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The Effects of Energy Dependency on Trade
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**Introduction.**

Energy dependency in an open economy is traditionally discussed in the context of detrimental effects on the exporter through some sort of distortion sometimes collected under the Dutch disease. I ask a different question: what does the energy exporter gain when the importer depends on their energy exports? This question is interesting in light of the recent Russian invasion of Ukraine and subsequent discussion about dependence of European countries on Russia's energy. In this paper, historical trade data is used to construct measures of energy dependency and comparative advantage and estimate linear models to analyze the question.

**Literature Review.**

My analysis of this question is built off of previous literature on energy and political influence. A full review of the literature can be found in the final paper. The examined literature discusses cases when political influence from countries like the USA (through CIA interventions), Russia and other energy exporting nations (through energy dependence and price control) gains them certain economic and political advantages. Key advantages found in these papers include increased exports of non-energy products from CIA influence, increased political security from dependent importers, and improved economic bargaining positions during times of political unrest.

**Data and Methods.**

The main data source used in my analysis is the CEPII BACI trade flow data from 2014. This dataset reports the quantity and value of products traded from exporter-country to importer-country. Flows under $10,000 were removed from the dataset as insignificant. The remaining 226 countries present are included in the final table. The trade flows are separated into product categories at the 6-digit Harmonized System (HS) level. Goods in product level 27 are marked as energy goods, and this determined what was considered an energy good in the analysis. This data was used to construct 2 additional measures: a revealed comparative advantage (RCA) for each exporter-product and an energy importer share which records what percentage of energy imports a country receives come from each exporting country.
CEPII gravity data was added to control for omitted variable bias and country fixed effects. A selection of variables from the data set were chosen and added to the final table for estimation. A net energy imports measure was taken from WDI data which records the percent of energy imports compared to energy use. Finally, data from UN Comtrade of BEC correlations were used to match HS codes at the 6-digit level to the Broad Economic Categories (BEC) codes. These codes were added in to create capital and intermediate good dummies for each product.

The final dependency measure was constructed by multiplying the energy importer share by the net energy imports. This was done so the final measure takes on values from 1 to 0. 1 indicates the importer has perfect dependency on the exporter for energy, while 0 indicates no dependency exists between the two countries.

In order to detect the effect of energy dependence on trade I use the following empirical specification:

\[ T = \text{the value of the trade flow of product } k \text{ from exporter } e \text{ to importer } i, \text{ measured in thousands current USD.} \]
\[ d = \text{the dependency measure described in the data section, taking values from 0 to 1 to represent the energy dependency of the importer on the exporter.} \]
\[ RCA = \text{the revealed comparative advantage the exporter has in trading product } k. \]
\[ distw = \text{the population weighted distance measure taken from the gravity data.} \]
\[ cap \text{ and } int \text{ are dummy variables indicating whether product } k \text{ is a capital good, and intermediate good, both or neither.} \]
\[ \delta \text{ terms are the fixed effects of each importer, exporter and product, and } \varepsilon \text{ is the residual error.} \]

My estimation includes 6 models, varying in the interaction terms included between the variables. The \emph{cap} and \emph{int} variables can only be interpreted with interaction terms, as they have perfect collinearity with the product fixed effects.

**Results.**
My goal with this paper was to determine if the economic effects of political influence found in previous work would hold true when the driving factor was energy dependency instead. Particularly, if energy dependence resulted in importers purchasing more goods from exporters that the exporters did not have a comparative advantage in.

The results of my estimation support the theory that energy dependence increases non-energy exports. All models indicated that a 1% increase in the dependency measure is associated with a greater than 1% increase in trade of non-energy products to dependent importers. However, the results for comparative advantage are far less conclusive. While it can be determined from the data that energy dependency reduces the effects of comparative advantage on exports, it does not reverse it to indicate an increased exportation of non-comparative advantage goods. The RCA interaction terms heavily dictate the overall impact RCA has in trade, with the type of good and level of dependency determining the strength of the effect. The product type effect seen in the data indicates that non-capital goods benefit the greatest from energy dependent importers, while no significant relationship could be seen with intermediate goods.

**Further Research.**

Weaknesses of this paper could be fixed with certain revisions. While two measures of energy dependency were combined in my data to construct the final measure, it still leaves the analysis of dependency somewhat simplistic. Additional measures of import concentration or other factors could allow for more in-depth analysis of what is going on in the data. The product data was aggregated from the 6-digit HS level to the 2-digit level. This was helpful in condensing the data and simplifying the definition of energy products, but it made creating the capital and intermediate goods terms difficult and not very accurate. Remaining at the 6-digit level if possible would make using the BEC correlations much easier and consequently help the analysis of their effects on trade.

Only one year was used for this analysis. This was mainly done for two reasons: the lack of data availability for certain measures beyond 2014 and keeping the size of the data manageable. However, using one-year panel data limits the analysis from time-varying effects.
Adding more years to the data would increase the strength of my analysis by including economic conditions outside of the year 2014.

While another inspiration to this project has been the recent events between Russia and Ukraine and its effects on energy trade, my data does not contain any political factors. This also limits my analysis specifically to my included economic measures, and only implicitly include political influences when they affect these measures. Adding political condition terms that measure risk and conflict would allow interpretations of how energy dependence and political influence interact.