To Pass (or Not to Pass) Through International Fuel Price Changes to Domestic Fuel Prices in Developing Countries: What Are the Drivers?

Kangni Kpodar and Patrick A. Imam

 WP/20/194

IMF Working Paper

Strategy, Policy and Review Department

To Pass (or Not to Pass) Through International Fuel Price Changes to Domestic Fuel Prices in Developing Countries: What Are the Drivers?

Prepared by Kangni Kpodar and Patrick A. Imam[1]

Authorized for distribution by Johannes Wiegand

September 2020

Abstract

While many developing countries limit the international fuel price pass through to domestic fuel prices, others do not. Against this backdrop, we examine the factors that determine whether governments allow international fuel price changes to be passed through to domestic prices in developing countries using a dataset spanning 109 developing countries from 2000 to 2014. The paper finds that the pass-through is higher when changes in international prices are moderate and less volatile. In addition, the flexibility of the pricing mechanism allows for higher pass-through while exchange rate depreciation and lower retail fuel prices in neighboring countries inhibit it. The econometric results also underscore the fact that countries with inflation tend to experience lower pass-through, whereas those with high public debt exhibit larger pass-through. Finally, no evidence is found that political variables or environmental policies matter with regard to fuel price dynamics in the short-term. These findings, which are consistent across fuel products (gasoline, diesel and kerosene), allow us to draw important policy lessons for fuel subsidy reforms.

JEL Classification Numbers: L71; Q48; H23

Keywords: retail fuel prices, fuel subsidies, pass-through

Author's E-Mail Address: pimam@imf.org; kkpodar@imf.org

[1] Kangni Kpodar (International Monetary Fund and FERDI) and Patrick A. Imam (International Monetary Fund). We are grateful for very helpful comments and feedback from Chadi Abdallah, Timothy Callen, Nico Valckx and participants at the IMF seminar held in October 2019. This research is part of a Macroeconomic Research in Low-Income Countries project (Project id: 60925) supported by the UK's Foreign, Commonwealth and Development Office (FCDO). The views expressed in this paper are those of the authors and do not necessarily represent the views of the International Monetary Fund (IMF), FERDI or FCDO.

Contents Page

I. INTRODUCTION

While international fuel prices are highly volatile (see Regnier, 2007 and Ftiti and Jawadi, 2020), their impact on domestic prices at the pump differ significantly from country to country. In some countries, international fuel price changes are fully passed through to retail prices with no delay. In other countries, especially developing ones, they move little or not at all, sometimes for a prolonged period, reflecting the fact that retail fuel prices are highly regulated. The lack of fuel price pass-through is the flip side of the fuel subsidies coin. The economic inefficiency implied by low fuel price pass-through and the consequent fuel subsidies are fiscally costly, inequitable and harmful for the environment (Clements et al., 2013). Despite these pitfalls, these subsidies have remained stubbornly high in many countries and proven extremely difficult to reform. Governments, especially in developing countries, have been hesitant to reduce them and to allow higher pass-through into domestic prices for fear of the political costs, including riots, given the potential impact on the poor.

Visually, Figure 1 illustrates the volatility of international gasoline prices across a number of years (mirroring crude oil price dynamics), with a sharp drop in 2008 followed by a strong recovery a year later, albeit with a certain deceleration in subsequent years until another sizeable drop is observed in 2014. The distribution of pass-through to retail gasoline prices[2] indicates significant cross-country disparities. The median pass-through was below 100 percent (less than full pass-through) during half of the 2000-14 period, particularly in years recording a large swing in international gasoline prices.

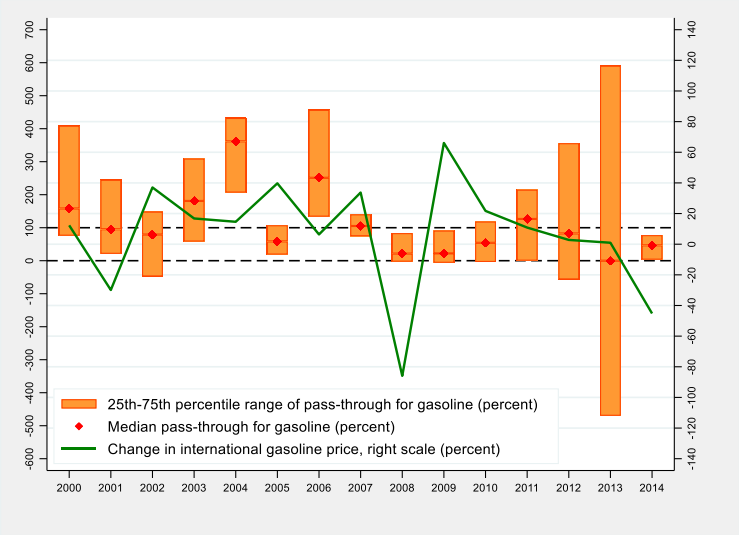
Despite a large body of literature on the economic impact of movements in fuel prices, more work is still required to fully understand the formation of domestic fuel prices. This is because studies analyzing the pass-through to domestic fuel prices do not systematically look at pass-through across countries and time – typically because of a lack of (consistent cross-sectional and long-term) data – and are instead selective in their analysis, focusing primarily on developed countries (see for instance Angelopoulou and Gibson, 2010; Bello and Contín-Pilart, 2012). Moreover, most studies tend to look at the level of fuel prices across countries rather than changes in prices over time, thereby missing important factors affecting the short-term dynamic of fuel prices (see Cheon et al., 2013 and Blair et al., 2017).

Our paper aims to fill this gap. It adds to the existing literature by systematically looking at the key factors that can impact international fuel price pass-through to domestic fuel prices both over time and across countries using a dataset spanning 109 developing countries. Unlike existing studies that focus on price levels and single countries, this paper focuses on dynamic price changes in a panel setting to better understand the role of macroeconomic and policy factors – such as exchange rate dynamics, inflation, public deficit and debt, current account deficit, oil price cycles and fuel price setting mechanisms – which other studies have largely neglected thus far. The focus is also on developing countries, where the issue of fuel

[2] The pass-through denotes how much of the change in international fuel prices is reflected in the domestic fuel prices paid by the end consumer.

subsidies is more prevalent.[3] To this end, the paper calls on a unique global fuel price dataset (see Kpodar and Abdallah, 2017) that covers more countries and a longer time period than existing studies. From a policy-making perspective, understanding the mechanisms of and differences in how international fuel prices impact domestic fuel prices can shed light on why and in which circumstances countries may allow a higher pass-through, and in which circumstances they may not; thereby providing useful insights into enabling factors and barriers to fuel subsidy reforms.

Figure 1. Change in International Gasoline Price and Distribution of Pass-through to Retail Gasoline Price, 2000-14



Source: Authors' calculations
Notes: See section III for the calculation of pass-through. A pass-through of at least 100 percent indicates that the nominal increase in international gasoline prices has been fully reflected in the prices of gasoline at the pump.

The paper finds that macroeconomic factors play a critical role in the short-term dynamic of pass-through while little evidence is found for political factors, which are slow-moving and tend to be better suited to explaining cross-country differences in retail fuel price levels rather than their changes. More specifically, we find strong evidence that higher inflation discourages pass-through while high public debt is associated with higher pass-through. Large current account deficits and countries recording high carbon emissions do not necessarily exhibit larger pass-through. Furthermore, pass-through is higher during periods of moderate and less volatile change in international fuel prices and in countries with more flexible fuel price-setting mechanisms. In contrast, where fuel prices are already elevated and exchange rate depreciation occurs, pass-through tends to be lower. Finally, retail fuel price dynamics in neighboring countries matter.

[3] It is worth noting that many advanced economies regulated domestic fuel prices in the 1970s and 1980s. For instance, in response to the 1973 oil crisis, the US passed the Emergency Petroleum Allocation Act of 1973 (EPAA) empowering the President to introduce price caps and mandatory allocation of domestic supply. In France, fuel prices were controlled by the government until 1981, when they were liberalized with the opening of the fuel distribution sector to competition.

The structure of the paper is as follows. Section II will provide a literature review, followed by Section III outlining the empirical strategy, including a discussion of the model, data and methodology. Section IV will discuss the main results and Section V will conclude with policy implications.

II. A LITERATURE REVIEW: WHAT EXPLAINS DIFFERENCES IN PASS-THROUGH

How changes in international crude oil prices impact domestic retail fuel prices is a question that the economic literature has looked at from a number of different angles. A first set of studies focuses on statistically documenting the trends and magnitude of pass-through across countries, while a second set pays attention to the explanatory factors of cross-country variations in fuel prices.

Studies in the first group include for instance Baig et al. (2007) who use a sample of 51 emerging and developing countries for the period 2003-2006 and find evidence of limited pass-through, reflecting a rise in fuel subsidies. Similarly, in an expanded study, Coady et al. (2010) provide estimates of pass-through coefficients for gasoline, diesel, and kerosene in 155 countries between the end of 2003 and mid-2008, again confirming that pass-through levels are in most cases low, but differ significantly across countries (see also Kojima, 2012 and Coady, Flamini and Sears, 2016). More recently, Kpodar and Abdallah (2017) investigate the degree of pass-through using a novel monthly dataset of retail fuel prices in 162 countries from January 2000 to December 2014, finding evidence of positive but varying pass-through levels across regions and income groups. The persistence of the pass-through also exhibits differences across samples. There is a large body of literature examining the asymmetric response of decreases and increases in the cost of crude oil, although the results are not uniform. Borenstein et al. (1997), Balke et al. (1998), together with Al-Gudhea et al. (2007) and Blair et al. (2017) for the U.S., Bacon (1991) for the U.K., and Grasso and Manera (2007) for France, Germany, Italy, Spain and the U.K. find relatively favorable evidence for the existence of the asymmetry (see also Kpodar and Abdallah, 2017), while Norman and Shin (1991), Bachmeier and Griffin (2003) for the U.S. and Godby et al. (2000) for Canada report a symmetric response of retail gasoline prices to world crude oil price changes (see also López-Villavicencio and Pourroy, 2019). In his well-designed meta-analysis, Perdiguero-Garcia (2013) illustrates that the conflicting results reported in empirical studies may be due to various factors ranging from the estimation method used to the time-frequency of data. The reasons for the mixed evidence include differences in data span, data frequency, market structure and estimation techniques.[4] These studies, while empirically interesting, are limited in that they do not systematically explain *why* the pass-through coefficient varies across countries.

The second group of studies attempts to answer this *why* by explaining differences in domestic fuel prices between countries, primarily focusing their attention on political variables. By taking a comprehensive look at economic and political drivers of fuel pricing,

[4] Menu-cost models of price adjustment suggest that inflation is higher in markets where price changes are more frequent (Taylor, 1999; Amano and van Norden, 1998). This is partially due to the cost of changing prices.

van Beers and Strand (2013) find that higher pass-through was associated with high income per capita, the provision of public goods (captured by health expenditure), democratic institutions and a low level of corruption. Differences in pass-throughs also reflect budgetary needs as well as energy and environmental policies as argued by Angelier and Sterner (1990), and evidenced by Rietveld and van Woudenberg (2005) in a sample of European countries. Consistent with Hammar et al. (2004), van Beers and Strand (2013) find that high gasoline consumption levels lead to more gasoline subsidies (hence lower pass-through), thereby supporting the theory of pressure groups. The complexity of the political economy is the most challenging barrier to reforming subsidies (Cheon et al., 2013 and 2015; Rentschler and Bazilian, 2016; El-Katiri and Fattouh, 2012 and 2017). According to Fattouh and El-Katiri (2012), pass-through is low when there is a lack of institutions able to redistribute wealth (through other means) or achieve other social goals. This view is echoed by Cheon et al. (2013) who stress that consumption subsidies are a common political tool for luring voters in countries with weak institutional capacity and poor governance (see also Ebeke and Lonkeng Ngouana (2015) who provide evidence of a crowding-out effect of fuel subsidies on social expenditure). Against this backdrop, policymakers have little incentive to pursue sound economic policies.

Another key factor that the literature has identified is whether a country is a net exporter or importer of the type of energy that can be subsidized or taxed. For instance, countries exporting fossil fuels may see less of a reason to resist subsidizing fuels and passing on fuel price increases, for fiscal or energy security reasons, especially when such revenues are large (Beers and Strand, 2013). Moghaddam and Wirl (2018) examine fuel subsidies in oil exporting countries, noting that the factors behind fuel subsidies in these countries include an implicit export tax embedded in world oil prices that should not be charged to domestic consumers; the redistribution of oil wealth (see also Fattouh and El-Katiri, 2012); the high political costs of raising fuel prices; and pressure from lobbying groups (agricultural sector, industries and so on). The authors find empirically that subsidy elimination hinges on the fiscal position, external buffers, and the political and social environment.

The above studies significantly contribute to understanding differences in fuel prices between countries, but also share a common shortcoming. The approach in previous studies is appropriate when looking at long-term determinants of fuel price levels, but they do not consider key macro factors influencing policymakers' decisions to let domestic fuel prices move in the short-term where they are government-controlled. In addition, many of these studies tend to focus on a select set of advanced countries where market forces, rather than government interventions, are the most important drivers of retail fuel prices.

