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Estimating the size of the trade sector in the Economic Freedom of the World index

Joshua C Hall
Beloit College

Robert Lawson
Auburn University

Chuck Skipton
University of Tampa

Abstract

The Economic Freedom of the World (EFW) index measures the extent to which nations allow their citizens economic freedom. The freedom of people to trade internationally is a featured area within the index. One component of this area is the size of the trade sector, or rather the deviation of a country's trade sector from its expected size. This note explains the basic methodology used to estimate the model and create the ratings for the deviation of a country's trade sector from its expected size component of the EFW index.

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1. Introduction

The *Economic Freedom of the World* (EFW) annual report is an index that measures the extent to which nations allow their citizens economic freedom (Gwartney, Lawson and Hall, 2010). From the beginning, the freedom of people to trade internationally has been a featured area within the index. One component of this area has been the size of the trade sector, or rather the deviation of a country's trade sector from its expected size. Since countries of differing sizes, both in terms of population and area, and differing locations would naturally trade more or less according to these differences, the index employs a regression model to estimate the expected size of the trade sector given the size and location of the country.

If a nation trades a lot more than the model predicts, then we conclude that the policy regime must be favorable to trade; in contrast, if a nation trades a lot less than expected we conclude that there must be significant barriers to trade in place. This paper explains the basic methodology used to estimate the model and create the ratings for the deviation of a country's trade sector from its expected size component of the EFW index. The specific estimates presented here were used to update the trade sector component for the *Economic Freedom of the World: 2010 Annual Report* (Gwartney, Lawson, and Hall, 2010). Slight variations exist from one edition to the next, but this basic methodology has been employed in all the EFW reports since the 2002 report.

2. The Empirical Model

The empirical model is designed to estimate "natural trade shares" in a fashion conceptually similar to Lee (1993). This approach tries to isolate the level of trade that would occur absent any country-specific institutional / policy effects. Recall that the purpose of this exercise is to determine the volume of trade that one would expect to occur naturally, and then use the residuals from the estimated equation as an estimate of the deviation of trade volume from this expected level. Such deviations are likely reflective of latent policy and country-specific institutional factors that are difficult to observe directly. For this reason it would be inappropriate to include any measureable country-specific institutional/policy factors like tariffs, regional trade agreements, legal origins, etc. One could, though, include such factors

in a more complete trade regression to establish the impact of these country-specific institutional factors on the level of trade flows, but this is not the goal here.

The final model includes working age population, geographic size, extent of coastline, absence of coastline, a linear trend variable, and a measure of each country's relative proximity to world concentrations of demand.The exact specification for the econometric model is as follows:

$$\ln(TRSHARE) = a + \beta_1 \ln(WPOP) + B_2 \ln(SIZE) + \beta_3 LOCK + \beta_4 COAST + \beta_5 DADS + \beta_6 TREND + \varepsilon$$

TRSHARE (trade share) is an economy's exports and imports together as a share of GDP. WPOP (working age population) is defined as the nation's population 15-64 years of age. SIZE is the country's geographic size in thousands of square kilometers. COAST is the country's extent of coastline (in kilometers). LOCK is a dummy variable denoting whether or not the country is "landlocked" (whether it possesses zero coastlines); LOCK is set to 1 if the country is landlocked and 0 otherwise. TREND is a linear trend variable.[1] DADS (distance adjusted demand scalar)[2] is a measure of a country's relative proximity to world concentrations of demand. This measure of a country's remoteness is constructed for each country, on an annual basis. The larger an economy's DADS, the closer it is to concentrations of measured

[1]The TREND variable is needed to take account of the reductions in natural trade impediments such as transport and communication costs that have taken place over time. If not included, the resulting increases in trade will be falsely attributed to policy or institutional changes. However, the TREND variable also picks up some of the increase in trade liberalization, which is a change in institutions. So inclusion of the TREND variable represents a trade-off between attributing too much to policy changes or too little. While we include the TREND variable, empirically the results are very similar, with a correlation of .94 between a measure of the trade sector employing the TREND variable and the measure estimated without a TREND term.

[2]Ultimately a 'gravity model' type variable, the DADS measure for a given economy in a given year is built by taking the real GDP for every other economy in the world and scaling them (individually) by the bi-lateral distance between them and the country for which the DADS is being constructed, and then summing the whole lot. The real GDP data employed for the DADS is de-trended (leaving the total sum of the world's GDP to equal its sum in 1980). The DADS that result are scalar proxies for an economy's relative proximity to world demand and are available for approximately 165 countries from 1980-2003. For more information see Skipton (2003).

economic activity.[3]

Among the alternate variables considered was whether the country is an island, but this was never significant. It appears the impact of being an island nation is fully captured with the existing geographic variables. We also tried several variants on land area (such as improved land) but found that the data were not as abundant as one would like and the simple land area variable was most robust.

