

Empirical Analysis of Georgian Trade Pattern: Gravity Model

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Abstract

This paper investigates and analyzes the Georgia's data of trade, export and import. The data cover the periods from 2000 to 2011 using the panel data gravity model of trade. For this purpose the large country sample and long time series and a balanced data have been used. The findings through results of analysis revealed that Georgia's trade is positively determined by the size of the economies, GDP per capita, and common history found to be significant factors influencing Georgia's trade pattern. The results also confirm the hypothesis that foreign direct investment (FDI) is positively correlated with trade.

Keywords: gravity model, panel data, FDI

Introduction

The fall of communism and process towards independence and market economy has significantly changed the trade pattern of Georgia. The trade between member states of USSR suddenly changed its shape from inter-block to international. The new independent states entered into the stage of transition from command economy into free market economy. Georgia is one of the countries facing a challenge during transition period from adjusting it inherited command economy into market economy. Globalization based upon the principles of market economy, gave an unprecedented impetus for international competition. For the post-soviet countries including Georgia it was and still remains one of the main challenges to compete with the countries practicing market economy with adjusted industries for decades. The structure of Soviet Georgian economy was tied with other member block countries and economies of each member countries were interdependent. Formation of new infrastructure and creation of competitive industries was a vital issue for newly independent countries. In years 1990-2003 the efforts made were unsuccessful in order to rehabilitate Georgian economy but the corrupted Soviet type management, lack of entrepreneurial skills and laws on regulation of trade lead the Georgian economy to further recession.

The 2003 rose revolution with reforms that succeeded it, gave a new stimulus to Georgian economy. According to Doing Business report Georgia made enormous improvements in many areas of its business regulations and jumped an astonishing 75 places in the rankings in just one year, moving from 112th place to number 37.

Trade reforms formed an integral part of the comprehensive program of structural reforms initiated in Georgia

in 2004. The increase in trade to GDP ratio from pre-reform ratio (1990-2000) 16%-25%, to 75-85% ratio in after reform (2004). Such success in trade reforms and abolishing most of the trade burdens lead to sharp increase in GDP of Georgia as an transition country.

This paper aims to estimate trade potential of Georgia using gravity model approach. Gravity model is one of the most popular models to estimate bilateral trade between countries and the trade potential of the country. The main advantage of using gravity model is that it explains international trade pattern under the conditions of comparatively little amount of data and validity of theoretical background of the model to the economies like Georgian economy. The dependent variable used is Georgia's bilateral trade. The data for the explanatory variables is sourced from World Bank statistics, and source for the dependent variable is from Georgian Department of Statistics site.

The Gravity Model of Trade in Modeling Bilateral Trade Flow

The gravity model of trade examines international and bilateral trade flows between countries. It takes its roots from the Newton's law of gravitation, which explains the gravity between two objects to their masses and distances among them. The gravity model of trade explains flow of trade between countries as proportional to their 'mass' (GDP or GNP) and inversely proportional to their distance. The application of gravity model in analyzing trade pattern goes back to Tiberger (1962) and Poyhonen (1963) who defined gravity model of trade equation as follow:

$$\text{Trade}_{ij} = \frac{\alpha \cdot \text{GDP}_i \cdot \text{GDP}_j}{\text{Distance}_{ij}}$$

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Where, $Trade_{ij}$ is the volume of trade between i and j; α is proportional constant; GDP_i and GDP_j are country I and j's respective national income. $Distance_{ij}$ is a measure of bilateral distance between the two countries.

Linneman (1966) one of the first authors who provided theoretical background for gravity model of trade went further toward theoretical justification, stressing on the fact that gravity equation could be derived from a partial equilibrium model by adding supply (total supply potential of country i) and demand (total demand potential of country j) tools he proposed to include tariff barriers and transportation cost to the model. He argued that two factors are expected to be equal to one another and gravity model can be obtained by equality of supply and demand. Bergstrand (1985) used a microeconomic foundation to explain the gravity model. He argued that countries trade potential can be derived from firms profit maximization level and gravity equation derived by using market equilibrium clearance.

