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# The Analysis of Export Drivers and Impediments Using Extended Gravity Model (The Case of Georgia)

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## Summary

The goal of the present paper is to examine the drivers and impediments of Georgia's exports to 33 Free Trade and Preferential partner countries during the 2000-2015 period and make trade policy recommendations. The analysis relies on the extended gravity model of trade in log-log form. The present analysis of the export determinants of Georgia, which is a small economy with high degree of trade openness, enriches the available international practice of application and testing the gravity model. The research results can be applied in comparative research studies.

The results show that Georgia's exports to Free Trade and Preferential partner countries is strongly influenced by partners' size (GDP and population) and geographic distance. Cultural and institutional distances as well as colonial ties are less significant determinants. There are variables other than the ones included in the model and they have stronger effects on Georgia's exports so they need to be explored further. The study provides the grounds to draw important conclusions on the directions of Georgia's economic integration and raises issues for further research.

**Keywords:** *export; gravity model; pooled OLS; random effects; fixed-effects; institutional distance; cultural distance; preferential trade regime; free trade regime; Georgia.*

**JEL code:** F14

## Introduction

Georgia is a small open economy, which makes active efforts to get efficiently integrated into the world economy. Trade liberalization policies have been intensively implemented since 1990s, but import growth has been stronger than export expansion. Preferential and Free Trade agreements represent additional stimuli for trade. The present study is an effort to contribute to the available research on export determinants and economic integration directions (Georgian case).

The goal of the present paper is to explore the drivers and impediments of Georgia's exports to Free Trade and Preferential partner countries during the 2000-2015 period and based on the results make trade policy recommendations.

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Trade analysis based on gravity model has been widely applied. In the present study the classic gravity model first used by Tinbergen (1962), comprising GDP and geographic distance, is extended by a number of variables such as population, institutional distance, cultural distance and colonial past. The present study covers Georgia's 33 partner countries, but the model can be further applied to other partners as well. Hence it will enrich the available international practice of application and testing the gravity model. The research results can be applied in comparative research studies and provide useful insights for Georgia's trade policy analysis.

The paper is organized as follows: the first part gives statistical analysis of Georgia's exports during 2000-2015 and formulates research question. The second part is devoted to the theoretical background and bibliographic research. It analyzes the available research on trade based on gravity model with the emphasis on trade determinants, model extension and the limits of research result interpretation. The third part describes data and methodology, followed by the model description. The fifth part gives research results. The main findings and recommendations are presented in the conclusive part of the paper.

## The Analysis of Georgia's Exports

Expansion and geographic diversification of trade has been one of the primary goals of trade policy reforms undertaken in Georgia for the period since its independence. Liberal trade regime was introduced in the 1990s, and import restrictions were reduced. Later on, Georgia's membership in the WTO and participation in multilateral trade system significantly improved its geographic patterns of trade. Simultaneously the country took important steps to facilitate trade at the bilateral level and many bilateral free trade agreements (FTA) with partner countries were concluded in 1990s. Today Georgia has free trade agreements with CIS countries, Deep and Comprehensive Free Trade Agreement (DCFTA) with EU 28[1] and is conferred Generalized System of Preferences by USA, Canada, Japan, Norway and Switzerland. It has bilateral FTA with Turkey. DCFTA is of special importance both strategically and politically, because it goes beyond the ordinary free trade agreements and involves gradual harmonization with EU through deep institutional reforms.

Based on the bilateral, multilateral and preferential trade agreements, Georgia has implemented very important reforms, such as reduction of trade barriers, elimination of quotas on exports and imports, elimination of import licensing and contract registration requirements, reduction of excise rates, elimination of export duties, among other measures. The country also effected legislative amendments related to taxation, standardization and certification, sanitary and phytosanitary measures, subsidies, intellectual property rights, etc. These reforms helped to etablish a predictable and compatible institutional environment of trade, which reduced transaction costs and ensured more favourable conditions to trade. However, despite broad trade liberalization and deep institutional reforms, there is evidence showing that Georgia's imports

[1] Deep and Comprehensive Free Trade Agreement (DCFTA) is the inseparable part of the Association Agreement (Section IV – Trade and Related Issues). It is the part of the Agreement which comprises the integration mechanisms with EU and opens internal market of EU for Georgia. The Agreement was signed on June 27, 2014 and later ratified by European Parliament and 28 member country parliaments. The date of conditional application of economic part of the Agreement is September 1, 2014 and it has entered into force since June 1, 2016.

grow faster than exports, leading to growing trade deficits (*appendix, figure 1*).