III. THE MODEL, METHODOLOGY AND DATA DESCRIPTION

A. The Sample and Measurement of the Pass-Through

In this paper, we focus on a sample of 109 developing countries with annual data during the period 2000-14. The country sample (Annex 1) and the period are constrained by data availability on domestic fuel prices as provided by Kpodar and Abdallah (2017). The rationale for focusing on developing countries is that fuel prices in those countries are for the most part heavily controlled by governments as opposed to advanced economies, where

domestic fuel prices respond to market forces (supply and demand). A related argument is that since the drivers of domestic fuel prices may differ between developing and advanced economies, focusing on the former group reduces sample heterogeneity (thereby improving the reliability of the results) and allows the econometric model to be tailored to this specific group of countries.

The dependent variable, which is the degree of pass-through (PT), can be calculated by comparing the price changes at retail level with the evolution of world market prices. The formula is expressed as follows:

$$PT_{i,t} = \frac{Retail\ Fuel\ Price_{i,t} - Retail\ Fuel\ Price_{i,t-1}}{Benchmark\ World\ Fuel\ Price_{i,t} - Benchmark\ World\ Fuel\ Price_{i,t-1}} \quad (1)$$

where (i) $PT_{i,t}$ is the pass-through coefficient of country *i* in year *t*. For a one dollar increase in the supply cost for fuel, *PT* denotes how many dollars or what fraction of a dollar is passed through to the consumer.
(ii) the retail fuel price is the price at which gasoline is sold to final consumers at the end of year t.
(iii) the benchmark world fuel price is the international price of gasoline at the end of year *t*.[5]

The end-of-year retail gasoline prices are extracted from a comprehensive database of monthly retail fuel prices compiled by Kpodar and Abdallah (2017). The price data, mainly collected from national authorities, represent the prevailing retail prices per liter of gasoline all tax inclusive and expressed in local currency. The fuel prices are then converted into US dollars using the average monthly exchange rate. The data on international gasoline prices, provided by the US Energy Information Administration, represent the average spot or future contract price for gasoline delivered at specific ports.[6] Prices are expressed in USD.

Under the assumption that other elements involved in setting retail fuel prices are relatively stable (for instance transport costs, distribution costs and margins, see Annex 2 on the decomposition of the retail fuel price), any changes in international fuel prices that are not passed through to the end consumers would be absorbed by taxes, particularly in countries where the government regulates fuel prices. For a given change in international fuel prices, a pass-through coefficient lower than 100 percent is an indication that net fuel tax has been reduced, whereas a pass-through coefficient of more than 100 percent implies a higher net fuel tax. Similarly, a drop (respectively an increase) in the pass-through typically mirrors a loss (respectively a gain) in government tax revenue compared to the initial point.

The pass-through coefficient is a simple and straightforward metric to gauge fuel pricing policy, but there are two caveats. First, there might be a transmission lag from international

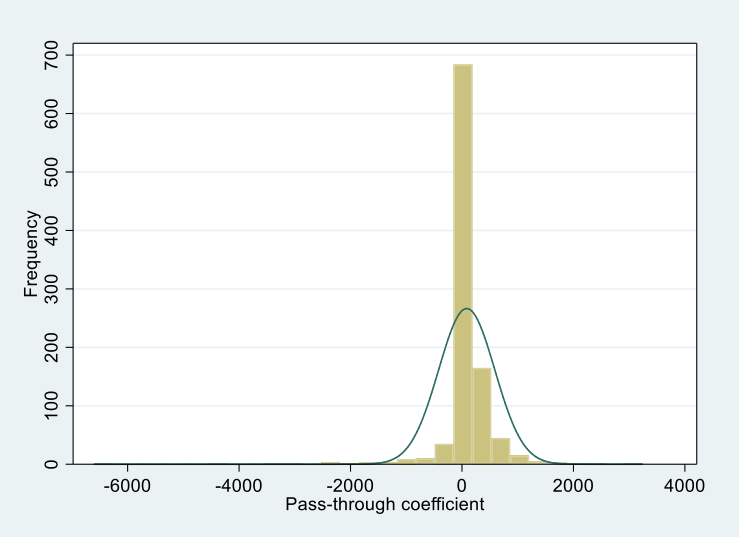
[5] The rationale for using international gasoline prices rather than the crude oil price is that most developing countries import refined fuels. Therefore, using crude oil prices without taking into account factors that affect the behavior of refiners may be misleading.

[6] Data are available at https://www.eia.gov/dnav/pet/pet_pri_spt_s1_d.htm.

gasoline prices to retail gasoline prices, reflecting fuel procurement processes, the frequency of fuel imports, and distance from markets. This implies that the denominator in equation 1 may not necessarily reflect changes in supply cost.[7] But because the pass-through is measured over a one-year period in this analysis, this bias is likely to be minimal. Second, the presence of an *ad valorem* tax can overstate the pass-through, particularly for a large change in international fuel prices. While there is no obvious way to eliminate the effect of *ad valorem* taxes, the pass-through coefficient remains the best proxy for changes in fuel taxation, in line with the approach adopted in the existing literature (see for instance Kojima, 2012; and Coady, Flamini and Sears, 2016).

An initial look at the distribution of pass-through coefficients (Figure 2) points to "outliers" at both ends of the distribution.[8]

Figure 2. Distribution of Gasoline Price Pass-Through Coefficients, 2000-14



Source: Authors' calculations

In a typical regression, one would exclude the extreme data points to mitigate potential biases in the regression coefficients. However, when dealing with pass-through coefficients, these data points can be quite informative. For instance, a high pass-through can occur when a country takes the opportunity of a period of stable international fuel prices to increase domestic fuel prices with a view to reducing subsidies. Rather than removing these potential outliers, we use a logistic transformation of the pass-through coefficients to "compress" extreme values into a more normal range, as follows:

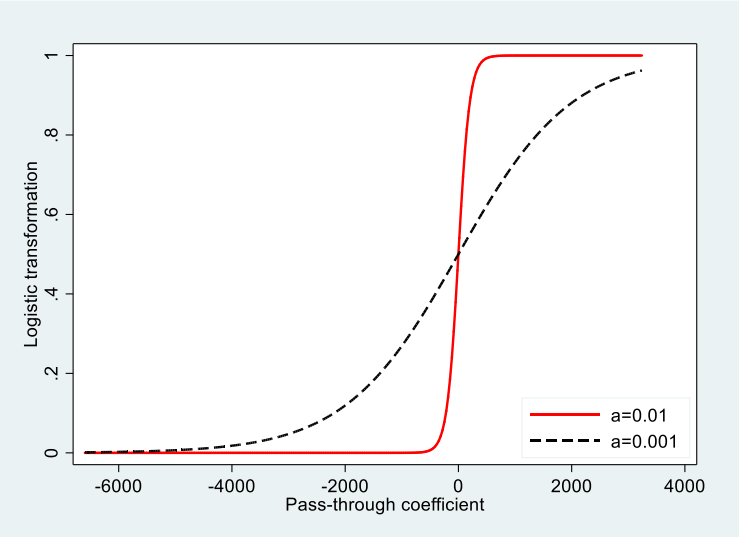
$$f(PT_{i,t}) = (1 + e^{-aPT_{i,t}})^{-1} \quad (2)$$

[7] Obtaining the change in the actual supply cost requires the availability of data on the price buildup, which is not in the public domain for many countries.

[8] For a detailed discussion on trends in pass-through and regional differences, see Kpodar and Abdallah (2017).

where $PT_{i,t}$ is the pass-through coefficient, and a is a parameter defining the steepness of the curve. It is set at 0.01 (Figure 3) to achieve a quasi-linear transformation for about 95 percent of the distribution of pass-through coefficients (this parameter will be subject to a sensitivity test with the value of 0.001, corresponding to a quasi-linear transformation for about 99 percent of the distribution).

Figure 3. Logistic Transformation of Gasoline Pass-Through Coefficients, 2000-14



Source: Authors' calculations

B. The Model Specification and Explanatory Variables

To explain the pass-through, the paper adopts the following model:

$$f(PT_{i,t}) = \alpha_0 + AX_{i,t} + \mu_i + \varepsilon_{i.t} \qquad (3)$$

where:

- $f(PT_{i,t})$ is the logistic transformation of the fuel price pass-through coefficient as defined above;
- $X_{i,t}$ is a set of variables including the fuel pricing mechanism, domestic and international fuel market conditions, macroeconomic and policy factors, as well as political and institutional factors that are likely to affect the pass-through.
- μ_i is the country specific effect, $\varepsilon_{i.t}$ is the error term, i represents the country and t the year.

Below we discuss how each of the control variables influences the pass-through, and the various mechanisms at play.[9]

[9] The summary statistics and the data sources are reported in appendix 1 and 2 respectively.

Initial fuel price level and pricing mechanism. We hypothesize that countries with low initial fuel prices have more room to pass an increase in international fuel prices to consumers, and it is important to control for this in a cross-country setting since the focus of this paper is on short-term dynamics of fuel prices. The degree of pass-through is also closely linked to the price setting mechanism in place, which can range from *ad hoc* price changes to liberalized regimes. In the former, the government controls fuel prices, and adjusts them irregularly sometimes after a prolonged period of freeze. In the latter, fuel prices are freely determined by market forces with the role of the government restricted to setting fuel taxes and regulating the sector to ensure competition. In between lies the automatic pricing mechanism in which retail fuel prices are linked to international prices through a formula and revised at regular intervals.[10] We expect more flexible price setting mechanisms (automatic pricing and liberalized regimes) to be associated with a higher pass-through. Given the lack of information and the difficulty in determining the pricing regime at a given point of time for a country, we use the frequency of price changes over a year as a proxy.[11]

International fuel price. The pass-through is expected to be negatively associated with changes in international fuel prices as governments would be more reluctant to pass on sizeable increases in supply costs to cushion the impact on the final consumers and the economy in general. Moreover, high volatility in international fuel prices may prompt a wait-and-see approach to fuel pricing, thus reducing the pass-through. The proponents of fuel price controls argue that government price regulation prevents this volatility from disrupting economic activities, although the benefit is not clear as the volatility is simply transferred to the budget, which in turn affects the economy. As underlined by Regnier (2007), the conventional wisdom that oil prices have been more volatile than prices of most other commodities has been used to justify price and allocation controls and energy efficiency subsidies. Taking the above reasons into consideration, the model includes the changes in international gasoline prices and the associated volatility (measured by the standard deviation over a year based on monthly data) as explanatory variables. To account for the high volatility in crude oil prices during the global financial crisis, which led to a massive drop in crude oil process (70 percent decline) in the second half of the year, after crude oil prices rallied in the first half by about 50 percent, a dummy variable is introduced.[12]

Price gap with neighboring countries. It is well known that large price differentials can give rise to fuel smuggling. One example is Nigeria, where heavily subsidized fuel finds its way to many neighboring countries such as Benin, Togo, Niger and Cameroon, where retail fuel

[10] Some countries also adopted stabilization funds to smooth prices at the pump, but experience with such funds has been mixed. In many instances, the funds quickly exhausted their reserves during periods of sustained increases in international fuel prices. Unfortunately, there is a lack of data on these funds, preventing them from being included in the analysis conducted in this paper.

[11] This is the number of months in a year for which retail fuel prices changed relative to the previous month.

[12] Note that effects such as oil wars (like the US-Iraq 2003 war), sanctions, geopolitical tensions, the Arab Spring in 2011, etc. are all events that had an impact on world oil prices. By incorporating the change and volatility in international fuel prices into our model, we indirectly control for these events. The volatility indicator based on monthly data allows us to capture intra-year oil price shocks as well as across-year shocks.

prices are many times higher (smuggled fuels also stem from illegal pipeline tapping). According to Ralby (2017), fuel smuggled out of Nigeria accounts for a staggering 30 percent of all hydrocarbon products produced in the country. In advanced economies, price differentials have also encouraged cross-border "fuel tourism", with significant tax losses for the countries with higher retail fuel prices (see Banfi, Filippini and Hunt, 2005). The challenge for the country with higher fuel prices is the limited room for higher pass-through, considering the risk of widening the price gap and thus creating more incentives for fuel tourism or for consumers to switch to the black market. The model accounts for this effect by considering the difference between the retail gasoline price in each country with the average retail gasoline price in neighboring countries.[13] The higher the price gap, the lower the pass-through would be in the country with the higher gasoline price. On the other hand, in the country with the lower gasoline price, pressure to increase the pass-through may build up to curtail subsidy leakage.

Other macroeconomic and policy factors. These include the level of development, exchange rate, inflation rate, government budget balance, current account balance, business cycle, oil rent, share of fuel in total consumption basket and the level of CO_2 emissions. How they can affect pass-through is discussed below.

Income per capita: While admittedly an (imperfect) proxy for economic development, most studies assume that a higher income per capita is expected to lead to higher pass-through. One reason is that energy costs represent a smaller proportion of total expenses for the average consumer in higher income countries, meaning that subsidies are less important as an instrument of income support. In addition, higher-income nations generally have better alternative transfer mechanisms, reducing the incentive for politicians to "buy votes" through fossil fuel subsidies. But a counterargument could be that richer countries can afford more fuel subsidies and thus lower the pass-through.

Exchange rate. As previously discussed, exchange rate depreciation can magnify international fuel price shocks, thus prompting governments to reduce pass-through in a move to cushion the impact on consumers and productive sectors. If this mechanism dominates, we should expect the coefficient of the nominal exchange rate expressed in local currency per dollar to be negatively correlated with pass-through.

