

# Estimating the Size of the Trade Sector: An Explanation of the Methodology Used to Construct Actual and Expected Trade Sector Size for Component 4-C of the Economic Freedom of the World Index.

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## 1. Introduction.

The Economic Freedom of the World (EFW) index measures the extent to which nations allow their citizens economic freedom. 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, we have employed 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: 2004 Annual Report*.<sup>1</sup> Slight variations will exist from one edition to the next, but this basic methodology has been employed in all the EFW reports.<sup>2</sup>

## 2. The Empirical Model.

In order to estimate the degree to which an economy's actual trade share deviates from its expected trade share, a model is employed which 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:

$$\ln(\mathbf{TRSHARE}) = a + b*\ln(\mathbf{WPOP}) + c*\ln(\mathbf{SIZE}) + d*\mathbf{LOCK} \\ + e*\mathbf{TREND} + f*\mathbf{COAST} + g*\mathbf{DADS}$$

**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.

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**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.

**DADS** (*distance adjusted demand scalar*)<sup>3</sup> 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 economic activity.<sup>4</sup>

The 2004 trade share regression results are below (constructed using annual data from the sample of the 123 EFW countries from 1980-2002). 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. The coefficient on coastlines (and on landlockedness) suggests that economies that do not possess direct access to low-cost ocean transport face increased costs 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.

Dependent variable:  $\ln TRSHARE$

Independent variable / coefficient / t-statistic:

Constant	6.132	58.7
$\ln WPOP$	-0.141	18.4
$\ln SIZE$	-0.087	13.3
<b>LOCK</b>	-0.113	4.4
<b>TREND</b>	0.017	11.1
<b>COAST</b>	-2.4 E6	6.0
<b>DADS</b>	0.002	9.1

Adjusted r-squared: 0.42; n = 2654.

### 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:  $(V_i - V_{\min}) / (V_{\max} - V_{\min}) @ 10$ .<sup>5</sup>  $V_i$  is the percentage deviation of a country's actual trade sector size from the expected.  $V_{\max}$  and  $V_{\min}$  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.<sup>6</sup> Countries with values in between negative 50% and positive 100% are given ratings along the 0 to 10 scale according to the formula.

#### **4. Conclusion.**

Obviously, 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. Even so, 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.

## Notes & References

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<sup>1</sup> Gwartney, James and Robert Lawson (2004). *Economic Freedom of the World: 2004 Annual Report*. (Vancouver: The Fraser Institute).

<sup>2</sup> The DADS variable was first introduced in the 2002 Annual Report.

<sup>3</sup> 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, C. (2003) "Measuring Trade Openness: 1980-1999," a working paper available upon request.

<sup>4</sup> Trade share estimates are constructed for the 123 countries in the EFW report using data from a wide range of sources: the working age population and geographic size data comes from the WDI – World Bank, *2003 World Development Indicators CD-ROM (with data for Taiwan sourced from the Statistical Abstract of the Republic of China – misc. years)*; the coastline data (and hence the landlocked status data) comes from the CIA, *World Factbook* (various years); the trade share data comes from various sources which include the *2003 WDI*, *Statistical Abstract of the Republic of China* (various years), the International Monetary Fund's *International Financial Statistics* (various years), and the OECD's online statistical database (annual national accounts); the *DADS* data are from the 2004 DADS 1.1 index (C. Skipton).

<sup>5</sup> 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  $V_{\max}$  and  $V_{\min}$  values were adjusted accordingly as well.

<sup>6</sup> Note that minus 50 percent is symmetrical with positive 100 percent.