Within free trade agreements, trade policy measures that impede trade and consequently drive up related trade costs are removed or minimized. Therefore determinants other than trade policy instruments come into play with higher strength. Discussing regional trade blocs, Frankel *et al* (1995) argue that trade liberalization reduces barriers only by 10%. Using gravity model the authors also conclude that intra-regional trade is greater than could be accounted for by determinants such as the proximity of a partner countries, their sizes and per-capita GNP and existence or a common border or a common language. Until 2000, Georgia's trade geography was alsmost entirely constrained to free trade and preferential partner countries. Later on, the geographic area began to expand (*appendix, figure 2*). Since 2013, the amount of exports to this group of countries has been declining (*appendix, figure 3*), and as a result, these countries' share in Georgia's total exports dropped (*appendix, figure 4*).

In this context, it is logical to explore the determinants of Georgia's export within GSP and FTA countries and identify the degree of their influence. Currently Georgia holds FTA and GSP agreements with 45 countries in total (excluding China, as the agreement has not entered in force yet). Based on these, in the analysis we included 33 countries for which all variable data were available. On average the sample countries have a 77.2-percent share in Georgia's export to GSP and FTA countries. The minimum and maximum are 57.8% and 97.7% respectively, while the median is 85.1% (*appendix, figure 5*).

Considering the above, research results can be extended to the entire group of FTA and GSP countries.

## Literature review

The gravity model has been widely used for the analysis of trade since the 1950s. Its initial idea is based on Newton's law of universal gravitation where the extent of bilateral trade flow is directly proportional to the size of economies (approximated by GDP) and indirectly proportional to their bilateral distance. The model was further expanded and used in various interpretations. Except for the traditional variables (trade, GDP, physical distance), many other determinants were included, such as: being a newly industrialized country, contiguity, common language, cultural similarity, currency overvaluation, colonial past, institutional quality indices, market size, membership in an economic union, political stability, preferential trade factor, product category, recession, trade barriers, membership in integration grouping, etc.

Early studies focused primarily on the relation between distance and trade. It has generally been established that distance is a strong determinant of the intensity of trade flows between nations. Countries that are geographically proximate will tend to trade relatively more than remote countries (see, e.g., Beckerman 1956; Ullman 1956; Linneman, 1966; Yeats, 1969).

Linneman (1966) applied an econometric model to study the factors that determined the trade flows between 80 nations in 1959. The independent variables in the model were GNP, population, distance, and a preferential trade factor. Linneman ran his regression on both exports and imports (separately). He found that all the variables had a statistically significant relation with the volume of imports and the volume of exports flowing between the pairs of nations. The variables with the greatest explanatory power were GNP (of both the importing and the exporting nations) and the distance between the two nations.

Examining the bilateral trade flows between 45 exporting and 82 importing nations, Srivastava & Green (1986) concluded that product category, GDP, population, political instability, cultural similarity, membership

in an economic union, colonial past are the factors that have greater explanatory power for relative trade flows of manufactured goods than those of basic products such as food and raw materials. The two variables that appeared to be responsible for the greater explanatory power for manufactures were the exporter's political instability and cultural similarity, in particular (Srivastava & Green, 1986). Meanwhile cultural similarity appeared to have a more pronounced effect on relative trade flows than shared membership in an economic union.

Yu & Zietlow (1995) tested the determinants of bilateral trade flows among 14 Asia-Pacific countries and came to the conclusion that market size, political stability, physical distance, cultural similarity, membership in ASEAN, and being a newly industrialized country are significant indicators of the bilateral trade relationships in the Pacific Basin.

We can see that the studies on the determinant of trade highlight the importance of distance. The effects of distance are discussed by Berthelon & Freund (2008); Frankel (1997); Smarzynska (2001). In the meta-analysis of 1,467 distance effects measured in 103 papers, Disdier and Head (2004) came to the conclusion that the negative effect of distance on trade increased in the mid 20th century and has remained high since then. Interestingly, the result seems to hold even when controlling for factors such as the formation of free trade areas, which tend to encompass geographically proximate countries (Hakanson & Dow, 2012). Analysing trade data of 174 countries in the 1950-2000 period, Zhou (2010) gives important findings with regard to distance. The study shows that trade-depressing effects of geographic distance, political difference and cultural dissimilarity remain strong. Furthermore, geographic and cultural proximity actually generates greater gravity over time that draws countries together, which may trigger fragmentation in global trade along geo-cultural lines (Zhou, 2010).