Inflation rate. By having large secondary effects through their impact on transportation costs, fuel price increases can have a significant impact on inflation. Policy makers are often concerned about high inflation eroding the purchasing power of consumers—particularly among the poor—and dampening economic growth. If inflation expectations are not well-anchored, higher inflation can feed through to wage increases and in turn push prices up further. One could, therefore, expect pass-through to be lower when inflation rises, as governments may worry that the potential inflationary impact of higher fuel prices might trigger a vicious inflationary cycle. The inflation rate is lagged by one period to ensure that it does not capture the feedback effect from the change in fuel prices.

[13] The data on country contiguity are derived from the Correlates of War Project Database (Direct Contiguity Data, 1816-2016. Version 3.2.).

Fiscal balance. Since the cost of an incomplete pass-through is, one way or another, ultimately borne by the budget, the ability of the government to maintain a low pass-through depends on the available fiscal space. Therefore, we expect the pass-through to be higher when the budget balance deteriorates. Public debt level is also used as an indicator of fiscal space. The fiscal balance and public debt as a ratio of GDP are lagged by one period because their contemporaneous value can be affected by the pass-through.

Current account balance. A high current account deficit is expected to be associated with a higher pass-through if it cannot be financed sustainably. The rationale is that higher fuel prices should help contain fuel consumption and therefore reduce pressure on the current account for fuel importing countries. In fuel exporting countries, lower domestic demand for fuels stemming from higher fuel prices should stimulate fuel exports and hence improve the current account balance. Taking the feedback effect from the pass-through to the current account balance into account, we incorporate the current account balance ratio (in percentage of GDP) into the model rather than the contemporaneous value.

Business cycle. Pass-through is likely to be higher during boom times when household incomes are growing, as the households can afford a higher cost of living. On the other hand, policy makers may be tempted to reduce pass-through during recessions to shield households from higher fuel prices and productive sectors from rising input costs. To test this hypothesis, we incorporate GDP growth rate into the model.

Oil rents. If a country has a fuel endowment and exports oil, the pass-through is likely to be lower. Although the opportunity costs of subsidizing domestic fuel consumption rise with the world market fuel price, so does the political cost of having higher domestic fuel prices.[14] Often, the perception exists that the oil "belongs to the population" leading to a populist pressure to keep pass-through and fuel price levels low. The data on oil rents as a percent of GDP are drawn from the World Development Indicators WDI.

Share of fuel in total consumption. Pass-through may not follow the same pattern across different fuel products, even though international fuel prices co-move closely. This is often due to cross-subsidies or "targeted" subsidies. For instance, it is common in many developing countries that pass-through for diesel be lower than that of gasoline because it accounts for a higher share of domestic fuel consumption and is primarily consumed in the transport sector, the cost of which can affect food prices. Hammar, Löfgren and Sterner (2004) underline the fact that a high level of fuel consumption can lead to considerable pressure against raising fuel taxes. The importance of a fuel product is proxied by its share in total domestic fuel consumption. The data are provided by the International Energy Agency (IEA).

[14] For an oil producing country, the relevant benchmark is the world fuel price and not the domestic production cost. This is because the word fuel price represents an opportunity cost as the country could have exported the fuel and earned more income than if it is sold domestically. The revenue forgone is akin to a subsidy, comparable to the case of an oil importing country that buys fuel from the world market and sells it below import parity cost on the domestic market.

CO_2 emissions. In light of the increasing awareness of the environmental consequences of fossil fuel consumption and the harmful impact on public health, countries with higher CO_2 emissions may also exhibit higher pass-through as an attempt to curb these negative externalities (see Kaufmann, 2019; Meléndez-Jiménez and Polanski, 2020). Data on CO_2 emissions stemming from the burning of fossil fuels are provided by the World Development Indicators Database and expressed in kg per PPP $ of GDP.

Political and institutional determinants. The degree to which a country is democratic can influence fuel price pass-through. Non-democratic or authoritarian regimes are typically plagued with weaker capacity, lower provision of public goods and more widespread corruption. They are averse to changes, including from volatile world oil prices, and often see energy subsidies as a substitute for providing public goods; as a result, low pass-through is likely to be prevalent in such regimes. On the other hand, in both non-democratic and democratic regimes, election years can coincide with downward pressure on fuel prices as incumbent governments seek to secure re-election. The existence of a large urban population can also deter higher pass-through, as the largest beneficiaries of fuel subsidies are in urban areas and they can exert pressure on the government to keep pass-through low. Another factor not conducive to full pass-through is political instability, reflecting concerns that higher fuel prices can further exacerbate tensions.[15] The range of political and institutional factors that can potentially affect pass-through is wide, and cannot therefore be covered comprehensively. Nevertheless, focusing on a subset would make it possible to investigate in detail their importance in explaining cross-country variations of pass-through. In this paper, we use the Polity score as a measure of the level of democracy, the share of urban population in total population as a proxy of the size of pressure groups, a dummy variable for election years and finally an indicator of ethnic tensions to gauge the likelihood of political instability.[16]

C. Methodology

The model is estimated with a fixed-effect estimator. It allows us to take country heterogeneity into account by controlling for unobservable time-invariant country characteristics that may drive pass-through. Due to missing data, countries have an average of about 9 data points available during the period of study (2000-14). This time dimension is still relatively small compared to the cross-country dimension (109 countries), implying that a standard panel estimator, such as the fixed-effect estimator, applies. Nevertheless, it is important to address two potential issues: stationarity and endogeneity. First, we run a panel unit root test for all variables individually to ensure that they are stationary. The result of the Fisher Test (see appendix 3) suggests that the null hypothesis of unit root is rejected for all

[15] The sensitivity of households to fuel price changes is reflected in the frequent riots observed around the world when fuel prices increase. This is commonly witnessed in developing countries, whether it is the recent riots driven by fuel price increases in Zimbabwe in January 2019, or the price rise in Haiti in July 2018 that also led to riots. In extreme cases, some protests triggered by fuel price increases have even led to revolutions, for instance Myanmar's "Saffron Revolution" of 2007.

[16] The data sources are respectively the Polity IV dataset, the World Development Indicators, the Database of Political Institutions and the International Country Risk Guide database.

variables, except for the share of gasoline in total domestic fuel consumption and the Polity score. Consequently, the first difference of these variables, which eliminates the unit root, is included in the model. Second, it is possible that there is a feedback effect from the pass-through to some of the right-hand side variables. For instance, a higher pass-through may lead to higher inflation and reduce government subsidies, thereby translating into a lower budget deficit. Given the challenges in identifying proper instruments for the relevant variables, we mitigate the issue of simultaneous bias by lagging these variables by one period.

IV. MAIN RESULTS

Table 1 presents the first set of results using gasoline prices as the dependent variable and focusing on the lagged retail gasoline price (to capture the initial level), the flexibility of the pricing mechanism, movements in international gasoline prices, the exchange rate and the price gap with neighboring countries as covariates. Overall, the results are robust with the coefficients for most variables being significant at the 1 percent level. We find that countries with higher initial gasoline prices tend to experience lower pass-through (column 1 to 5, table 1). Also, in line with expectations, the higher the frequency of changes in retail gasoline prices – a proxy of the flexibility of fuel pricing – the higher the pass-through, as evidenced by the positive and highly significant coefficient in all columns of table 1. Moreover, the results consistently support a strong negative correlation across all specifications between changes in the international gasoline price and the degree of pass-through to the retail gasoline price. This is not surprising as fuel subsidies often emerge during periods of sharp increases in international fuel prices, precisely reflecting incomplete pass-through. The coefficient for the exchange rate vis-à-vis the dollar (significant in column 1 to 5, table 1) provides evidence that countries tend to reduce pass-through in periods of currency depreciation as fuel supply costs expressed in local currency rise.

Interestingly, the pass-through in a given country turns out to be sensitive to the price gap with neighboring countries (the coefficient is negative and significant in two out of three specifications, column 4 and 5 in table 1). A higher price gap discourages pass-through in the country with the higher retail gasoline price, confirming the pervasive negative externalities (e.g. tax revenue loss) from fuel subsidies not only in the country bearing the cost of subsidies but also in neighboring countries. As discussed above, the inability of the country with the higher gasoline price to achieve full pass-through is likely due to the increased risk of smuggling activities this move could trigger. But even in the absence of fuel smuggling, policymakers may be subject to pressure from the public with regard to why domestic fuel prices are much higher than in neighboring countries, and could therefore be tempted to limit pass-through. We further investigate the impact of the gasoline price gap on pass-through by breaking it down into positive and negative price gaps (when the gasoline price in the home country is lower than the price in neighboring countries). The results (column 3, table 1) reveal that the pressure to contain pass-through tends to increase in the country with higher gasoline prices, but in the country with lower gasoline prices, the negative price gap does not necessarily lead to an increase in pass-through. This implies that heavy subsidizers would not necessarily hike pass-through to close the gap with neighboring countries, probably because curbing smuggling through tighter border controls may be politically less costly than reforming fuel subsidies.

Table 1. Drivers of Gasoline Price Pass-Through: Testing for Domestic and International Oil Market Factors, 2000-2014.

Fixed-effect estimations	(1)	(2)	(3)	(4)	(5)
Retail gasoline price (lagged)	-0.173	-0.281	-0.286	-0.175	-0.177
	[0.108]	[0.068]***	[0.067]***	[0.061]***	[0.062]***
Retail gasoline price flexibility	0.213	0.211	0.196	0.236	0.239
	[0.052]***	[0.054]***	[0.052]***	[0.070]***	[0.069]***
GDP per capita (log)	0.024	0.082	0.106	0.019	0.019
	[0.082]	[0.056]	[0.052]**	[0.053]	[0.054]
Change in international gasoline price	-0.122	-0.111	-0.108	-0.089	-0.092
	[0.016]***	[0.019]***	[0.019]***	[0.021]***	[0.021]***
Exchange rate (local currency unit per USD)	-0.499	-0.508	-0.497	-0.576	-0.578
	[0.091]***	[0.104]***	[0.103]***	[0.124]***	[0.123]***
Dummy year 2008	-0.123	-0.097	-0.097	-0.066	-0.059
	[0.030]***	[0.033]***	[0.034]***	[0.037]*	[0.037]
Fuel price gap with neighbors (lagged)		-0.125		-0.168	-0.172
		[0.082]		[0.094]*	[0.094]*
Positive gap (local fuel prices higher, lagged)			-0.368		
			[0.106]***		
Negative gap (lagged)			0.075		
			[0.110]		
Gasoline share in total fuel consumption (lagged, and first-differenced)				-0.005	-0.005
				[0.004]	[0.004]
Volatility in international gasoline price					-0.009
					[0.005]*
Constant	0.367	-0.087	-0.210	0.346	0.348
	[0.626]	[0.423]	[0.398]	[0.425]	[0.431]
Number of observations	947	785	785	601	601
Number of countries	107	91	91	72	72
R2	0.14	0.17	0.18	0.17	0.17

Notes. Robust standard errors (clustered by country) in brackets. *,**,*** denote significance at 10%, 5% and 1%, respectively. Retail fuel price flexibility measures the flexibility of the fuel pricing mechanism, proxied by the number of months (within a year) during which retail fuel prices changed relative to the previous month, divided by 12. Fuel price gap with neighbors is the domestic fuel price minus the average fuel price in neighboring countries for the same product. Volatility in international fuel price is calculated as the standard deviation of international fuel prices over a year using monthly data. Gasoline share in total fuel consumption (lagged) is first-differenced as it is non-stationary in level.

Higher volatility in international gasoline price tends to be associated with lower pass-through, as expected (column 5, table 1). This may reflect a wait-and-see approach to fuel pricing, but could also be a sign of fuel price smoothing. The result in column 4 (table 1) offers no evidence that the share of gasoline in total fuel consumption determines pass-through, in contrast to the findings of Hammar, Löfgren and Sterner (2004). While governments may face pressure to contain the pass-through on the most commonly consumed fuel products (and consequently the one for which an increase in the price affects the economy the most), they may also be limited by the extent to which this is affordable. As the fiscal cost of fuel subsidies is a function of the unit subsidy and the quantities consumed, a small unit subsidy can prove to be very costly considering the quantities involved.

Moving to the second set of drivers of pass-through focusing on macro-policy variables, the results in table 2 do not suggest a meaningful difference between pass-through in periods of expansion and downturn, as the coefficient on the real GDP growth rate is positive but not significant at a conventional level (column 1 and 6). On the other hand, macroeconomic

factors such as the inflation rate and fiscal space play a role in driving pass-through (column 2, 3 and 6). Indeed, in a high-inflation environment, policymakers would tend to reduce pass-through, even though this strategy can prove to be ineffective due to imported inflation stemming from higher international fuel prices. Although a large primary balance seems to be associated with lower pass-through, this correlation is not significant. The public debt level, which reflects accumulated past years' deficits, is nevertheless positively and significantly associated with higher pass-through, reflecting limited available fiscal buffers to absorb the cost of an incomplete pass-through. There seems to be no robust link between current account balance and pass-through, suggesting that increasing pass-through to dampen domestic fuel demand (and hence fuel imports) is not as common as was thought (column 4). When current account deficit is high, some countries might choose to reduce pass-through to boost exports while others might increase it to reduce fuel imports. It also emerges that the effect of CO_2 emissions on pass-through is not as strong as expected (column 5), suggesting that negative externalities from fuel consumption are not being adequately factored into the pricing of fuel products, potentially due to the reluctance of policymakers to rely on carbon taxation to fight climate change (see Kaufmann, 2019).[17] Consistent with van Beers and Strand (2013), income per capita correlates positively with pass-through, although not significantly, in all specifications.

