How have Liquified Natural Gas export prices changed in the United States after policy changes in 2005 and 2016? - Sample

Sri Akhil Jonnalagadda 05/06/2020

Abstract

This paper looks at the causal effects of policy changes in 2005 and 2016 on export prices of liquefied natural gas. The 2005 policy is that of an increase in LNG terminal production and more relaxed domestic energy laws. The 2016 policy change is that of the market opening up to non free trade agreement countries. This was a demand shock in 2005 as this was a time of huge increase in energy use and demand worldwide. In 2016 the USA faced a supply shock as the now open markets allowed for increase efficiency in production capability. This was modeled using a two stage least squared regression discontinuity. We find that there is about a 1.56 dollar increase in export LNG prices in 2005 and about a 8.22 dollar decrease in prices in 2016. ##Introduction:

The purpose of this paper is to look at the causal effects of liquefied natural gas(LNG) prices exported out of the United States.The time frame of focus is 2001 to 2019. At the start of the 2000's the United States was a net importer of LNG and as time has gone on they switched to being an exporter in mid 2018. This study focuses on tracking the LNG export prices by looking at other fuel source prices domestically and in the international market. The goal of which is to see the causal effects on price trends due to policy changes. The policy changes this study is taking into consideration are those of 2005 and 2016. The Energy Act of 2005 enacted by the Bush administration was developed to provide tax incentives and loan guarantees to increase energy output in attempts to deal with increasing energy demands.

We also are taking into account 2016. FERC(Federal Energy Regulatory Commission) is the regulatory agency of LNG. In 2016 they received DOE(Department of Energy) authorization to export LNG to non-FTA countries (free-trade agreement). The thought is that the increase in total demand brings down the market price.

This study will look at the export prices of LNG based on the domestic and international market price of other fuels sources and the causal effects of the policy changes of 2005 and 2016. The hypothesis is that these policies both lead to a "relative" decrease in market price of export LNG prices. ##Empirical Model:

The Empirical Model is a sharp regression discontinuity paired with a Two-Stage least squares (2SLS). The model is made this way so that we can deal with endogeneity and find the causal effects of our policy changes. We are looking at the changes in 2005 and 2016. As seen in our graph below there is a sharp change in rate of growth in 2005 and a drop in prices in 2016.
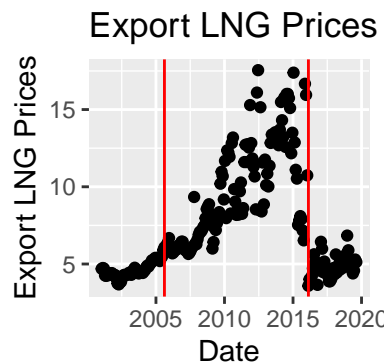
We choose to regress the variables on LNG export prices but it is reasonable and true that LNG, crude and other prices may be affected by each other. By instrumenting crude prices with the unemployment rate we can help deal with the endogeneity while taking into account the quality of the economy, i.e. recession of 2008. The use of this 2SLS estimator is to create a more accurate estimator than an option such as linear regression

as it creates a better model with less overestimation of each parameter. After such the discontinuity at the cutoff points is the causal effect of the treatments.

Ledger

E.LNG- average monthly price in dollars per thousand cubic feet of LNG domestic exports
I.LNG- average monthly price in dollars per thousand cubic feet of all US LNG imports
I.Gas- average monthly US Natural Gas Industrial price in dollars per thousand cubic feet
C.Gas- average monthly US Natural Gas Commercial price in dollars per thousand cubic feet
R.Gas- average monthly US Natural Gas Residential price in dollars per thousand cubic feet
Dum2- Treatment variable for 2005 policy act
Dum2- Treatment variable for 2016 policy act
D.Crude- Crude oil export average price which is instrumented with Unemployment Rate
U.Rate- Unemployment Rate
ID- This was a numerical list of the data to help model the trend over time

Regression Discontinuity Model

$$E.lng_{s,t} = \alpha_s * I.lng_t + \beta_s * R.Gas_t + \gamma_s * C.Gas_t + \delta_s * I.Gas_t + \kappa_s * WTI_t + \zeta_s * Brent_t + \eta_s * ID + \epsilon_s$$

s= Treatment Group, t= Time

The model uses data in prices to model LNG export prices per month. The use of import prices are to show the domestic market price/market for LNG. This should help track for infrastructure and changes in LNG trends. The three Gas variables are made so that they can model domestic demand for natural gas as those trends would also relate to the LNG global trends. D.Crude is to show the competing energy source to LNG Export prices. It is instrumented so that we can deal with some endogeneity in our model. The use of the interaction variable(U.Rate) is to account for the recession of 2008. The ID variable is used to help account for change in overall demands and energy efficiency that could change LNG export prices over time. The constant was included to help account for a baseline cost for LNG export which is not affected by the other variables and accounts for the effects that we did not account for.

##Discussion and Conclusion

In 2005 we hypothesized a negative effect on price since the goal of the policy was to increase output and make the US more competitive in the world market. Our regression discontinuity model gives us an estimate of an increase in export prices of 1.56. This disproves our original hypothesis. In context this is most likely due the fact that 2005 was a energy boom. Demands spiked and worldwide use of LNG rose. This was the premise of why the 2005 policy went in place. From what we see is that the policy may have increased our output but the prices still rose.

In our model of 2016 we have a decrease in prices of 8.22. The hypothesis was that with the opening of new markets domestic production would be more efficient. This efficiency would ideally drop prices. In our regression discontinuity we see this drop. The time plot also concurs with a steep change in export prices after 2016. Between these measures we can validate our hypothesis that opening the world market to non-FTA countries increased efficiency such that export prices dropped.

Our simple model has the causal effects of -1.147 and -8.870 for 2005 and 2016. While this model supports both parts of the original hypothesis we can safely say between our regression discontinuity and time plot prices most likely did not drop after the 2005 policy change. The 2016 causal effect surprisingly did match our previous findings. This all being said the estimates were highly insignificant, the main purpose of this model was as a summary and baseline to compare to our estimates in our regression discontinuity

From our modeling we have established a 1.56 increase in 2005 and 8.22 decrease in 2016. In context the 1.56 increase makes sense. In our plot we see this huge growth rate in prices between 2005-2016. We see that this policy in 2005 still led to an increase in prices but the policy alone should have lead to decrease in prices. Since we see the price rise the assumption is the growth in demand out weighs the supply shock explaining our result.In 2016 the model shows this drop of $8.22 in export prices. From this we can conclude that our hypothesis is supported and the market did become more efficient under the new regime.This study did show us general trends. It was enough to have strong conclusions. This being said it can be further developed.