Krugman (1995) and Grossman (1998) paid attention to the importance of geographic distance, as well as to the possibility for personal contact between buyers and sellers. Taking a more holistic perspective on distance, Dunning (1993) argues that countries differ not only in geographic distance, but also with regard to social, cultural, and political institutions. Anderson and Marcouiller (2002) studied the influence of quality of institutions on trade and conceded that inadequate institutions constrain trade as much as tariffs.

Researchers have advanced multiple constructs to understand and measure the differences in national institutional environments. Prominent amongst these are the constructs of institutional distance (ID) (Gaur and Lu, 2007; Kostova, 1999; North, 1990) and cultural distance (Hofstede, 1980; Kogut and Singh, 1988). Kostova (1999) and Kostova and Zaheer (1999) first conceptualized the construct of ID as comprising of regulatory, normative and cognitive dimensions.

Estrin et al (2009) distinguish between formal and informal institutional distances. Formal institutional distance as the difference in the set of rules by which economic actors are to interact was studied by Xu & Shenkar (2002) and De Groot et al (2004), who tried to explain export patterns by the differences in institutional quality across countries. Alternatively the notion of informal institutions is related to cultural norms and values as operationalized by Hofstede (2001), Schwartz (2008) and others. Linders et al (2005) studied the influence of cultural and institutional distance, and institutional quality on bilateral trade flows between 92 countries in 1999. They argue that institutional distance has a negative effect on bilateral trade, while cultural distance has a positive impact

on it (Linders et al, 2005). Nevertheless, based on Austrian international trade reasearch, Davidová, Benáček (2014) found that while in particular years Austrian exporters kept distributing exports among their trade partners according to the quality of institutions abroad, the decision-making about the trade dynamics was free from such concerns and became nearly exclusively dependent on the evolution of economic factors at home and abroad.

The alternative viewpoint has been widely accepted, whereby the larger the cultural distance, the less countries trade with each other, given that larger cultural differences increase the costs of trade. The influence of culture and institutions on different modes of economic activity is empirically tested by Srivastava and Green (1986); De Groot *et al*. (2004); Subramanian and Wei (2007). Neal (1998) argues that cultural distance is related to the differences in the perception of the same situation, and the factors that hamper the development of trust and interaction. Tadesse & White (2010) argue that cultural dissimilarity between nations has an economically significant and consistently negative impact on aggregate and disaggregated trade flows.

The number of studies that apply gravity model to Georgia‘s trade is quite small. Fuenfzig (2016) used the model to assess the possible impacts of FTA between China and Georgia. The author studied the influence of GDP and GDP per capita, physical distance, common border, FTA, language, legal origin, sectorial share, colonial ties and World Bank Doing Business Index on Georgia’s exports. The conclusion is that Georgia-China free trade agreement will have strong effects on bilateral trade and a sizable impact on Georgian GDP per capita. Gylfason et al (2015) estimated the effects of deep and shallow free trade agreements for the EaP states and the effect of changes in the quality of institutions on exports. The main results show that the EaP countries gain significantly from free trade agreements with the EU, but little if anything from free trade agreements with Russia and that improvements in the quality of institutions in EaP countries have played an important role in fostering exports. Athukorala & Wagle (2013) examined Georgia‘s export performance by using the gravity model. By incorporating GDP and per-capita GDP of Georgia’s trading partners, distance, contiguity, common language, common colonial power, average export-weighted tariff, and remoteness as explanatory variables into the model, the authors conclude that there has not been a significant diversification of the geographic profile of trade away from the traditional markets in the former Soviet Union towards more dynamic emerging economies and Western markets. There has not been a sufficient reorientation in exports either in terms of commodity structure or market reach.

Neither of the above-mentioned studies on Georgia‘s trade assess the impact of cultral and institutional distances. Although Jamagidze et al, (2011) studied the social and cultural environment of business activity in Georgia by applying Hofstede‘s model, yet there has been no research analyzing the relations of trade and cultural variables in Georgian context using gravity model. We have incorporated these variables into our gravity model to establish the relative importance of various export determinants within FTA and GSP schemes and make conclusions with regard to trade policy that can help reconsider the under-performance of Georgia‘s exports.