Turning to political and institutional factors, the results are very weak (table 3). All the political and institutional factors display the correct sign, but in most cases are not statistically significant. This may suggest that political and institutional factors primarily tend to affect fuel price levels (as advocated by van Beers and Strand, 2013) rather than the short-term dynamics captured by the pass-through. In addition, part of the lack of significance of the political and institutional variables could also be attributed to country fixed effects that may capture the persistence of political and institutional factors given that re-estimating the regression using a pooling estimator (table 3, column 7) yields improved results as election years, oil rent and ethnic tensions[18] are significantly associated with lower pass-through.

[17] Our study may not be capturing more recent efforts by countries to reduce fossil energy consumption in the wake of the 2015 Paris Agreement on Climate Change.

[18] A lower score for ethnic tensions means tensions between opposing groups are high.

Table 2. Drivers of Gasoline Price Pass-Through: Macro and Policy Factors, 2000-2014.

Fixed-effect estimations	(1)	(2)	(3)	(4)	(5)	(6)
Retail gasoline price (lagged)	-0.178	-0.331	-0.337	-0.325	-0.324	-0.318
	[0.106]*	[0.057]***	[0.063]***	[0.056]***	[0.057]***	[0.063]***
Retail gasoline price flexibility	0.214	0.203	0.201	0.195	0.220	0.212
	[0.051]***	[0.052]***	[0.056]***	[0.052]***	[0.052]***	[0.055]***
GDP per capita (log)	0.025	0.143	0.155	0.133	0.140	0.166
	[0.081]	[0.047]***	[0.053]***	[0.046]***	[0.052]***	[0.061]***
Change in international gasoline price	-0.497	-0.579	-0.534	-0.540	-0.547	-0.571
	[0.091]***	[0.093]***	[0.099]***	[0.096]***	[0.096]***	[0.094]***
Exchange rate (local currency unit per USD)	-0.124	-0.116	-0.120	-0.118	-0.118	-0.110
	[0.017]***	[0.018]***	[0.017]***	[0.017]***	[0.017]***	[0.018]***
Dummy year 2008	-0.128	-0.094	-0.094	-0.096	-0.092	-0.088
	[0.031]***	[0.027]***	[0.029]***	[0.027]***	[0.027]***	[0.030]***
Real GDP growth rate (lagged)	0.002					0.003
	[0.002]					[0.002]
Inflation rate (log, lagged)		-0.163				-0.168
		[0.031]***				[0.025]***
Government primary balance (percent of GDP, lagged)			-0.000			-0.000
			[0.001]			[0.001]
Gross public debt (percent of GDP, log, lagged)			0.044			0.063
			[0.025]*			[0.024]***
Current account balance (percent of GDP, lagged)				0.001		0.002
				[0.001]		[0.002]
CO2 emissions (kg per PPP $ of GDP, lagged)					0.147	0.157
					[0.144]	[0.172]
Constant	0.344	-0.346	-0.771	-0.445	-0.552	-0.784
	[0.615]	[0.353]	[0.438]*	[0.353]	[0.409]	[0.528]
Number of observations	947	911	896	930	919	857
Number of countries	107	103	101	104	105	98
R2	0.14	0.17	0.18	0.17	0.17	0.19

Notes. Robust standard errors (clustered by country) in brackets. *,**,*** denote significance at 10%, 5% and 1%, respectively. Retail fuel price flexibility measures the flexibility of the fuel pricing mechanism, proxied by the number of months (within a year) during which retail fuel prices changed relatively to the previous month, divided by 12.

Table 3. Political and Institutional Factors: Implications for Gasoline Price Pass-Through, 2000-2014.

	Fixed-effect						Pooling
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Retail gasoline price (lagged)	-0.351	-0.321	-0.326	-0.314	-0.259	-0.285	-0.051
	[0.059]***	[0.056]***	[0.056]***	[0.057]***	[0.059]***	[0.061]***	[0.019]***
Retail gasoline price flexibility	0.204	0.195	0.201	0.200	0.226	0.235	0.128
	[0.062]***	[0.053]***	[0.053]***	[0.052]***	[0.064]***	[0.071]***	[0.027]***
GDP per capita (log)	0.168	0.131	0.132	0.151	0.093	0.168	-0.002
	[0.051]***	[0.046]***	[0.046]***	[0.046]***	[0.047]**	[0.054]***	[0.015]
Change in international gasoline price	-0.525	-0.536	-0.538	-0.546	-0.541	-0.551	-0.584
	[0.108]***	[0.097]***	[0.096]***	[0.096]***	[0.105]***	[0.111]***	[0.088]***
Exchange rate (local currency unit per USD)	-0.143	-0.114	-0.118	-0.122	-0.119	-0.157	-0.130
	[0.024]***	[0.017]***	[0.018]***	[0.017]***	[0.019]***	[0.027]***	[0.030]***
Dummy year 2008	-0.119	-0.096	-0.098	-0.104	-0.104	-0.144	-0.138
	[0.038]***	[0.027]***	[0.027]***	[0.028]***	[0.032]***	[0.044]***	[0.040]***
Polity variable (first difference)	-0.000					-0.002	-0.002
	[0.004]					[0.005]	[0.006]
Election year dummy		-0.022				-0.032	-0.050
		[0.020]				[0.023]	[0.028]*
Oil rents (percent of GDP)			0.002			-0.004	-0.003
			[0.004]			[0.004]	[0.001]***
Urban population share				-0.007		-0.008	-0.001
				[0.007]		[0.009]	[0.001]
Ethnic tension score					0.033	0.033	0.018
					[0.029]	[0.031]	[0.009]*
Constant	-0.711	-0.432	-0.451	-0.268	-0.309	-0.432	0.655
	[0.386]*	[0.351]	[0.350]	[0.409]	[0.365]	[0.468]	[0.085]***
Number of observations	795	921	930	933	707	631	631
Number of countries	95	102	105	105	78	75	75
R2	0.16	0.16	0.17	0.17	0.17	0.19	0.17

Notes. Robust standard errors (clustered by country) in brackets. *,**,*** denote significance at 10%, 5% and 1%, respectively. Retail fuel price flexibility measures the flexibility of the fuel pricing mechanism, proxied by the number of months (within a year) during which retail fuel prices changed relatively to the previous month, divided by 12. The ethnic tension score lies between 0 and 6, with a lower score for countries where tensions between opposing groups are high. The Polity variable is first-differenced as it is non-stationary in level.

Do diesel or kerosene prices tell a different story? This is worth investigating as different fuel products may be subject to different pricing policies, and cross-subsidization may also exit. To address this question, we rerun all the regressions in tables 1 to 3, considering diesel and kerosene as the fuel product of interest. The results, presented in tables A1 to A6 in appendix 4, are comparable to that of gasoline. They again support the importance of fuel pump price flexibility, international fuel prices, the exchange rate, the price gap with neighboring countries inflation rate and public debt as the main drivers of pass-through.

Robustness analysis.

To test the robustness of our results, we conduct a battery of tests. The above findings do not in any way depend on the logistical transformation of the pass-through variable to deal with extreme values. We demonstrate this in two ways. First, we set the value of the parameter defining the steepness of the logistic function to 0.001 instead of 0.01 as in the previous regressions (in other words, the extreme values of pass-through coefficients at both ends of the distribution are less compressed, see Figure 3). All specifications in tables 1 to 3 are re-run (see tables A7, A8 and A9 in appendix 4, respectively); the previous findings remain unchanged. Second, we drop the logistical transformation and rerun a set of specifications after excluding potential outliers defined as pass-through values that exceed the sample average by one standard deviation. Once again, this does not alter the previous findings to any significant extent (table A10 in appendix 4). Another robustness test consists in excluding oil exporting countries from the sample (15 of the109 countries). Re-running the regressions once again does not materially change the previous findings.[19]

V. CONCLUSION

Against the backdrop of the limited empirical literature on the dynamics of fuel prices, this paper attempts to shed light on the drivers of the pass-through of international fuel prices to domestic retail fuel prices. Using a dataset spanning 109 developing countries from 2000-2014, the paper finds that the pass-through is higher when changes in international prices are low, moderate and less volatile. Furthermore, the flexibility of the pricing mechanism allows for higher pass-through while exchange rate depreciation and lower retail fuel prices in neighboring countries inhibits pass-through. The results also underline the fact that countries with higher inflation tend to experience lower pass-through, whereas those with high public debt exhibit larger pass-through. Finally, we do not find evidence that political and environmental factors matters. These findings are consistent across fuel products, namely gasoline, diesel and kerosene.

The policy implications emerging from these findings can help draw important lessons for fuel subsidy reforms. Since price flexibility improves pass-through, an automatic pricing mechanism or fuel price liberalization, conditions permitting, may be a useful tool to contain fuel subsidies. Social considerations should nevertheless also be taken into account to avoid fuel price surges harming the most vulnerable part of the population. Second, the results imply that the current environment of relatively low international fuel prices provides a

[19] The results are not shown to save space but are available upon request.

window of opportunity to undertake fuel subsidy reforms. Third, exchange rate depreciation and high inflation can undermine fuel subsidy reforms, considering their negative impact for pass-through. Thus, countries seeking to reform subsidies should target periods where macroeconomic conditions are relatively stable, which may provide tailwinds for this reform. While the lack of fiscal space can trigger higher pass-through, countries should not wait until public debt becomes unsustainable before undertaking fuel subsidy reforms, where this is an issue. Last, some regional coordination may be needed where the price gap with neighboring countries is a major concern.

For policymakers, the maxim that if things cannot continue forever they will stop has not been very helpful when it comes to fuel subsidies. Whereas in most countries around the world costs are visible and the policy is viewed as unsustainable, this has not led countries to implement subsidy reforms. Fuel subsidy reforms remain a major hurdle for most governments, even when they destabilize a country's fiscal health. Our paper illustrates that, strategically speaking, there are times when subsidy reforms are easier, notably when international fuel prices are low. At present, with fuel prices and hence fuel subsidy costs being low, the time is ripe for reform, as the political costs are also low.

One possibility for extension and future research is to integrate the changes in global environmental policies taking place at the domestic and, more particularly, the global level. Following the COP-21 agreement in Paris in 2015, 197 countries have committed to limiting global temperature increases to 2°C by reducing GHG emissions caused by fossil fuels. Extending our dataset and taking the implementation of these policies in developing countries into account may help to further refine our conclusions. Such an analysis may show that environmental policies matter more and more when it comes to allowing for pass-through of international fuel prices to domestic ones.

REFERENCES

Angelopoulou, E. and H. Gibson, 2010, "The Determinants of Retail Petrol Prices in Greece," *Economic Modelling*, 27(6), pp. 1537-42.

Angelier, J. P. and T. Sterner, 1990, "Tax harmonization for petroleum products in the EC," *Energy Policy*, 18(6), pp. 500-505.

Bacon, R.W., 1991. Rockets and Feathers: The Asymmetric Speed of Adjustment of UK Retail Gasoline Prices to Cost Changes. Energy Economics 13, 211-218.

Baig, T., A. Mati, D. Coady and J. Ntamatungiro, 2007, "Domestic Petroleum Product Prices and Subsidies; Recent Developments and Reform Strategies," IMF Working Papers 07/71, International Monetary Fund.

Banfi, S., M. Filippini and L. Hunt, 2005, "Fuel Tourism in Border Regions: The case of Switzerland," *Energy Economics*, 27(5), pp. 689-707.

van Beers, C. and J. Strand, 2013, "Political Determinants of Fossil Fuel Pricing," Policy Research Working Paper 6470, The World Bank.

Bello A. and I. Contín-Pilart, 2012, "Taxes, Cost and Demand Shifters as Determinants in the Regional Gasoline Price Formation Process: Evidence from Spain," *Energy Policy*, 48, pp. 439-48.

Blair, B, R. Campell and P. Mixon, 2017, "Price pass-through in US gasoline markets" *Energy Economics,* Vol. 65, pp.42-49

Chen, Shiu-Sheng, 2009, "Oil price pass-through into inflation," *Energy Economics*, Vol. 31, pp.126-133

Cheon, A., M. Lackner and J. Urpelainen, 2015, "Instruments of political control: national oil companies, oil prices, and petroleum subsidies" *Comparative Political Studies*, Vol. 48, pp.370-402

Cheon A., J. Urpelainen and M. Lackner, 2013, "Why do Governments Subsidize Gasoline Consumption? An Empirical Analysis of Global Gasoline Prices, 2002–2009," *Energy Policy*, 56, pp. 382-390.

Clements, B., D. Coady, S. Fabrizio, S. Gupta, T. Alleyne, and C. Sdralevich, eds., 2013, *Energy Subsidy Reform: Lessons and Implications* (Washington: International Monetary Fund).