Eaton and Kortum (1997) derived gravity model from international trade theories. He shows that in Ricardian model, the gravity equation can be derived but shows the limits of the model on technology parameters across countries. Deardorff (1995) proved that gravity model can be derived from two extreme cases of Heckscher-Ohlin model with and without trade impediments. In the first case, identical products cause suppliers and demanders to be indifferent among trading partners. The second case is that different countries produce different goods and with complete specialization.

Gravity Model is successful empirically so that a wide range of countries bilateral trade pattern is estimated by this model. Within a considerable variation of the model there are some unchanged variables that are 'masses' of the estimated countries. Another variable traditionally is Distance, some authors uses the distances between industrial centers or between economical centers of the countries. GDP, GDP per capita or GNP is widely used to define the 'masses' of the countries. Another feature of the model is dummy variables that are always included into the model in order to investigate qualitative variables such as history, common language, border, trade agreement, etc.

Econometric Model and Hypothesis

In this paper the panel data of gravity model was chosen. The model will quantify the Georgia's trade with its' main trading partners. To the classical form of gravity model, financial variables like foreign direct investment have been added and common history and weather a country a EU member state were added as a dummy variables. In order to make large amount of data simple for estimating the log form of gravity function (1) have been applied:

$$\log(T_{ijt}) = \alpha_0 + \alpha_1 \log(Y_{it} Y_{jt}) + \alpha_2 \log(P_{it} P_{jt}) + \alpha_3 FID_{ijt} + \alpha_4 \log D_{ij} + \alpha_5 Hist. + \alpha_6 EU_{ijt} + e_{ijt}$$

Where:

j:trade partner countries

I: Georgia

T: years

T_{ijt} : Georgia's trade with country j in year t.

Y_{it} : Georgia's GDP in year t

Y_{jt} : Country j GDP in year t

P_{it} : Population of Georgia in year t

P_{jt} : Population of country j in year t

FID_{ijt} : Real exchange rate between Georgia and country j in year t

Hist: History dummy variable.

EU_{ijt} :EU member state

e_{ijt} : Error term

In this paper 5 hypothesis were tested:

H1: The large economic dimension (GDP) increases bilateral trade

H2: The foreign direct investment (FDI) influences the volume of trade

H3: Trade increases when partners are geographically close

H4: There is increase in the volume of trade if the partner country is a member of EU

H5: Common history promotes trade

Georgia's Trade Pattern

Trade sector is one of the vital ones of Georgian Economy after the independence. The trade share was always increasing in years 2000-2011. The trade ratio reached its top in 2007 when the trade ratio was (-0.634), after that due to 2008 war and world economic crisis the ratios of trade decreased considerably. The trade pattern of Georgia economy is import oriented and import ratio of GDP is the highest in 2007 as well as export ratio to GDP (0.512, 0.121).The gradual increase in ratios prove the hypothesis that reforms conducted during 2000-2011 and trade liberalization policy bring it fruits in trade sector.

Table 1: The ratio of GDP to export and Import of Georgia in years (2000-2011)

Year	Import/GDP	Export/GDP	Trade/GDP
2000	0,233	0,106	-0,34
2001	0,235	0,099	-0,334
2002	0,234	0,102	-0,336
2003	0,336	0,136	-0,472
2004	0,36	0,126	-0,486
2005	0,405	0,141	-0,546
2006	0,473	0,12	-0,593
2007	0,512	0,121	-0,634
2008	0,492	0,117	-0,609
2009	0,418	0,105	-0,523
2010	0,442	0,135	-0,577
2011	0,493	0,145	-0,593

The multiple regressions of Georgia's trade data give as the same result. In this regression the dependent variable is GDP and independent variables are export and import of Georgia in 2000-2011 year intervals

The result of multiple regressions is presented in the Table 2.

Table 2: Regression equation section (2000-2011)

Independent variable	Regression coefficient (b)	Standard error	t-statistics	Probability Level
Intercept	1,294058	0,430509275	3,00587785	0,016919458
Export	0,002351	0,001607447	1,462746103	0,181683169
Import	0,001268	0,000360734	3,515579614	0,007896818

The estimated model is: $GDP = 1,294058 + 0,002351 * \text{export} + 0,001268 * \text{import}$, the null hypothesis is rejected due to the (T-test) results at 5% significance level, the model is free of multicollinearity. R2 is 0,984189382 and it is significant. The model allow us to interpret so that if export will increase by 1% the GDP will increase by 0,002351 and if import will increase by 1% the GDP will increase by 0,001268.