## Data and Methodology

The subject of analysis (dependent variable) is Georgia’s bilateral export flows to FTA and GSP countries during the 2000-2015 period. Georgia has been the member of WTO since 2000 so this

year was taken as the reference point in time. By limiting the geographic area of sample export destinations to FTA and GSP countries, the possible effects of tariffs and non-tariff barriers that hinder exports have been minimized. The countries covered are presented in the table 1 (*see appendix*).

In compliance with our research objective, we extended the initial gravity model to incoprorate the following variables: the number of population as another measure of economic mass, cultural distance between Georgia and each of its trade partners, institutional distance and colonial mode.

The data on export flows are taken from World Integrated Trade Solution (WITS) database, GDP and population data are collected from World Bank Development Indicators and the measures of geographic distance are taken from Paris based Centre d'études prospectives et d'informations internationales CEPII gravity database.

Cultural distance between Georgia and partner countries is calculated according to the Kogut and Singh (1988) index. The initial index is based on the differences in the scores on the four (or five) Hofstede (2001) dimensions between two countries. These differences are corrected for differences in the variance of each dimension and then arithmetically averaged. We modified the index by 7 cultural dimension scores offered by Schwartz (2006), which involve: harmony, embeddedness, hyerarchy, mastery, effective autonomy, intellectual autonomy and egalitarianism. It is noteworthy that most cultural distance scores in the literature are based on Hofstede's cultural dimensions. Siew Imm Ng et al (2006) offer the analysis of cultural distance based on Schwartz's country-level values and arrive at interesting conclusions about the relations between culture and trade. The authors give the first analysis of cultural distance based on Schwartz's value scores and argue that Schwartz's values may be more appropriate compared to Hofstede's dimension scores to construct the cultural distance measure and to evaluate its effects in the context of international trade. Following this finding we have chosen the measure of cultural distance based on Schwartz values to explore its influence on Georgia's export. Another issue is whether the value scores gathered between 1988 and 2007 can adequately explain export flows after that period. The argument is that athough cultural values change over time, the changes are absolute rather than relative, so the cultural distance between countries remains stable (Beugelsdijk et al, 2015).

To calculate institutional distance we also follow Kogut and Singh (1988) index. We apply aggregated scores of public and private institutions, which comprise property rights, ethics and corrpution, undue influence, government efficiency, security, corporate ethics and accountability. They are taken from the instituions pillar of the World Economic Forum's Global Competitiveness Index.

Our gravity model is the following:

$$LLLL(\mathbb{Y}_{iiiii}) = aa_0 + aa_1 \ln(GGGGPP_{iii}) + aa_2 \ln(GGGG\mathbb{Y}_{iii}) + \\ +aa_4 \ln(ddddddtt_{iiii}) + aa_5 \ln(ppppppp_i) + aa_6 \ln(ppppppp_{ii}) + aa_7 \ln(ccccctt.ddddddt_{iiii}) \quad (1) \\ +aa_8 \ln(dLLddtt.ddddddt_{iiii}) + aa_9 \ln(ccppcc_{iiii}) + ee_{iiiii}$$

where,

*dd*-is the index of Georgia;
*jj*- is the index of exporter country;
$YY_{iiiii}$- is the volume of export from *dd* to *jj* at period *tt*;
$GGGGPP_{ii(ii)ii}$- is the volume of gross domestic product respectively in *dd* and *jj* at period *tt*;
$ddddddtt_{iiii}$- is the geographic distance between *dd* and *jj*;
$ppppppp_{ii(ii)}$ - is the number of population respectively in *dd* and *jj*;
$ccccctt.ddddddtt_{iiii}$ - is the cultural distance between *dd* and *jj*;
$ddLLddtt.ddddddtt_{iiii}$ - is the institutionnel distance between *dd* and *jj*;
$ccppcc_{iiii}$ is the dummy variable if colonial mode between *dd* and *jj* exists.

The estimation technique involves, random effects, fixed effects and pooled OLS models.

## Results

We used Panel data of 33 countries, from 2000 to 2015 years, with 512 observations in total.