Coady, D., J. Arze del Granado; L. Eyraud, H. Jin, V. Thakoor, A. Tuladhar and L. Nemeth, 2013, "Automatic Fuel Pricing Mechanisms with Price Smoothing : Design,

Implementation, and Fiscal Implications" Technical Notes and Manuals No.2012/03 (Washington DC: IMF)

De Gregorio, J., O. Landerretche, C. Neilson, C. Broda and R. Rigobon, 2007, "Another Pass-through Bites the Dust? Oil Prices and Inflation" *Economía* Vol. 7, pp. 155-208

Ebeke C. and C. Lonkeng Ngouana, 2015, "Energy Subsidies and Public Social Spending; Theory and Evidence," IMF Working Papers 15/101.

El-Katiri, L. and B. Fattouh, 2012, "Energy Subsidies in the Arab World. Fossil Fuel Subsidies" European Parliament http://www.europarl.europa.eu/RegData/etudes/IDAN/2017/595372/IPOL_IDA(2017)595372_EN.pdf

El-Katiri, L. and B. Fattouh, 2017 "A Brief Political Economy of Energy Subsidies in the Middle East and North Africa" pp.58-87 in G. Luciani, (Ed.), *Combining Economic and Political Development: The Experience of MENA*. (Brill: Leiden)

Ftiti, Z. and F. Jawadi, 2020. "On the Oil Price Uncertainty," *The Energy Journal*, (forthcoming).

Gangopadhyay, S., B. Ramaswami and W. Wadhwa, 2005 "Reducing subsidies on household fuels in India: how will it affect the poor?" *Energy Policy*, Vol. 33, pp. 2326-2336

Gao, L, H. Kim, R. Saba, 2014, "How do oil price shocks affect consumer prices?" *Energy Economics*, Vol. 45, pp. 313-323

Gelos, G. and Y. Ustyugova, 2017, "Inflation responses to commodity price shocks – How and why do countries differ?" *Journal of International Money and Finance*, Vol. 72, pp. 28-47.

Gillingham, R. and M. Keen, 2012, "Mitigation and Fuel Pricing in Developing Economies," Chapter 6 in Fiscal Policy to Mitigate Climate Change. A Guide for Policymakers, edited by Ian W.H. Parry, Ruud de Mooij and Michael Keen, pp. 103-132 (Washington DC: IMF).

Hammar, H., A. Löfgren and T. Sterner, 2004, "Political Economy Obstacles to Fuel Taxation," *Energy Journal*, 25(3), pp. 1-17.

Karl, T., 1997, "The Paradox of Plenty: Oil Booms and Petro-states" (California: University of California Press)

Kaufmann, Robert, 2019, Pass-through of motor gasoline taxes: Efficiency and efficacy of environmental taxes, *Energy Policy*, Vol.125, pp.207-215

Kojima, M., 2012, "Oil Price Risks and Pump Price Adjustments," Policy Research Working Paper No. 6227 (Washington: World Bank).

Kpodar, K. and C. Abdallah, 2017, "Dynamic Fuel Price Pass-Through: Evidence from a New Global Retail Fuel Price Database" *Energy Economics,* 66, pp.303-312.

Labandeira, X., J. M. Labeaga and X. López-Otero, 2017, "A Meta-Analysis on the Price Elasticity of Energy Demand," *Energy Policy*, Vol. 102, pp. 549-568

LeBlanc, Michael and Chinn, Menzie David, 2004, "Do High Oil Prices Presage Inflation? The Evidence from G-5 Countries" *UC Santa Cruz Economics Working Paper No. 561*; (SCCIE Working Paper No. 04-04).

López-Villavicencio, A. and M. Pourroy, 2019, "Inflation target and (a)symmetries in the oil price pass-through to inflation", *Energy Economics,* Vol.80, pp. 860-875

Meléndez-Jiménez, M. and A. Polanski, 2020, "Dirty neighbors — Pollution in an interlinked world" *Energy Economics,* Vol.86 (forthcoming).

Moghaddam, H. and F. Wirl, 2018, "Determinants of oil price subsidies in oil and gas exporting countries" *Energy Policy,* Vol. 122, pp.409-420

Ralby, I., 2017, "Downstream Oil Theft: Global Modalities, Trends, and Remedies", Atlantic Council, Global Energy Center.

Rentschler, J and M. Bazilian, 2016, "Reforming fossil fuel subsidies: drivers, barriers and the state of progress" *Climate Policy,* Vol.3062, pp. 1-24

Regnier, Eva, 2007, "Oil and Energy Price Volatility" *Energy Economics,* Vol. 29, pp.405-27

Rietveld, P. and S. van Woudenberg, 2005, "Why Fuel Prices Differ," *Energy Economics*, 27(1), pp. 79– 92.

Siddig, K., A. Aguiar, H. Grethe, P. Minor and T. Walmsley, 2014, "Impacts of removing fuel import subsidies in Nigeria on poverty" *Energy Policy,* Vol. 69, pp. 165-178

Stinnett, D, J. Tir, P. Schafer, P. Diehl and C. Gochman, 2002, "The Correlates of War Project Direct Contiguity Data, Version 3." *Conflict Management and Peace Science*, 19 (2), pp.58-66.

Annex 1. Sample Composition

Sub-Saharan Africa
Angola
Benin
Botswana
Burkina Faso
Burundi
Cameroon
Cape Verde
Central African Republic
Chad
Comoros
Congo, Republic of
Cote d'Ivoire
Democratic Republic of the Congo
Ethiopia
Gabon
Gambia, The
Ghana
Guinea
Guinea-Bissau
Kenya
Lesotho
Liberia
Madagascar
Malawi
Mali
Mauritania
Mauritius
Mozambique
Namibia
Niger
Nigeria
Rwanda
Senegal
Seychelles
Sierra Leone
South Africa
Sudan
Swaziland
Sao Tome and Principe
Tanzania
Togo
Uganda
Zambia
Zimbabwe

Europe and Central Asia
Armenia
Azerbaijan
Belarus
Bulgaria
Georgia
Hungary
Kazakhstan
Kyrgyz Republic
Moldova
Romania
Serbia
Tajikistan
Turkey
Uzbekistan

East Asia and Pacific
China
Fiji
Indonesia
Kiribati
Lao P.D.R.
Malaysia
Mongolia
Myanmar
Philippines
Samoa
Thailand
Timor-Leste, Dem. Rep. of
Vietnam

South Asia
Afghanistan
Bangladesh
India
Maldives
Nepal
Pakistan
Sri Lanka

Latin America and the Caribbean
Argentina
Bolivia
Brazil
Colombia
Costa Rica
Dominican Republic
Ecuador
El Salvador
Grenada
Guatemala
Haiti
Honduras
Jamaica
Mexico
Nicaragua
Panama
Paraguay
Peru
Venezuela

Middle East and North Africa
Algeria
Djibouti
Egypt
Iran
Iraq
Jordan
Lebanon
Libya
Morocco
Tunisia
West Bank and Gaza
Yemen

Annex 2. Breaking Down the Retail Fuel Price

At the micro-level, the determinants of fuel pass-through by country can be broken down by looking at the value chain:

- **Crude oil prices**: Crude oil is an important factor in explaining price movements. The price depends on the worldwide supply of crude oil, and the worldwide demand for it. The high inelasticity of supply and demand explains the large fluctuation in fuel prices—small changes on either side have a high impact on prices. Speculation and political tensions can also cause fuel prices to fluctuate sporadically. In principle, countries all pay roughly the same price for the fuel they purchase.

- **Processing cost**: There are different types of crude oil in the world, and they vary greatly in composition, liquidity, gravity, sulfur content and other factors. The cost of processing crudes, therefore, varies based on these factors as well as on the refining capacities available. The diesel prices from US Gulf Coast are for ultra-low-sulfur diesel while in many Latin American markets, the sale is still of high-sulfur diesel.

- **Exchange rate**: Fluctuations in the exchange rate impact the price of imported oil, which is traded in US dollars. Over the last 15 years, the adverse impact of rising fuel prices has often been exacerbated by a simultaneous depreciation against the USD strengthening the impact of fuel price declines in local currencies. Note that sometimes, particularly in remote areas given the lagged effect between purchase of fuel and delivery, the exchange rate impact may not be felt immediately.

- **International transportation costs**: Depending on the location of the market, as well as the size of the market, there can be a large gap between import and export prices. A small, distant market in a volatile region (requiring higher insurance costs) will have higher transportation costs than a large market located close to the oil source that benefits from economies of scale in terms of transportation.

- **Domestic distribution costs**: Once the fuel has entered the country, often via a port, it must be distributed across the territory. Costs include transportation, storage, distribution, marketing and retail sales. In a large country with poor infrastructure, local distribution costs should be higher. In addition, as part of the license, many countries require that the oil company provide a public service – force them to locate in areas where the market is shallow and make losses – allowing them to recoup the loss through cross-subsidizing from other activities, for instance. Other factors that can impact distribution costs include the size of the market – are there economies of scale in distribution – as well the level of competitiveness of the market.

- **Local taxation**: In many AEs, such as Belgium for instance, it is common to impose significant excise, VAT and import taxes, among others, on the fuel consumed. In other countries, often producers of fuel such as Venezuela, prices are subsidized and below those on the international market. Much of the pricing differences paid by local consumers is dependent on national pricing policies. European countries have typically imposed high taxes – often a multiple of the price of fuel – while other countries, such as oil producing countries, often subsidize the fuel.

- **Other factors.** The timing of fuel purchases is an additional factor. This is especially the case in small markets, where there are often lags between the purchase of fuel on the world market and the final retail price. Other countries have smoothing mechanisms in place, meaning that the transmission from international to domestic taxes occurs gradually over time.

Appendix 1. Summary Statistics and Correlation Matrix

Summary Statistics

	Number of observations	Mean	Standard deviation	Minimum	Maximum
Gasoline price pass-through (percent)	916	91.41	504.44	-6596.09	3240.47
Diesel price pass-through (percent)	967	133.54	703.34	-4619.34	8001.58
Kerosene price pass-through (percent)	692	92.35	553.02	-4908.87	7168.78
Retail gasoline price level	922	1.00	0.42	0.01	2.61
Retail diesel price level	967	0.89	0.41	0.01	2.34
Retail kerosene price level	699	0.76	0.37	0.01	1.68
Gasoline price flexibility	967	0.54	0.40	0.00	1.00
Diesel price flexibility	967	0.50	0.39	0.00	1.00
Kerosene price flexibility	967	0.59	0.41	0.00	1.00
Change in international gasoline price	967	0.12	0.37	-0.58	0.94
Change in international diesel price	967	0.10	0.30	-0.45	0.56
Change in international kerosene price	967	0.10	0.28	-0.46	0.51
Gasoline price gap with neighbors	773	-0.04	0.34	-1.29	1.61
Diesel price gap with neighbors	802	-0.03	0.32	-1.12	1.36
Kerosene price gap with neighbors	536	-0.03	0.35	-1.27	1.46
Share of gasoline in fuel consumption	647	31.83	12.15	6.38	73.91
Share of diesel in fuel consumption	647	54.22	12.47	4.29	82.91
Share of kerosene in fuel consumption	647	13.95	9.78	0.72	55.20
Volatility of international gasoline price	967	0.75	2.64	0.00	33.00
Volatility of international diesel price	967	0.70	2.51	0.00	34.24
Volatility of international kerosene price	967	0.69	2.50	0.00	34.76
Log of GDP per capita	967	7.42	1.14	4.66	9.72
Exchange rate (LCU per USD)	967	0.03	0.12	-0.98	0.98
Real GDP growth rate	963	4.73	5.70	-62.08	104.49
Inflation rate (log)	944	1.07	0.06	0.90	1.62
Primary balance (percent of GDP)	949	-0.51	6.77	-73.80	123.49
Public debt (percent of GDP)	945	3.72	0.63	1.83	5.65
Current account balance (percent of GDP)	890	-4.64	10.35	-80.05	80.67
CO2 emissions (kg per PPP $ of GDP)	946	0.22	0.16	0.02	1.22
Polity variable	812	3.53	5.50	-9.00	10.00
Election year dummy	941	0.15	0.36	0.00	1.00
Oil rents (percent of GDP)	957	3.33	8.45	0.00	57.57
Urban population share	960	46.34	19.66	8.46	91.60
Ethnic tension score	719	3.71	1.21	0.67	6.00

Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Gasoline price pass-through	1	1.00																																
Diesel price pass-through	2	0.6363*	1.00																															
Kerosene price pass-through	3	0.4898*	0.6384*	1.00																														
Retail gasoline price level	4	0.03	0.0844*	0.06	1.00																													
Retail diesel price level	5	0.01	0.0880*	0.05	0.9399*	1.00																												
Retail kerosene price level	6	-0.02	0.02	0.0744*	0.8228*	0.8853*	1.00																											
Gasoline price flexibility	7	0.01	0.00	-0.01	0.1153*	0.1733*	0.2451*	1.00																										
Diesel price flexibility	8	0.01	0.01	-0.01	0.1257*	0.1881*	0.2289*	0.9106*	1.00																									
Kerosene price flexibility	9	-0.03	0.01	-0.01	0.02	0.0829*	0.2160*	0.7639*	0.7331*	1.00																								
Change in international gasoline price	10	0.01	-0.01	-0.02	-0.04	-0.0754*	-0.0851*	0.01	0.00	-0.01	1.00																							
Change in international diesel price	11	0.04	-0.01	0.00	-0.05	-0.0868*	-0.0835*	0.00	-0.02	-0.01	0.8639*	1.00																						
Change in international kerosene price	12	0.04	0.00	0.01	-0.05	-0.0901*	-0.0884*	0.01	-0.01	-0.01	0.9002*	0.9917*	1.00																					
Gasoline price gap with neighbors	13	0.03	0.0624*	0.05	0.6373*	0.5481*	0.5048*	0.2558*	0.2634*	0.1363*	0.01	0.01	0.01	1.00																				
Diesel price gap with neighbors	14	0.03	0.0771*	0.0697*	0.5945*	0.6134*	0.5282*	0.3269*	0.3036*	0.1715*	0.03	0.03	0.03	0.9003*	1.00																			
Kerosene price gap with neighbors	15	0.07	0.0948*	0.03	0.4247*	0.4318*	0.5644*	0.1937*	0.1855*	0.1080*	0.00	0.01	0.01	0.6547*	0.6975*	1.00																		
Share of gasoline in fuel consumption	16	0.00	0.03	0.02	-0.2840*	-0.1244*	0.02	0.1528*	0.1626*	0.1878*	0.00	0.00	0.01	-0.2540*	-0.2152*	-0.0940*	1.00																	
Share of diesel in fuel consumption	17	-0.05	-0.05	-0.01	0.2504*	0.1251*	-0.05	-0.05	-0.0830*	-0.01	-0.01	-0.03	-0.04	0.1889*	0.1027*	-0.1214*	-0.6848*	1.00																
Share of kerosene in fuel consumption	18	0.05	0.03	-0.01	0.05	0.00	0.03	-0.1294*	-0.0962*	-0.2240*	0.01	0.04	0.04	0.0922*	0.1468*	0.2585*	-0.3700*	-0.4237*	1.00															
Volatility of international gasoline price	19	0.00	-0.01	-0.02	-0.05	-0.05	-0.0782*	-0.05	-0.0628*	-0.0747*	-0.0901*	-0.1109*	-0.1112*	-0.1296*	-0.1324*	-0.1241*	0.05	0.02	-0.0862*	1.00														
Volatility of international diesel price	20	0.00	-0.02	-0.03	-0.0578*	-0.05	-0.0804*	-0.04	-0.0561*	-0.0669*	-0.0885*	-0.0973*	-0.1022*	-0.1292*	-0.1279*	-0.1225*	0.05	0.02	-0.0864*	0.9834*	1.00													
Volatility of international kerosene price	21	0.00	-0.02	-0.03	-0.0573*	-0.05	-0.0797*	-0.04	-0.0547*	-0.0673*	-0.0842*	-0.0936*	-0.0982*	-0.1264*	-0.1247*	-0.1185*	0.05	0.02	-0.0857*	0.9803*	0.9988*	1.00												
Log of GDP per capita	22	-0.01	0.04	-0.02	-0.05	-0.04	-0.1058*	0.2136*	0.2153*	0.3690*	-0.0729*	-0.1098*	-0.1066*	-0.1628*	-0.1905*	-0.3293*	0.2581*	0.06	-0.3990*	-0.05	-0.05	-0.05	1.00											
Exchange rate (LCU per USD)	23	-0.1574*	-0.1717*	-0.1203*	-0.03	0.00	-0.01	-0.01	-0.01	-0.02	-0.2760*	-0.2582*	-0.2745*	-0.05	-0.02	0.01	0.02	0.05	-0.0852*	0.03	0.04	0.03	-0.02	1.00										
Real GDP growth rate	24	-0.01	-0.02	0.02	-0.02	-0.03	-0.01	-0.0552*	-0.0572*	-0.05	-0.05	0.01	0.01	-0.01	-0.01	-0.02	-0.04	-0.02	0.06	0.03	0.03	0.03	-0.04	-0.05	1.00									
Inflation rate (log)	25	-0.02	-0.04	-0.06	-0.1675*	-0.1393*	-0.1661*	-0.1310*	-0.1133*	-0.1693*	-0.1167*	-0.0932*	-0.1021*	-0.2337*	-0.2317*	-0.0800*	0.03	-0.01	-0.02	0.2194*	0.2206*	0.2224*	-0.1309*	0.2356*	-0.01	1.00								
Primary balance (percent of GDP)	26	0.01	0.02	-0.04	0.03	0.04	0.01	0.03	0.04	0.03	0.00	0.05	0.04	0.0729*	0.05	0.06	0.03	-0.0867*	0.0740*	0.0927*	0.1128*	0.1142*	0.02	-0.02	0.2140*	0.03	1.00							
Public debt (percent of GDP)	27	0.04	0.05	0.0684*	-0.02	-0.1019*	-0.1041*	0.02	0.03	-0.1130*	0.05	0.0763*	0.0790*	0.1252*	0.0886*	-0.07	-0.2301*	0.1026*	0.1566*	-0.01	-0.01	-0.01	-0.2065*	0.0808*	-0.1276*	0.0985*	-0.02	1.00						
Current account balance (percent of GDP)	28	0.01	0.05	0.00	-0.2731*	-0.2578*	-0.1938*	-0.1064*	-0.1028*	-0.01	0.05	0.0570*	0.0590*	-0.1640*	-0.1738*	0.07	0.06	-0.03	-0.03	-0.1689*	-0.1653*	-0.1652*	0.1855*	-0.0650*	0.05	-0.1380*	0.0568*	-0.2398*	1.00					
CO2 emissions (kg per PPP $ of GDP)	29	-0.04	-0.03	-0.04	-0.2903*	-0.2619*	-0.3327*	0.0996*	0.1292*	0.1939*	0.00	0.00	0.00	-0.1528*	-0.2018*	-0.2572*	0.3098*	-0.1968*	-0.1341*	0.02	0.02	0.02	0.3434*	0.02	0.00	-0.03	0.04	-0.0781*	0.0748*	1.00				
Polity variable	30	0.01	0.03	0.02	0.1393*	0.1440*	0.1642*	0.2918*	0.2897*	0.2468*	-0.02	0.00	0.00	0.1315*	0.2082*	0.04	0.0848*	-0.03	-0.06	-0.2294*	-0.2187*	-0.2187*	0.2270*	0.02	-0.0775*	-0.05	-0.0684*	0.1035*	-0.1148*	0.02	1.00			
Election year dummy	31	-0.02	-0.05	-0.03	-0.01	0.01	0.04	0.00	-0.02	-0.01	0.03	0.01	0.02	-0.03	-0.02	0.03	0.0878*	-0.05	-0.05	0.00	-0.01	-0.01	-0.02	0.01	0.01	0.01	-0.02	-0.01	-0.05	-0.0736*	0.04	1.00		
Oil rent (percent of GDP)	32	-0.01	-0.01	-0.02	-0.3408*	-0.3251*	-0.3310*	-0.3258*	-0.3216*	-0.2585*	-0.01	-0.01	-0.01	-0.3861*	-0.4358*	-0.2282*	0.03	0.01	-0.05	0.03	0.02	0.02	0.2271*	-0.03	0.0643*	0.0638*	0.1261*	-0.2531*	0.3370*	0.1115*	-0.3665*	-0.01	1.00	
Urban population share	33	0.01	0.04	0.01	-0.0694*	-0.0803*	-0.1237*	0.1453*	0.1585*	0.2619*	-0.03	-0.05	-0.05	-0.1094*	-0.1404*	-0.2654*	0.2822*	0.06	-0.4245*	-0.01	-0.01	-0.02	0.7217*	0.00	-0.0779*	-0.0983*	0.03	-0.0583*	0.0789*	0.2834*	0.2240*	0.0577*	0.1808*	1.00
Ethnic tension score	34	0.06	0.00	0.01	-0.0729*	-0.05	0.1209*	0.2170*	0.1846*	0.2581*	0.00	0.00	0.00	-0.04	-0.06	-0.0966*	0.2783*	-0.06	-0.3532*	-0.01	-0.01	-0.01	0.3978*	0.01	-0.02	-0.04	0.02	-0.1436*	0.05	0.1447*	0.1071*	0.06	0.02	0.4469*	1.00

Notes. Grayed coefficients are significant at 1, 5 or 10% level.

Appendix 2. Variable Definitions and Sources

Variable	Definition	Sources
Gasoline price pass-through	The ratio of the change in the retail gasoline price over the change in the international gasoline price throughout a year (as a percent)	Authors' calculations and Kpodar and Abdallah (2017)
Diesel price pass-through	The ratio of the change in the retail diesel price over the change in the international diesel price throughout a year (as a percent)	
Kerosene price pass-through	The ratio of the change in the retail kerosene price over the change in the international kerosene price throughout a year (as a percent)	
Gasoline price flexibility	Number of months during which gasoline price changes in a year, divided by 12	
Diesel price flexibility	Number of months during which diesel price changes in a year, divided by 12	
Kerosene price flexibility	Number of months during which kerosene price changes in a year, divided by 12	
Retail gasoline price level ($USD/liter)	Gasoline price paid by consumers at the pump. The price is tax-inclusive.	Kpodar and Abdallah (2017)
Retail diesel price level ($USD/liter)	Diesel price paid by consumers at the pump. The price is tax-inclusive.	
Retail kerosene price level ($USD/liter)	Kerosene price paid by consumers at the pump. The price is tax-inclusive.	
Change in international gasoline price	Percentage change in the benchmark world price of gasoline	US Energy Information Administration
Change in international diesel price	Percentage change in the benchmark world price of diesel	
Change in international kerosene price	Percentage change in the benchmark world price of kerosene	
Gasoline price gap with neighbors	Difference between the retail gasoline price in the country and the average retail gasoline price in neighboring countries	Authors' calculations and the Correlates of War Project Database (Direct Contiguity Data, 1816-2016. Version 3.2.).
Diesel price gap with neighbors	Difference between the retail diesel price in the country and the average retail diesel price in neighboring countries	
Kerosene price gap with neighbors	Difference between the retail kerosene price in the country and the average retail kerosene price in neighboring countries	
Share of gasoline in fuel consumption	The ratio of gasoline consumption over total fuel consumption	International Energy Agency
Share of diesel in fuel consumption	The ratio of diesel consumption over total fuel consumption	
Share of kerosene in fuel consumption	The ratio of kerosene consumption over total fuel consumption	
Volatility of international gasoline price	The standard deviation of the monthly change in the world price of gasoline over a year	Authors' calculations and the International Energy Agency
Volatility of international diesel price	The standard deviation of the monthly change in the world price of diesel over a year	
Volatility of international kerosene price	The standard deviation of the monthly change in the world price of kerosene over a year	

Variable	Definition	Sources
Log of GDP per capita	Logarithm of the ratio of gross domestic product (in USD) divided by the size of the population	World Development Indicators
Real GDP growth rate	Percentage change in the gross domestic product in constant USD	
CO2 emissions (kg per PPP $ of GDP)	Kg of carbon dioxide emissions divided by GDP in purchasing power parity terms	
Oil rents (percent of GDP)	The difference between the value of crude oil production at world prices and total costs of production, expressed as a ratio to GDP	
Urban population share	Ratio of urban population to total population	
Exchange rate (LCU per USD)	The value in USD of one unit of local currency	International Financial Statistics
Inflation rate (log)	Percentage change in the consumer price index	
Primary balance (percent of GDP)	Government net borrowing, excluding interest payments, as a percent of GDP	
Public debt (percent of GDP)	General government public debt divided by GDP	
Current account balance (percent of GDP)	The sum of the trade balance (exports minus imports) plus net income and net transfers, expressed as a ratio to GDP	
Polity variable	Polity Score is an index ranging from -10 to 10, with higher scores indicating more democratic countries	Polity IV dataset
Election year dummy	Dummy variable taking 1 during election years and zero otherwise	Database of Political Institutions
Ethnic tension score	An assessment of the degree of tension within a country attributable to racial, nationality, or language divisions. A low score means high tensions.	International Country Risk Guide database

Appendix 3. Panel unit root test

	Variable in level		Variable in first difference	
	Chi2 statistic		Chi2 statistic	
Gasoline price pass-through	288.0	***		
Retail gasoline price	223.7	*		
GDP per capita (log)	267.0	**		
Retail gasoline price flexibility	285.9	***		
Change in international gasoline price	332.6	***		
Exchange rate (local currency unit per USD)	354.9	***		
Volatility in international gasoline price	227.5	*		
Gasoline price gap with neighbors	503.4	***		
Gasoline share in total fuel consumption	165.2		458.0	***
Real GDP growth rate	578.1	***		
Inflation rate (log)	605.1	***		
Government primary balance (percent of GDP)	368.1	***		
Gross public debt (percent of GDP, log)	260.5	**		
Current account balance (percent of GDP	462.1	***		
CO2 emissions (kg per PPP $ of GDP)	298.1	***		
Polity variable	199.1		331.0	***
Oil rents (percent of GDP)	120.7	*		
Urban population share	405.8	***		
Ethnic tension score	363.4	***		

Notes. Fisher Test for panel unit root using an augmented Dickey-Fuller test (Ho: unit root); *,**,*** denote significance at 10%, 5% and 1%, respectively. A significant Chi2 statistic indicates that Ho is rejected, hence the variable is stationary. Variable in level means variable as defined in the left column.

