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Abstract

This research will analyze the effects of the similarities in economic size and institutional level on bilateral trade. It is interested whether similarities at the country size and institutional level encourage international trade between countries. Using panel data of the bilateral trade of Azerbaijan with 50 different countries from 1995 to 2012 estimating by the Poisson Pseudo-Maximum Likelihood (PPML) method, it is expecting that similarity at the income size is not necessary for increasing bilateral trade across countries, on the contrary, country has interest to trade with dissimilar economic-size countries. Institutional similarity is expecting plays pivot role in international relationships and it has positive impact on bilateral trade.

Keywords: international trade, gravity model, economic growth, institutions

JEL Classification: F14; P33; P48

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Introduction

The gravity model is a successful model to analyze bilateral trade corresponding economic size, distance between countries and other economic factors as well as institutional levels. Inspired by Newton's law of gravity in physics, the gravity model of international trade modelled for the analysis of bilateral trade relationship as a function of economic sizes (mostly GDP, income) and the inverse of distance (geographical, trade cost, tariffs).

The theoretical methodology of the gravity model in economics was introduced by Tinbergen [1962], and it has been performing very successfully as an empirical application. Anderson and van Wincoop [2003] developed a method that consistently and efficiently estimates a theoretical gravity equation, and estimates the comparative statics of trade frictions. The authors applied the method to solving McCallum [1995]'s border puzzle, they emphasized that borders reduce bilateral national trade levels by moderate amounts of 20-50 percent.

The main discussions across the studies are whether national borders reduce bilateral trade between developed countries [Anderson and van Wincoop, 2001]; analyzes the effects of institutional similarities on bilateral tarde; whether good institutions foster economic growth [Duc et al., 2008]. With regards to institutions, primary research suggest that the institutional governance of a country has strong and positive effects on bilateral economic relationships [Milner and Kubota, 2005, Lundstrm, 2005, Duc et al., 2008]. It is expected that a good institution reduces trade costs, decreases default risks and builds credible business environments; therefore, these foster bilateral trade within countries. Institutional quality may indirectly effect bilateral trade by discouraging domestic investments that are the key determinant of international trade [Mauro, 1995]. A weak institutional quality of a country through the design of trade policies causes low public expenditures that play crucial roles in bilateral trade [Mauro, 1998, Limao and Venables, 1999].

This research will analyze the gravity model of bilateral trade in several ways.

Firstly, extends the literature by simply using "similarity index" range from 0 to 1. Second, detects whether the similarity indices on GDP and institutional level matter for Azerbaijan exports. Third, whether better institutional quality of resource-rich countries encourages bilateral trade with the rest of world. Fourth, whether historical background, contiguity and distance matter for Azerbaijan as a former Soviet country.

The effective management of natural resource richness and good institutions are crucial for resource-rich countries. It is expected that these two tools may foster trade, and they have a great potential to contribute to economic and human capital development. However, institutional quality might be more important than natural resource richness: natural resource income can be a blessing for a country with high levels of institutions and a curse for countries with low level of institutions [Mehlum et al., 2006].

The main object of this study is analyzing intuitional similarity across countries in the context of resource-rich countries, whether same level of intuitional quality is crucial for bilateral trade relationship.

The research will be organized as follows: Section 2 will give an overview of the performance of Azerbaijans exports. Section 3 will review previous literature on the gravity model and the institutional quality in the international trade of resource-rich countries. Section 4 will explain the data description, methodology and methods' robustness. Section 5, the results will be discussed, while Section 6 will provide concluding remarks.

Azerbaijan Export Determinants

The export as bilateral trade plays an important role in clarifying the performance of transition economics while building their free-market economy [Svejnar, 2002]. In past decades, Azerbaijan needed to thank its oil and natural gas reserves, as well as high crude oil worldwide prices, for experienced rapid economic growth. Oil and gas incomes enlarged the country's export volume, and they became the main determinant of country's income.

Azerbaijan has challenges to reduce dependence on the oil and gas sectors: the shares of oil and gas in total exports are 87 % and 7 %, respectively. These shares will change to 60 % and 30 % if Azerbaijan will be able to produce at its peak point and export it to Europe before 2020 [IMF, 2014]. Therefore, the oil boom during last decade, the country experienced high export-to-GDP ratios and it is highly concentrated on the oil sector.

The growth of the non-oil sector was close to 10 percent in 2013. For decreasing shares of resource-based income on GDP, the country supported non-oil growth with high public spending and rapid consumer loans [IMF, 2014]. However, it needed to improve the efficiency of public investment and reduce the transfers from the state oil fund to the country budget.

This research will analyze, the similarity in the institutional quality and the economic size in the context of Azerbaijan, using gravity the model of international trade.

Methodology and Data

Methodology

The methodology will be designed to take into account two main issues. The first is related to the similarity index. Following the idea from Helpman [1987], the GDP, CPI, and institutional qualities standardize to 0-1. There are many similarity indices where it first appeared in Finger and Kreinin [1979]. However, this study standardizes the similarity indicator with a simple method:

$$S_{ij} = \frac{2\varphi_i\varphi_j}{\varphi_i^2 + \varphi_j^2} \tag{1}$$

where i stands for home country, $j = 1, ..., 50$ indices for the 50 different countries. Y represents three different macroeconomic indicators: GDP, CPI and institutional quality. $S_{ij} \in (0; 1)$ represents similarity index between countries. Values close to 1 shows high

similarity in country size; values closest to 0, high difference in country size (for detail, see Appendix 1).