According to the results neither colonial mode nor institutional are important variables. Thus we took them away from the model and left GDP, geographical distance, cultural distances and number of population.

Descriptive statistics of these variables are given in table 2 (*see appendix*). First we estimated fixed effects model. This choice comes from the economic literature according to which FE is almost always much more convincing than RE using aggregated data (Wooldridge, 2013). The results are given in table 3 (*see appendix*). We tested for time fixed effects, and rejected the null hypothesis that year coefficient are jointly equal to zero. So we keep year dummies in the model. Shapiro-Wilk test for fixed-effects model shows that the residuals are normally distributed. Also from the histogram we see that they are near-normally distributed.

While we are not quite sure that country specific fixed effects are correlated with inserted independent variables, beside the fixed-effects model we estimated random effects model. The results are given in the table 4 bellow. Shapiro-Wilk test is better here than in the previous model and shows residual normality.

We used Hausman test in order to make choice between this two models. The results are shown in table 5 (*see appendix*). According to it random effects model is better in this case.

As it becomes obvious from the random effects model (table 4), GDP, population and geographical distance are important variables that impact Georgia's exports to partner countries. GDP and population have a positive impact on exports. In particular, if a partner country's GDP increases by 1%, while controlling for other variables, Georgia's export with this country will increase by 0.92%. Population has a less significant impact. Other variables fixed, if population increases by 1% in a partner country, exports increase by 0.42%.

Geographical distance has a negative sign, and its coefficient is quite high, -2.7, which means that if distance with the partner country increases twice, exports will decrease almost three times.

We tested if there are significant effects across countries. We ran Breusch-Pagan Lagrangian multiplier test in order to establish whether there are differences across countries. According to this test there are significant differences across countries, therefore, the random-effects model is preferred.

**Table 4.** *Random-effects GLS regression*

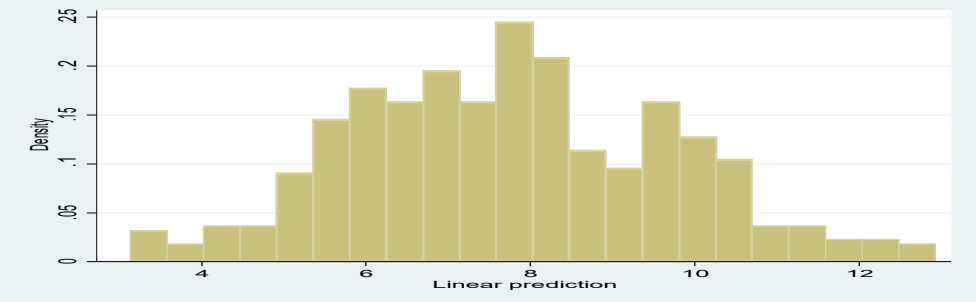
```
Random-effects GLS regression                   Number of obs      =       482
Group variable: countries                       Number of groups   =        31

R-sq:                                           Obs per group:
     within  = 0.4249                                         min =        12
     between = 0.5047                                         avg =      15.5
     overall = 0.4793                                         max =        16

                                                Wald chi2(19)      =    350.47
corr(u_i, X)   = 0 (assumed)                    Prob > chi2        =    0.0000
```