Appendix 4. Additional Regressions

Table A1. Drivers of Diesel Price Pass-Through: The Role of Domestic and International Oil Market Factors, 2000-2014

Fixed-effect estimations	(1)	(2)	(3)	(4)	(5)
Retail diesel price (lagged)	-0.159	-0.191	-0.169	-0.165	-0.167
	[0.080]*	[0.053]***	[0.051]***	[0.054]***	[0.054]***
Retail diesel price flexibility	0.186	0.192	0.190	0.221	0.231
	[0.046]***	[0.049]***	[0.045]***	[0.065]***	[0.064]***
GDP per capita (log)	0.026	0.039	0.050	0.030	0.029
	[0.075]	[0.056]	[0.055]	[0.063]	[0.063]
Change in international diesel price	-0.080	-0.092	-0.110	-0.094	-0.099
	[0.020]***	[0.023]***	[0.023]***	[0.026]***	[0.026]***
Exchange rate (local currency unit per USD)	-0.440	-0.541	-0.529	-0.590	-0.592
	[0.093]***	[0.093]***	[0.090]***	[0.096]***	[0.097]***
Dummy year 2008	-0.099	-0.083	-0.102	-0.071	-0.057
	[0.025]***	[0.029]***	[0.029]***	[0.033]**	[0.033]*
Fuel price gap with neighbors (lagged)		-0.180		-0.200	-0.208
		[0.099]*		[0.106]*	[0.108]*
Positive gap (local diesel prices higher, lagged)			-0.665		
			[0.177]***		
Negative gap (lagged)			0.257		
			[0.114]**		
Diesel share in total fuel consumption (lagged)				-0.001	-0.001
				[0.002]	[0.002]
Volatility in international diesel price					-0.015
					[0.005]***
Constant	0.319	0.210	0.242	0.300	0.310
	[0.581]	[0.433]	[0.417]	[0.488]	[0.492]
Number of observations	967	789	789	623	623
Number of countries	109	92	92	72	72
R2	0.12	0.15	0.18	0.16	0.17

Notes. Robust standard errors (clustered by country) in brackets. *,**,*** denote significance at 10%, 5% and 1%, respectively. Retail fuel price flexibility measures the flexibility of the fuel pricing mechanism, proxied by the number of months (within a year) during which retail fuel prices changed relative to the previous month, divided by 12. Fuel price gap with neighbors is the domestic fuel price minus the average fuel price in neighboring countries for the same product. The volatility in international fuel price is calculated as the standard deviation of international fuel prices over a year using monthly data.

Table A2. Drivers of Diesel Price Pass-Through: Do Macro and Policy Factors Matter? 2000-2014

Fixed-effect estimations	(1)	(2)	(3)	(4)	(5)	(6)
Retail diesel price (lagged)	-0.158	-0.251	-0.269	-0.259	-0.260	-0.255
	[0.081]*	[0.048]***	[0.057]***	[0.047]***	[0.049]***	[0.055]***
Retail diesel price flexibility	0.186	0.184	0.187	0.181	0.179	0.181
	[0.046]***	[0.046]***	[0.050]***	[0.046]***	[0.047]***	[0.050]***
GDP per capita (log)	0.025	0.102	0.144	0.111	0.113	0.146
	[0.075]	[0.051]**	[0.062]**	[0.048]**	[0.050]**	[0.062]**
Change in international diesel price	-0.440	-0.517	-0.531	-0.499	-0.506	-0.542
	[0.093]***	[0.086]***	[0.089]***	[0.089]***	[0.089]***	[0.086]***
Exchange rate (local currency unit per USD)	-0.080	-0.079	-0.092	-0.088	-0.086	-0.082
	[0.020]***	[0.021]***	[0.023]***	[0.021]***	[0.021]***	[0.024]***
Dummy year 2008	-0.100	-0.086	-0.086	-0.092	-0.083	-0.078
	[0.026]***	[0.026]***	[0.028]***	[0.027]***	[0.025]***	[0.029]***
Real GDP growth rate (lagged)	-0.000					-0.001
	[0.001]					[0.003]
Inflation rate (log, lagged)		-0.180				-0.198
		[0.029]***				[0.028]***
Government primary balance (percent of GDP, lagged)			-0.000			-0.000
			[0.001]			[0.001]
Gross public debt (percent of GDP, log, lagged)			0.051			0.064
			[0.029]*			[0.027]**
Current account balance (percent of GDP, lagged)				0.001		0.003
				[0.002]		[0.002]
CO2 emissions (kg per PPP $ of GDP, lagged)					0.028	0.090
					[0.209]	[0.236]
Constant	0.331	-0.066	-0.772	-0.328	-0.353	-0.618
	[0.583]	[0.400]	[0.512]	[0.377]	[0.390]	[0.533]
Number of observations	961	943	925	957	946	886
Number of countries	109	106	104	106	107	101
R2	0.12	0.15	0.15	0.14	0.14	0.17

Notes. Robust standard errors (clustered by country) in brackets. *,**,*** denote significance at 10%, 5% and 1%, respectively. Retail fuel price flexibility measures the flexibility of the fuel pricing mechanism, proxied by the number of months (within a year) during which retail fuel prices changed relative to the previous month, divided by 12.

Table A3. Political and Institutional Factors: Implications for Diesel Price Pass-Through, 2000-2014

Fixed-effect estimations	(1)	(2)	(3)	(4)	(5)	(6)
Retail diesel price (lagged)	-0.289	-0.250	-0.253	-0.257	-0.228	-0.247
	[0.052]***	[0.047]***	[0.048]***	[0.048]***	[0.047]***	[0.050]***
Retail diesel price flexibility	0.199	0.173	0.189	0.183	0.200	0.222
	[0.052]***	[0.046]***	[0.046]***	[0.046]***	[0.054]***	[0.057]***
GDP per capita (log)	0.148	0.104	0.103	0.118	0.090	0.151
	[0.055]***	[0.050]**	[0.050]**	[0.052]**	[0.050]*	[0.055]***
Change in international diesel price	-0.483	-0.496	-0.500	-0.504	-0.480	-0.474
	[0.099]***	[0.088]***	[0.088]***	[0.088]***	[0.095]***	[0.100]***
Exchange rate (local currency unit per USD)	-0.084	-0.081	-0.088	-0.089	-0.071	-0.095
	[0.030]***	[0.020]***	[0.020]***	[0.021]***	[0.022]***	[0.033]***
Dummy year 2008	-0.086	-0.088	-0.096	-0.093	-0.076	-0.101
	[0.035]**	[0.026]***	[0.026]***	[0.026]***	[0.026]***	[0.038]**
Polity variable (first difference)	0.004					-0.000
	[0.006]					[0.006]
Election year dummy		-0.040				-0.033
		[0.023]*				[0.027]
Oil rents (percent of GDP)			0.004			-0.003
			[0.004]			[0.004]
Urban population share				-0.002		-0.008
				[0.006]		[0.007]
Ethnic tension score					0.033	0.032
					[0.035]	[0.039]
Constant	-0.620	-0.274	-0.284	-0.275	-0.332	-0.390
	[0.423]	[0.390]	[0.390]	[0.413]	[0.413]	[0.470]
Number of observations	810	941	957	960	719	643
Number of countries	96	104	107	107	79	76
R2	0.14	0.14	0.14	0.14	0.15	0.16

Notes. Robust standard errors (clustered by country) in brackets. *,**,*** denote significance at 10%, 5% and 1%, respectively. Retail fuel price flexibility measures the flexibility of the fuel pricing mechanism, proxied by the number of months (within a year) during which retail fuel prices changed relative to the previous month, divided by 12. The ethnic tension score lies between 0 and 6, with a lower score for countries where tensions between opposing groups are high. Polity variable is first-differenced as it is non-stationary in level.

Table A4. Domestic and International Oil Market Factors and their Impact on Kerosene Price Pass-Through, 2000-2014

Fixed-effect estimations	(1)	(2)	(3)	(4)	(5)
Retail kerosene price (lagged)	-0.196	-0.226	-0.205	-0.166	-0.171
	[0.079]**	[0.063]***	[0.061]***	[0.059]***	[0.060]***
Retail kerosene price flexibility	0.185	0.133	0.130	0.179	0.205
	[0.053]***	[0.058]**	[0.056]**	[0.077]**	[0.073]***
GDP per capita (log)	0.085	0.123	0.141	0.129	0.128
	[0.070]	[0.061]**	[0.057]**	[0.051]**	[0.053]**
Change in international kerosene price	-0.075	-0.080	-0.083	-0.073	-0.083
	[0.025]***	[0.033]**	[0.033]**	[0.036]*	[0.036]**
Exchange rate (local currency unit per USD)	-0.252	-0.305	-0.308	-0.382	-0.398
	[0.130]*	[0.151]**	[0.151]**	[0.191]*	[0.190]**
Dummy year 2008	-0.106	-0.104	-0.107	-0.090	-0.074
	[0.029]***	[0.035]***	[0.035]***	[0.035]**	[0.035]**
Fuel price gap with neighbors (lagged)		-0.112		-0.060	-0.068
		[0.078]		[0.097]	[0.099]
Positive gap (local kerosene prices higher, lagged)			-0.383		
			[0.148]**		
Negative gap (lagged)			0.136		
			[0.080]*		
Kerosene share in total fuel consumption (lagged)				0.005	0.005
				[0.003]*	[0.003]*
Volatility in international kerosene price					-0.017
					[0.002]***
Constant	-0.158	-0.390	-0.441	-0.567	-0.562
	[0.538]	[0.452]	[0.424]	[0.393]	[0.408]
Number of observations	693	515	515	371	371
Number of countries	81	65	65	46	46
R2	0.12	0.12	0.13	0.13	0.14

Notes. Robust standard errors (clustered by country) in brackets. *,**,*** denote significance at 10%, 5% and 1%, respectively. Retail fuel price flexibility measures the flexibility of the fuel pricing mechanism, proxied by the number of months (within a year) during which retail fuel prices changed relative to the previous month, divided by 12. Fuel price gap with neighbors is the domestic fuel price minus the average fuel price in neighboring countries for the same product. The volatility in international fuel price is calculated as the standard deviation of international fuel prices over a year using monthly data.

Table A5. Impact of Macro and Policy Factors on Kerosene Price Pass-Through, 2000-2014

Fixed-effect estimations	(1)	(2)	(3)	(4)	(5)	(6)
Retail kerosene price (lagged)	-0.197	-0.278	-0.287	-0.286	-0.274	-0.253
	[0.078]**	[0.056]***	[0.063]***	[0.056]***	[0.056]***	[0.059]***
Retail kerosene price flexibility	0.187	0.199	0.191	0.180	0.215	0.224
	[0.053]***	[0.053]***	[0.059]***	[0.055]***	[0.053]***	[0.052]***
GDP per capita (log)	0.085	0.157	0.175	0.160	0.174	0.202
	[0.069]	[0.054]***	[0.063]***	[0.051]***	[0.056]***	[0.065]***
Change in international kerosene price	-0.253	-0.333	-0.357	-0.317	-0.341	-0.369
	[0.130]*	[0.124]***	[0.132]***	[0.128]**	[0.126]***	[0.126]***
Exchange rate (local currency unit per USD)	-0.079	-0.071	-0.081	-0.088	-0.081	-0.073
	[0.024]***	[0.026]***	[0.028]***	[0.025]***	[0.026]***	[0.028]**
Dummy year 2008	-0.110	-0.091	-0.091	-0.103	-0.090	-0.090
	[0.029]***	[0.030]***	[0.031]***	[0.030]***	[0.030]***	[0.031]***
Real GDP growth rate (lagged)	0.001					0.002
	[0.001]					[0.003]
Inflation rate (log, lagged)		-0.111				-0.122
		[0.026]***				[0.030]***
Government primary balance (percent of GDP, lagged)			0.000			-0.000
			[0.001]			[0.001]
Gross public debt (percent of GDP, log, lagged)			0.024			0.053
			[0.024]			[0.023]**
Current account balance (percent of GDP, lagged)				0.003		0.004
				[0.002]		[0.002]**
CO2 emissions (kg per PPP $ of GDP, lagged)					0.266	0.447
					[0.220]	[0.193]**
Constant	-0.161	-0.580	-0.916	-0.707	-0.879	-1.152
	[0.530]	[0.414]	[0.509]*	[0.391]*	[0.430]**	[0.540]**
Number of observations	690	678	661	683	672	634
Number of countries	81	79	77	78	79	75
R2	0.12	0.15	0.15	0.15	0.15	0.18

Notes. Robust standard errors (clustered by country) in brackets. *,**,*** denote significance at 10%, 5% and 1%, respectively. Retail fuel price flexibility measures the flexibility of the fuel pricing mechanism, proxied by the number of months (within a year) during which retail fuel prices changed relative to the previous month, divided by 12.