The second issue deals with heteroskedasticity which estimates the panel data random effect. While most gravity models had estimated using by cross-sectional dataset, OLS models might be misleading in the presence of heteroskedasticity [Silva and Tenreyro, 2006]. The authors propose the Poisson Pseudo-Maximum Likelihood estimation because it produce robust results and it deals with zero trade flows.

The gravity equation are represented with different forms in primary studies. According to the gravity theoretical concept:

$$E[x_{ijt}] = S_{ijt}^{GDP} S_{ijt}^{INS} S_{ijt}^{CPI} D_{ij}^{\theta} exp(\lambda L_{ij}) \epsilon ijt \tag{2}$$

where S_{ijt} represents the similarity index, D_{ij} is the distance between countries, and L_{ij} is the vector of linkage dummy variables for bilateral trade. The home country, host country, and year represent with i, j and t, respectively. x_{ijt} represents exports from country i to country j in year t. θ defined as distance effect, which expects negative. λ represents the coefficient of linkage dummy variable of bilateral trade such as contiguity, historic background, landlock.

Firstly, different estimation techniques will be compared to find the "preferred" gravity model for a chosen sample country. The results will contain the estimation outcomes from classical logarithm transformed OLS methods, panel regression with fixed and random effect, and Poisson Pseudo Maximum Likelihood (PPML).

Employing various panel data estimation techniques will allow the study to control for heterogeneity among countries. As Silva and Tenreyro [2006] claim that OLS is not consistent while the empirical model is log linearized in the presence of heteroscedasticity: the estimating of model in levels is preferable than taking logarithms. Random-effects Poisson

regression and Generalized Estimating Equation (GEE) population-averaged models have advantages. GEE gives consistent parameter even when the covariance structure is mis-specified. Estimating the average response over the population would enable predictions of the effect of changing one or more covariates on a given individual [Winkelmann, 2003].

Data

The sample concerns data of Azerbaijna with 50 different countries in 1995-2012 (see Appendix A). The panel dataset consist of 900 observations of bilateral export flow (16 years * 50 countries). The information of bilateral exports of Azerbaijan comes from the Statistic Comities of the Azerbaijan Republic. This exports represent 94 % of total export of home country (the list of countries - Appendix B). Data on GDP and CPI come from the World Development Indicator (WDI). The data on distance (both km, and latitude) and dummies indicating landlock, historical background, contiguity come from Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). Dummies indicate a common membership in a preferential trade agreement computed from WTO.

Measure of institutional quality (law of rule and control on corruption) data come from the Worldwide Governance Indicator (WGI). It scores countries from 0 to 5 with 5 representing high level institutional quality. The Rule of Law defined as a "reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence" [Kaufmann et al., 2009] and Control of Corruption defined as a "capturing perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests" [Kaufmann et al., 2009].

Appendix A

The standartization of Similaity index:

$$(\varphi_i - \varphi_j)^2 \geq 0 \text{ for } \varphi > 0$$

$$\varphi_i^2 - 2\varphi_i\varphi_j + \varphi_j^2 \geq 0$$

$$\varphi_i^2 + \varphi_j^2 \geq 2\varphi_i\varphi_j$$

$$1 \geq \frac{2\varphi_i\varphi_j}{\varphi_i^2 + \varphi_j^2}$$

consider that $\varphi > 0$

$$1 \geq \frac{2\varphi_i\varphi_j}{\varphi_i^2 + \varphi_j^2} \geq 0$$

Therefore similarity index:

$$S_{ij} = \frac{2\varphi_i\varphi_j}{\varphi_i^2 + \varphi_j^2}$$

Index ranges:

if $\varphi_i = \varphi_j + C$, C is positive value, which represents difference between two parameter.

Then,

$$S_{ij} = \frac{2(\varphi_j + C)\varphi_j}{(\varphi_j + C)^2 + \varphi_j^2} = \frac{2\varphi j^2 + C * \varphi_j}{2\varphi_j^2 + 2*C*\varphi_j + C^2} = 1 - \frac{C^2}{2\varphi_j^2 + 2*C*\varphi_j + C^2}$$

if $C = 0$, then, $S_{ij} = 1 - 0 = 1$

as we observe, when C increases S_{ij} converge to the zero.

Appendix B

The countries of the sample

Afghanistan	Georgia	Lithuania	Taiwan
Austria	Greece	Malta	Tajikistan
Belarus	India	Moldova	Thailand
Belgium	Indonesia	Netherlands	Tunisia
Bulgaria	Islam Republic of Iran	Norway	Turkey
Canada	Israel	Poland	Turkmenistan
China	Italy	Portugal	Ukraine
Croatia	Japan	Republic of Korea	United Arab Emirates
Cyprus	Kazakhstan	Romania	UK
Czech Republic	Kyrgyzstan	Russia Federation	USA
Egypt	Latvia	Singapore	Uzbekistan
Estonia	Lebanon	Spain	Vietnam
France		Switzerland	

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