The 2010 trade share regression results are presented in Table 1 (constructed using annual data from the sample of the countries included in the EFW report from 1980-2008). The results suggest that the larger the size of an economy (in terms of either population or geographic size) the smaller the expected size of the trade sector. This result is as economic theory would suggest – implying that larger population centers possess greater opportunities to pursue internal comparative advantages and economies of scale, and larger geographic economies possess larger reserves of natural resources, reducing the need to import some necessary inputs. Further larger geographic countries necessarily must pursue exchange over longer distances to trade with nations outside of their own vast borders.

Table 1. OLS Estimates of ln(TRSHARE)

Predictor	Coefficient	t-statistic
ln(WPOP)	-0.1459	-20.25
ln (SIZE)	-0.0836	-13.61
LOCK	-0.1043	-4.52
COAST	2.12E6	5.43
DADS	0.0023	12.71
TREND	0.1773	17.42
CONSTANT	6.0296	60.98
n	3572	
Adjusted R-squared	0.4118	

The coefficient on COAST (and on LOCK) suggests that economies that do not possess direct access to low-cost ocean transport face increased costs

[3]Trade share estimates are constructed using data from World Bank (various years), International Monetary Fund (various years), and United Nations (2010). Coastline and landlocked data were obtained from Central Intelligence Agency (various years). The DADS data was constructed by Chuck Skipton (available upon request) and all data on Taiwan was obtained from Council for Economic Planning and Development (various years).

as it relates to international trade and, so, relatively speaking, trade less internationally than other otherwise similar nations. This result is exasperated in the absence of coastline. The coefficient on the DADS measure suggests that proximity to world concentrations of demand (like being located in Western Europe or just north or south the United States) is positively correlated with trade. Alternatively, if a state is remotely situated, like New Zealand or Argentina, this geographic attribute impacts trade share negatively. Finally, as is widely observed in the data, there has been a worldwide trend towards larger trade sectors that may be attributable to many omitted factors that have positively influenced the size of trade sectors across the global economy – such as the end of the cold war, the rise of the information age, and a general liberalization of economies and stabilization of monetary systems worldwide.

3. Calculating the Ratings

The percentage difference between the actual size of the trade sector and the expected size of the trade sector is used to create a rating on a 0 to 10 scale. Higher ratings are assigned to countries with large trade sectors compared to what would be expected, given their population, geographic size, and location. On the other hand, countries with small trade sectors relative to the expected size receive correspondingly lower ratings. The following formula is used to place the figures on a 0-to-10 scale: (Vi – Vmin) / (Vmax – Vmin) * 10.[4] Vi is the percentage deviation of a country's actual trade sector size from the expected. Vmax and Vmin are set at 100 percent and minus 50 percent, respectively. Countries whose trade sizes are 50% less than expected are automatically given a 0 rating and countries with trade sizes 100% greater than expected are automatically given a rating of 10.[5] Countries with values in between negative 50% and positive 100% are given ratings along the 0 to 10 scale according to the formula.

[4]Before using the formula, all negative percentage changes are adjusted so that they are symmetrical with their positive counterparts by using this formula: -|x| / (1-|x|). Thus going from 100 to 75 (negative 25%) is converted to negative 33% so that it is symmetric with a move from 75 to 100 (positive 33%). Also, since the rating formula requires the numbers to be positive, all the figures were made positive by adding the lowest negative value on the list to all the numbers. The Vmax and Vmin values were adjusted accordingly as well.

[5]Note that minus 50 percent is symmetrical with positive 100 percent.

4. Conclusion

Much of the trade and growth literature uses simple trade shares as a measure of openness, but we believe this is flawed because the volume of international trade is likely to vary considerably across nations because of differences in their natural circumstances. The model employed above is simple and subject to a number of the usual criticisms of econometric models. Yet, we believe it allows us to get a better idea of which countries are more open to trade than we would get by just looking at unadjusted trade shares. We would warn against using this measure as a sole indicator of openness. Other direct measures such as tariff rates are available, and various surveys about the severity of customs regulations exist. These other indicators are used in the EFW index in addition to the trade sector component to paint a more complete picture.

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