Table A6. Political and Institutional Factors and their Impact on Kerosene Price Pass-Through, 2000-2014

Fixed-effect estimations	(1)	(2)	(3)	(4)	(5)	(6)
Retail kerosene price (lagged)	-0.302	-0.282	-0.286	-0.289	-0.280	-0.290
	[0.061]***	[0.057]***	[0.056]***	[0.059]***	[0.065]***	[0.073]***
Retail kerosene price flexibility	0.183	0.181	0.189	0.187	0.153	0.148
	[0.060]***	[0.055]***	[0.056]***	[0.055]***	[0.058]**	[0.063]**
GDP per capita (log)	0.190	0.156	0.158	0.164	0.144	0.201
	[0.059]***	[0.054]***	[0.052]***	[0.052]***	[0.058]**	[0.066]***
Change in international kerosene price	-0.244	-0.309	-0.317	-0.327	-0.268	-0.203
	[0.135]*	[0.128]**	[0.127]**	[0.127]**	[0.140]*	[0.146]
Exchange rate (local currency unit per USD)	-0.100	-0.077	-0.086	-0.084	-0.047	-0.081
	[0.037]***	[0.026]***	[0.026]***	[0.026]***	[0.027]*	[0.039]**
Dummy year 2008	-0.120	-0.094	-0.110	-0.098	-0.068	-0.117
	[0.043]***	[0.030]***	[0.032]***	[0.028]***	[0.034]**	[0.048]**
Polity variable (first difference)	0.004					-0.001
	[0.007]					[0.006]
Election year dummy		-0.018				-0.036
		[0.023]				[0.031]
Oil rents (percent of GDP)			0.007			0.002
			[0.004]			[0.006]
Urban population share				-0.001		-0.012
				[0.009]		[0.012]
Ethnic tension score					0.061	0.065
					[0.024]**	[0.026]**
Constant	-0.932	-0.689	-0.728	-0.731	-0.871	-0.746
	[0.443]**	[0.410]*	[0.388]*	[0.500]	[0.451]*	[0.620]
Number of observations	589	672	683	686	501	451
Number of countries	71	77	79	79	57	56
R2	0.14	0.14	0.15	0.15	0.15	0.15

Notes. Robust standard errors (clustered by country) in brackets. *,**,*** denote significance at 10%, 5% and 1%, respectively. Retail fuel price flexibility measures the flexibility of the fuel pricing mechanism, proxied by the number of months (within a year) during which retail fuel prices changed relative to the previous month, divided by 12. The ethnic tension score lies between 0 and 6, with a lower score for countries where tensions between opposing groups are high. Polity variable is first-differenced as it is non-stationary in level.

Table A7. Drivers of Gasoline Price Pass-Through: Testing for Domestic and International Oil Market Factors and Alternative Logistic Function, 2000-2014

Fixed-effect estimations	(1)	(2)	(3)	(4)	(5)
Retail gasoline price (lagged)	-0.051	-0.071	-0.071	-0.036	-0.036
	[0.032]	[0.024]***	[0.024]***	[0.023]	[0.023]
Retail gasoline price flexibility	0.031	0.038	0.036	0.047	0.048
	[0.017]*	[0.018]**	[0.018]**	[0.022]**	[0.022]**
GDP per capita (log)	0.019	0.027	0.031	0.008	0.008
	[0.025]	[0.019]	[0.019]	[0.019]	[0.019]
Change in international gasoline price	-0.034	-0.030	-0.030	-0.027	-0.028
	[0.005]***	[0.005]***	[0.005]***	[0.006]***	[0.006]***
Exchange rate (local currency unit per USD)	-0.128	-0.131	-0.129	-0.143	-0.144
	[0.027]***	[0.031]***	[0.031]***	[0.037]***	[0.037]***
Dummy year 2008	-0.030	-0.024	-0.024	-0.023	-0.021
	[0.009]***	[0.009]**	[0.009]**	[0.011]**	[0.011]**
Fuel price gap with neighbors (lagged)		-0.056		-0.083	-0.084
		[0.026]**		[0.029]***	[0.029]***
Positive gap (local fuel prices higher, lagged)			-0.096		
			[0.036]***		
Negative gap (lagged)			-0.024		
			[0.037]		
Gasoline share in total fuel consumption (lagged, and first-differenced)				-0.001	-0.001
				[0.001]	[0.001]
Volatility in international gasoline price					-0.002
					[0.001]**
Constant	0.370	0.299	0.279	0.432	0.433
	[0.188]*	[0.144]**	[0.143]*	[0.152]***	[0.153]***
Number of observations	947	785	785	601	601
Number of countries	107	91	91	72	72
R2	0.07	0.09	0.09	0.10	0.10

Notes. Robust standard errors (clustered by country) in brackets. *,**,*** denote significance at 10%, 5% and 1%, respectively. In the above regressions, the logistic transformation of the dependent variable uses the value of 0.001 (compared to 0.01 for the main results) for the parameter *a* defining the steepness of the logistic function curve. Retail fuel price flexibility measures the flexibility of the fuel pricing mechanism, proxied by the number of months (within a year) during which retail fuel prices changed relative to the previous month, divided by 12. Fuel price gap with neighbors is the domestic fuel price minus the average fuel price in neighboring countries for the same product. The volatility in international fuel price is calculated as the standard deviation of international fuel prices over a year using monthly data. Gasoline share in total fuel consumption (lagged) is first-differenced as it is non-stationary in level.

Table A8. Drivers of Gasoline Price Pass-Through: Macro and Policy Factors with Alternative Logistic Function, 2000-2014

Fixed-effect estimations	(1)	(2)	(3)	(4)	(5)	(6)
Retail gasoline price (lagged)	-0.052	-0.093	-0.099	-0.093	-0.094	-0.092
	[0.031]*	[0.020]***	[0.022]***	[0.020]***	[0.021]***	[0.021]***
Retail gasoline price flexibility	0.031	0.028	0.021	0.023	0.028	0.023
	[0.017]*	[0.017]	[0.017]	[0.017]	[0.017]	[0.018]
GDP per capita (log)	0.019	0.051	0.059	0.050	0.050	0.057
	[0.024]	[0.016]***	[0.018]***	[0.016]***	[0.018]***	[0.020]***
Change in international gasoline price	-0.127	-0.154	-0.139	-0.139	-0.140	-0.155
	[0.027]***	[0.026]***	[0.031]***	[0.028]***	[0.028]***	[0.029]***
Exchange rate (local currency unit per USD)	-0.034	-0.033	-0.034	-0.033	-0.034	-0.032
	[0.005]***	[0.005]***	[0.005]***	[0.005]***	[0.005]***	[0.005]***
Dummy year 2008	-0.031	-0.022	-0.022	-0.023	-0.022	-0.020
	[0.009]***	[0.008]***	[0.008]**	[0.008]***	[0.008]***	[0.008]**
Real GDP growth rate (lagged)	0.000					0.000
	[0.000]					[0.001]
Inflation rate (log, lagged)		-0.022				-0.024
		[0.013]*				[0.012]**
Government primary balance (percent of GDP, lagged)			-0.000			-0.000
			[0.000]			[0.000]
Gross public debt (percent of GDP, log, lagged)			0.012			0.014
			[0.007]*			[0.007]**
Current account balance (percent of GDP, lagged)				0.000		0.001
				[0.000]		[0.001]
CO2 emissions (kg per PPP $ of GDP, lagged)					0.018	0.010
					[0.061]	[0.074]
Constant	0.365	0.153	0.027	0.142	0.128	0.064
	[0.185]*	[0.127]	[0.147]	[0.122]	[0.142]	[0.176]
Number of observations	947	911	896	930	919	857
Number of countries	107	103	101	104	105	98
R2	0.07	0.09	0.09	0.09	0.09	0.10

Notes. Robust standard errors (clustered by country) in brackets. *,**,*** denote significance at 10%, 5% and 1%, respectively. In the above regressions, the logistic transformation of the dependent variable uses the value of 0.001 (compared to 0.01 for the main results) for the parameter *a* defining the steepness of the logistic function curve. Retail fuel price flexibility measures the flexibility of the fuel pricing mechanism, proxied by the number of months (within a year) during which retail fuel prices changed relative to the previous month, divided by 12.

Table A9. Political and Institutional Factors: Implications for Gasoline Price Pass-Through with Alternative Logistic Function, 2000-2014

	Fixed-effects					
	(1)	(2)	(3)	(4)	(5)	(6)
Retail gasoline price (lagged)	-0.097	-0.090	-0.096	-0.091	-0.067	-0.080
	[0.022]***	[0.021]***	[0.021]***	[0.020]***	[0.020]***	[0.023]***
Retail gasoline price flexibility	0.028	0.029	0.024	0.025	0.040	0.043
	[0.020]	[0.017]*	[0.017]	[0.017]	[0.018]**	[0.022]*
GDP per capita (log)	0.059	0.047	0.051	0.055	0.038	0.060
	[0.019]***	[0.017]***	[0.017]***	[0.017]***	[0.017]**	[0.022]***
Change in international gasoline price	-0.134	-0.137	-0.141	-0.141	-0.146	-0.145
	[0.031]***	[0.029]***	[0.029]***	[0.028]***	[0.032]***	[0.033]***
Exchange rate (local currency unit per USD)	-0.043	-0.031	-0.034	-0.034	-0.036	-0.058
	[0.008]***	[0.005]***	[0.005]***	[0.005]***	[0.005]***	[0.009]***
Dummy year 2008	-0.033	-0.022	-0.021	-0.025	-0.032	-0.050
	[0.013]**	[0.008]***	[0.008]***	[0.008]***	[0.009]***	[0.013]***
Polity variable (first difference)	0.001					0.001
	[0.001]					[0.002]
Election year dummy		-0.003				-0.005
		[0.008]				[0.008]
Oil rents (percent of GDP)			-0.001			-0.003
			[0.001]			[0.001]**
Urban population share				-0.002		-0.001
				[0.002]		[0.003]
Ethnic tension score					0.005	0.006
					[0.006]	[0.007]
Constant	0.074	0.154	0.130	0.185	0.201	0.087
	[0.144]	[0.127]	[0.130]	[0.140]	[0.134]	[0.174]
Number of observations	795	921	930	933	707	631
Number of countries	95	102	105	105	78	75
R2	0.09	0.09	0.09	0.09	0.10	0.13

Notes. Robust standard errors (clustered by country) in brackets. *,**,*** denote significance at 10%, 5% and 1%, respectively. In the above regressions, the logistic transformation of the dependent variable uses the value of 0.001 (compared to 0.01 for the main results) for the parameter *a* defining the steepness of the logistic function curve. Retail fuel price flexibility measures the flexibility of the fuel pricing mechanism, proxied by the number of months (within a year) during which retail fuel prices changed relative to the previous month, divided by 12. The ethnic tension score lies between 0 and 6, with a lower score for countries where tensions between opposing groups are high. Polity variable is first-differenced as it is non-stationary in level.

Table A10. Regressions without a Logistic Transformation of the Dependent Variable, and Excluding Potential Outliers, 2000-2014.

	(1)	(2)	(3)
Retail gasoline price (lagged)	-0.787	-1.453	-1.467
	[0.396]*	[0.350]***	[0.342]***
Retail gasoline price flexibility	1.174	1.431	1.715
	[0.323]***	[0.263]***	[0.363]***
GDP per capita (log)	0.095	0.891	0.968
	[0.328]	[0.373]**	[0.351]***
Change in international gasoline price	-0.633	-0.713	-1.235
	[0.145]***	[0.135]***	[0.217]***
Exchange rate (local currency unit per USD)	-2.830	-2.627	-2.675
	[0.629]***	[0.572]***	[0.641]***
Dummy year 2008	-0.076		
	[0.029]**		
Fuel price gap with neighbors (lagged)	-0.593	-0.796	-1.396
	[0.185]***	[0.173]***	[0.286]***
Gasoline share in total fuel consumption (lagged, and first-differenced)	-0.609		
	[0.620]		
Volatility in international gasoline price	-0.026		
	[0.024]		
Real GDP growth rate (lagged)		0.614	
		[1.668]	
Inflation rate (log, lagged)		-0.963	
		[0.178]***	
Government primary balance (percent of GDP, lagged)		-0.003	
		[0.005]	
Gross public debt (percent of GDP, log, lagged)		0.609	
		[0.146]***	
Current account balance (percent of GDP, lagged)		0.010	
		[0.011]	
CO2 emissions (kg per PPP $ of GDP, lagged)		1.953	
		[1.147]*	
Polity variable (first difference)			-0.037
			[0.038]
Election year dummy			-0.191
			[0.160]
Oil rents (percent of GDP)			-0.007
			[0.022]
Urban population share			-0.055
			[0.055]
Ethnic tension score			0.042
			[0.220]
Constant	-0.545	-8.094	-4.629
	[2.599]	[3.225]**	[2.762]*
Number of observations	543	763	569
Number of countries	72	96	74
R2	0.13	0.17	0.18

Notes. Robust standard errors (clustered by country) in brackets. *,**,*** denote significance at 10%, 5% and 1%, respectively. Retail fuel price flexibility measures the flexibility of the fuel pricing mechanism, proxied by the number of months (within a year) during which retail fuel prices changed relative to the previous month, divided by 12. Fuel price gap with neighbors is the domestic fuel price minus the average fuel price in neighboring countries for the same product. The volatility in international fuel price is calculated as the standard deviation of international fuel prices over a year using monthly data. Potential outliers are defined as pass-through values that exceed the sample average by one standard deviation. Gasoline share in total fuel consumption (lagged) and the Polity variable are first-differenced as they are non-stationary in level.