLS	Population average	Fixed effect	Random effect
Reserves	-0.00000085 0.00000024	-0.00000043 0.00000030	-0.00000043 0.00000030	-0.00000043 0.00000030
GDP per capita	0.0010 0.0001	0.0006 0.0002	0.0005 0.0002	0.0006 0.0002
Oil rents of GDP	-0.4065 0.0732	-0.7346 0.1137	-0.9452 0.1235	-0.7300 0.1144
governance	0.0048 0.0016	0.0103 0.0020	0.0114 0.0024	0.0102 0.0020
gasoline dummy	13.1413 1.4670	12.9792 3.1963	(omitted)	12.9796 3.2064
Democratic plus	12.0121 2.0301	12.7522 3.0770	12.0116 4.8890	13.7263 3.0789
Year	3.5869 0.1996	4.1940 0.2080	4.3561 0.2109	4.1895 0.2089
EX_OIL	-13.6269 2.1779	-6.1634 3.2425	-1.5688 3.5630	-6.2729 3.2767
OPEC	-18.1048 2.8349	-15.5591 5.3850	(omitted)	-15.6165 5.4059
Constant	-7131.1100 399.5770	-8350.6100 416.0540	-8671.2900 421.8340	-8341.5700 417.9140
N	1155	1155	1155	1155
R2	0.60		0.61	
R2 overall			0.53	0.59
R2 between			0.47	0.56
R2 within			0.61	0.61
sigma_u			23.49	19.13
sigma_e		39	15.36	15.36
rho			0.70	0.61

The estimator cluster-robust standard errors are reported below the estimated coefficient.

Crude oil prices and fuel prices

- The change in fuel prices that followed the increase in crude oil prices varies across countries.
 - Although prices in many countries increased, for some countries fuel prices stayed the same and even declined slightly.
- The gap between the lowest and the highest fuel price increased overtime.

Gasoline versus diesel: The gap widens over time



The effects estimated: Oil exporting countries

- Fuel prices at the pump in oil exporting countries are, on average, lower than in oil importing countries.
- But fuel prices in OPEC countries are, on average, much lower—between 24 and 43 US cents lower.

Variable	Obs	Mean	Std. Dev.	Min	Max
non-OPEC					
gasoline prices	1269	85.79196	40.1634	2	254
diesel prices	1276	70.71082	39.68923	1	203
OPEC					
gasoline prices	99	25.45455	17.30221	1	79
diesel prices	98	19.5551	19.02203	1	113

The regression results: OPEC and oil exporting countries

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Political survival

- The analysis suggests that when governments are subject to assembly confidence, fuel prices are higher by 14 US cents.
- If fuel prices are an administrative task and is not something that the head of state is usually occupied with, then introducing checks and balances at the government level seems to be quite effective at reducing subsidies.

The regression results

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Fiscal fragility and tax base

- We could not find support for countries fiscal budget fragility and for the importance of fuel taxes (although we did look at taxes only indirectly).
- We do find that governance matters, and weaker institutions and lack of administrative capacity result in lower prices, although only marginally.
- We find evidence for sharing oil-wealth among domestic constituencies.

Prices and the environment

The average gasoline and diesel price in the EU 15 is among the highest in the world.

The difference between EU15 and North America for gasoline and diesel prices is more than 60 US cents per liter for gasoline and 50 US cents for diesel.

The poorest region in the world (Western Africa) pays 30 and 20 US cents per liter more than the North America region for gasoline and diesel, respectively—even though North America is one of the richest regions in the world.

Table 11: The average price of gasoline and diesel across the various regions

Region	Average gasoline price	Average diesel price	GDP per capita (2000 US\$)
Western Europe	117.18	102.98	33,529.32
Northern Europe	112.77	101.87	21,819.66
Polynesia	103.00	109.00	2,050.12
Southern Europe	101.44	88.22	9,249.51
Middle Africa	85.23	70.54	1,034.12
Eastern Asia	83.12	67.03	13,178.60
Eastern Africa	81.37	65.12	405.76
Melanesia	80.63	65.50	1,441.85
Eastern Europe	80.48	72.04	3,228.47
Western Africa	77.79	65.13	365.19
Caribbean	74.40	56.83	5,072.94
Australia and New Zealand	70.54	58.08	18,085.16
South America	64.94	43.48	3,445.22
Central America	64.46	50.25	2,852.14
Southern Asia	63.44	38.04	696.41
Southern Africa	58.35	56.76	2,269.72
South Eastern Asia	51.97	38.89	5,478.56
Northern America	51.75	51.19	28,830.28
Western Asia	51.64	27.55	3,742.04
Northern Africa	49.37	30.75	1,966.30
Central Asia	43.88	35.35	777.15

Why does it matter...

- The cost of fuel policies is large.
 - Governments and taxpayers spent about half a trillion dollars in 2010 supporting the production and consumption of fossil fuels, and without further reforms the IEA forecasts that subsidizing fossil fuels will reach 660 billion US\$ in 2020 or 0.7% of world gross domestic product (IEA, 2011).
 - Furthermore, the burning of fossil fuels is the largest source of global anthropogenic greenhouse gas emissions (Solomon et al., 2007).
- Policies affecting the consumption and production of fuel reflects a political and economic reality, and understanding this reality is essential for an effective reform of fuel policies.

Differences of fuel prices across countries

- Key to the heterogeneity of fuel prices across countries are
 - differences between oil exporting and oil importing countries,
 - as well as the degree of fragility of the political regime.
- Highest prices are likely to be observed in strong oil-importing democracies, while the lowest prices are observed in the oil-exporting countries whose political regime and its leaders are highly contested.
- These differences among countries suggest that
 - the heterogeneity of fuel prices among nations will continue in the future;
 - that prices will rise in some countries more than others, leading to a threshold model of adoption of energy conservation as well as alternative fuels in some countries but to stable or even lower fuel prices in others; and that
 - differences among fuel prices are likely to grow as crude oil prices continue to break historical highs.