

Modeling Energy Price Reform Outcomes and Their Determinants Using a Newly Constructed Dataset

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Overview

Energy provides households with essential services such as lighting, heating, and cooling, which is why many governments regulate domestic energy prices. However, low regulated energy prices strain government finances while contributing to wasteful energy use and climate change.

Recent trends have moved energy price reform (also referred to as energy subsidy reform) up the policy agenda. In many energy-exporting countries, the fall in international oil prices in late 2014 and the subsequent decrease in government revenue drove their reform plans. In many energy-importing countries, the rise of government debt has been the primary driver of energy price reform attempts. In other countries, growing concerns around climate change have prompted their efforts to reform energy prices.

But energy price reform can be challenging for policymakers to implement. Some attempts to reform energy prices have been successful, thereby delivering fiscal, economic, and environmental benefits to those countries. Other attempts have led to social unrest, causing governments to backtrack and bring energy prices back down. Surprisingly, there is a lack of studies on energy price reform outcomes. Drawing lessons from past attempts can inform policymakers currently exploring how to reform energy prices effectively. In one of the earliest studies on this topic, the IMF (2013) reviewed 28 attempts to reform energy prices across various countries, categorizing the attempts into successful, partially successful, and unsuccessful. Of the 28 attempts, 12 were classified as successful, 11 as partially successful, and five as unsuccessful. The IMF (2013) then identified six barriers to reform: lack of information on the cost of subsidies, lack of government capacity, concerns over negative impacts on the poor, concerns over inflation and competitiveness, opposition from interest groups, and weak macroeconomic conditions. More recently, Natalini et al (2020) constructed a dataset with 59 instances of social unrest triggered by energy price increases, which they referred to as “fuel riots”. They then explored the relationships between these fuel riots and various explanatory variables, focusing on the international oil price as a determinant. McCulloch et al (2021) used the same dataset on fuel riots developed by Natalini et al (2020) but explored the domestic gasoline price as a determinant alongside the international oil price. Both Natalini et al (2020) and McCulloch et al (2021) applied regression analysis to understand the determinants of fuel riots, while the IMF (2013) study used a qualitative analysis approach.

Methods

The first step is to categorize energy price reform outcomes. For successful energy price reforms, we adopt a definition of “success” used by Hill (2013) and Chelminski (2018), where they define a successful reform as one that is durable, that is, not overturned or reversed. On the other hand, we define an unsuccessful reform as one that is rolled back soon after it is launched, generally in response to social unrest.

We begin studying the determinants of energy price reform outcomes by building a new dataset in which each observation is a specific episode of energy price reform. Our newly constructed dataset contains variables that reflect the characteristics of each reform episode, alongside the country characteristics. We build our dataset through a structured manual data collection process. To ensure maximum coverage, we undertake an exhaustive search of media sources, mainly using ProQuest, Factiva, PRIO, and GDELT. We use different combinations of keywords in our manual search, such as “gasoline”, “diesel”, “kerosene”, “fuel”, “price increase”, “subsidy removal”, “price reform”, “subsidy cut”, “protest”, “social unrest”, and “backlash”. Although there exist more advanced methodologies for collecting data from news, such as machine learning techniques, “these tend to be extremely time-consuming and often result in a large number of duplicates,” as noted by Natalini et al (2020). Our newly constructed dataset contains variables such as the date of the reform, the outcome, the energy price increases by energy product, whether it was implemented alongside other reforms (e.g., food prices), and whether compensation was given, to name a few.

With our newly constructed dataset in hand, we empirically investigate the relationship between reform reversal, social unrest, and other explanatory variables through qualitative and quantitative analyses. Our quantitative analysis relies on logistic regression, which is commonly used to investigate the relationship between a binary dependent variable and a set of potential explanatory variables. We explore two approaches to empirically investigate energy price reform outcomes and their determinants. Our first approach sets the occurrence of social unrest following energy price reform as the dependent variable:

$$EPRSU_i = \beta_1 + \beta_2 x_{1i} + \beta_3 x_{2i} + \dots + \beta_n K x_{ni} + \varepsilon_i \quad [1]$$

where $EPRSU_i$ is the occurrence of energy price related social unrest in country i , x_{ji} are the explanatory variables, and ε_i is the residual. This equation is similar to what was used by Natalini et al (2020) and McCulloch et al (2021), differing in the explanatory variables. The differences between our approach and the approaches used by Natalini et al (2020) and McCulloch et al (2021) are best illustrated through an example. Suppose Country A reformed diesel and kerosene prices, while Country B reformed residential electricity tariffs only. Let's also suppose that the former attempt at reform led to social unrest while the latter did not. Natalini et al (2020) would attempt to measure the relationship between the international crude oil price and the occurrence of social unrest, while McCulloch et al (2021) would attempt to measure the relationship between the domestic gasoline price and social unrest. In this example, both Natalini et al's (2020) and McCulloch et al' (2021) approaches may miss the true determinants, which our approach would not miss, since it captures all the price increases across all energy products during the reform. Furthermore, our newly constructed dataset allows us to isolate the domestic price changes that occurred due to reform from the domestic price changes that are driven by fluctuations in global fuel prices.

Our second approach sets the occurrence of a reversal as the dependent variable, with the same right-hand side explanatory variables:

$$R_i = \beta_1 + \beta_2 x_{1i} + \beta_3 x_{2i} + \dots + \beta_n K x_{ni} + \varepsilon_i \quad [2]$$

where R_i is the reversal of the reform. This equation has not previously been explored in the literature.

Results

Data analysis on our newly constructed dataset reveals which factors increase the likelihood of a successful or unsuccessful outcome. We find that smaller energy price increases and the use of a compensation scheme are two critical drivers of successful outcomes. Energy price reforms are also more likely to succeed in countries with higher incomes. On the other hand, we find that energy price reforms are less likely to succeed in lower-income countries, especially when implemented alongside price increases to other essential goods and services, such as food and telephone. Furthermore, when an initial attempt at energy price reform in a country leads to social unrest, we find that future attempts at reform, even if well-designed, will likely lead to an unsuccessful outcome. Finally, our analysis demonstrates that in some cases, depending on national circumstances, alternative policies to energy price reform may be better for achieving fiscal and environmental targets.

Conclusions

To the best of our knowledge, this study is the first to build a comprehensive dataset of energy price reform episodes, stretching from 1990 to 2022, which is used to analyze and model the determinants of energy price reform outcomes. Given the considerable economic and fiscal benefits, many countries are currently exploring ways to reform energy prices, even though it can be challenging to do so. Drawing lessons from the experiences of governments that had previously attempted to reform energy prices, through both qualitative and quantitative analyses, can inform the design of effective energy price reform programs in the future.

References

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