Table (1) shows the relationship between GDP and import, result indicates that GDP is increased year to year, also imports increased per time related to increase of GDP, the same results with export but no with the same ratio, table (2) declared that.

Estimation Results

The OLS with time dummies and Descriptive Statistics analysis results are shown in table (3,4) The gravity model of trade of Georgia has been estimated taking all explanatory variables (384) observation of 35 country. As we expected the partner economies with larger GDP influences positively on trade volume of Georgia so that increase in 1% of average GDP of the partner countries increases Georgia's trade volume by 2.399749%. In the relation to Foreign Direct Investment the hypothesis predicts a positive sign.

Table 3: Georgia's Trade: OLS with time dummies regression results

Variables	Coefficients	t-Statistics	Expected Sign
GDPlog	2,399749	(8,771131)***	(+)
EXlog	1,267311	(41,76958)***	(+)
GDPpclog	0,000604	0,100631	(+)
FDIlog	0,076133	(5,268995)***	(+)
EU	0,802815	(7,367829)***	(+)
HIS	0,03913	(0,48717)***	(+)
POPlog	0,143799	(2,006533)***	(+)
DISlog	-1,30962	(11,2127)***	(-)

T-statistics are in round brackets. ***/*-statistically significant, respectively at the 1%, and 10% levels. Observation: (384)

Table 4: Georgia's Trade: Descriptive Statistics results

Series	Mean	St/Deviation	Minimum	Maximum
GDPlog	2,830618	1,39279064	0,739527	5,973349
Exlog	2,824126	1,15946604	-1	5,034294
GDPpclog	2,460532	4,34804548	-26,4982	30,84907
FDIlog	2,214208	1,95339974	-0,27116	5,486539
EU	0,771429	0,42045893	0	1
HIS	0,2	0,40052049	0	1
POPlog	1,067131	0,76372363	-0,52288	3,127429
DISlog	0,890686	0,07298122	0,732515	1,005527

Observation: (384)

The results display a positive effect when we use both estimators, OLS and Descriptive statistics, so that according to our results increase in 1% of FDI of partner countries, increases Georgia's trade volume by 0, 076133%. In our analysis geographical distance has been used as a typical gravity model variable, the coefficient of (DISlog) Distance is negative as we expected. The result confirms the gravitational model and the importance of neighborhood. The results also prove that the relations with a EU member country increases Georgia's trade volume by 0, 802815%. The last hypothesis also have been proven, so that the coefficient is 0,03913, however it is comparatively smaller than other variables. Georgia's trade pattern tends to make trade with the countries where they had common history like Post Soviet countries. Due to 2008 conflict and Russia as a one of the major partner closed the border for Georgian products, the reason of lower level of this coefficient can be associated with that, since Georgia and Russia shared common history.

Conclusion

The objective of this study was to analyze the country-specific determinants of Georgia's trade by using gravity model. The Hypothesizes put forward in regard to common country characteristics are generally confirmed by the empirical results. The results of analysis are robust with Descriptive Statistics and OLS with time dummies.

The variable (GDPlog) used to evaluate the economic differences between countries present and a positive impact on trade, when it has been used OLS with dummy variables and Descriptive Statistics estimators. The study also includes one proxy to evaluate the economic dimension. The average GDP per capita in logs has an expected positive sign for the two models (OLS and Descriptive Statistics).

The variable foreign direct investment (FDI) according to our analysis tends to be complementary with the trade.

The variable common history (HIS) presented a positive correlation with bilateral trade flow. However the coefficient is not large due to broken economic relation be-

tween Russia and Georgia. According to the gravity model we expected a negative sign to geographical distance. The findings support the hypothesis: trade increases when partners are geographically close. The variable EU member (EU) confirms the theoretical model; the country of EU member promotes trade inflows.

As a result of analysis recommended policies can be the political relationship, thus this needs a potential efforts that should be given to neighbor or border countries due to cost of transportation, and it should be given great care to varieties of the export side of goods and services.

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