| log_exp | Coef. | Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| log_GDP | .9158252 | .2375732 | 3.85 | 0.000 | .4501903 | 1.38146 |
| log_pop | .418559 | .2495486 | 1.68 | 0.093 | -.0705473 | .9076653 |
| log_dist | -2.735427 | 1.014131 | -2.70 | 0.007 | -4.723087 | -.747768 |
| log_cult_dist | -.4007614 | .4204636 | -0.95 | 0.341 | -1.224855 | .4233321 |
| years | | | | | | |
| 2001 | -.1073728 | .2919559 | -0.37 | 0.713 | -.6795958 | .4648503 |
| 2002 | -.1850944 | .2995478 | -0.62 | 0.537 | -.7721974 | .4020085 |
| 2003 | -.1056076 | .3015901 | -0.35 | 0.726 | -.6967133 | .4854982 |
| 2004 | .5927204 | .3200328 | 1.85 | 0.064 | -.0345324 | 1.219973 |
| 2005 | .7427144 | .3259885 | 2.28 | 0.023 | .1037885 | 1.38164 |
| 2006 | .6828378 | .3362809 | 2.03 | 0.042 | .0237393 | 1.341936 |
| 2007 | .8049416 | .3612371 | 2.23 | 0.026 | .09693 | 1.512953 |
| 2008 | .6554469 | .3820495 | 1.72 | 0.086 | -.0933564 | 1.40425 |
| 2009 | .86724 | .3596379 | 2.41 | 0.016 | .1623627 | 1.572117 |
| 2010 | 1.013854 | .3621151 | 2.80 | 0.005 | .3041213 | 1.723586 |
| 2011 | 1.265491 | .3773031 | 3.35 | 0.001 | .5259908 | 2.004992 |
| 2012 | 1.035759 | .3698279 | 2.80 | 0.005 | .3109099 | 1.760609 |
| 2013 | 1.465199 | .3760724 | 3.90 | 0.000 | .7281102 | 2.202287 |
| 2014 | 1.595023 | .3766637 | 4.23 | 0.000 | .8567753 | 2.33327 |
| 2015 | 1.629404 | .3548074 | 4.59 | 0.000 | .9339944 | 2.324814 |
| _cons | -2.267779 | 7.902585 | -0.29 | 0.774 | -17.75656 | 13.221 |
| sigma_u | 1.46983 | | | | | |
| sigma_e | 1.0846678 | | | | | |
| rho | .64742645 | (fraction of variance due to u_i) | | | | |

*Random-effects model residuals normality*




Also we established important variables, other than the ones explored in our model, which have a significant impact on Georgia's export flows to partner countries (the issue for further research).

Although the importance of the institutional distance variable and the cultural distance variable has been theoretically justified, they cannot account for Georgia's exports in terms of quantity. We removed these variables from our gravity model and used simple OLS regression models to recheck the influence of each variable on exports. These models are not used as a main analytical instrument because of omitted variable issue, as the aim is just to see the significance of the estimated dependent variables.

First simple OLS regression model is built between exports and institutional distance. Neither model nor the estimated coefficient is relevant.

The second model is built between export and cultural distance. The model and cultural distance coefficient is not significant:

```
Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)   7.9713     0.1449 55.000 <2e-16 ***
cult.dist    -0.1574     0.1391 -1.131 0.259
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Residual standard error: 2.603 on 480 degrees of freedom
Multiple R-squared: 0.002659
Adjusted R-squared: 0.0005808
F-statistic: 1.28 on 1 and 480 DF, p-value: 0.2586
```

Unlike institutional and cultural distances, there is an important correlation between exports and GDP. Simple OLS estimator for them is the following:

```
Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -12.76382    1.79509   -7.11 4.22e-12 ***
GDP           0.78468    0.06812   11.52  < 2e-16  ***
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Residual standard error: 2.307 on 480 degrees of freedom
Multiple R-squared: 0.2165
Adjusted R-squared: 0.2149
F-statistic: 132.7 on 1 and 480 DF, p-value: < 2.2e
```

So the model and GDP coefficient are both important. If a partner country's GDP increases by 1%, exports to it will increase by 0.78%.

There is important correlation between export and population. The OLS estimator results show that 1% increase in a partner

country's population, Georgia's export will increase by 0.97%.

```
Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept) -8.24440 1.07860 -7.644 1.16e-13 ***
population 0.97738 0.06512 15.009 < 2e-16 ***
---
Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
Residual standard error: 2.15 on 480 degrees of freedom
Multiple R-squared: 0.3194
Adjusted R-squared: 0.318
F-statistic: 225.3 on 1 and 480 DF, p-value: < 2.2e-16
```

## Conclusions and recommendations

Georgia's trade patterns are similar to those of many developing countries and economies in transition. Reasons and solutions to its negative trade balance, export growth sources and new opportunities are still on research and policy-making agenda. The present analysis of export determinants in Georgia's case makes contribution to the available stock of empirical literature on export growth opportunities and provides the basis for policy recommendations.

The results show that Georgia's exports to Free Trade and Preferential partner countries is strongly influenced by partners' size (GDP and population) and geographic distance. Cultural and institutional distances as well as colonial ties are less significant determinants. The study reveals that there are variables other than those included in the model that have stronger effects on Georgia's exports that need to be further explored. The outcome corresponds to the evidence on the share of Free Trade and Preferential partner countries in Georgia's export, which is gradually decreasing. Obviously, trade liberalization and institutional convergence cannot possibly play the role of strong export driver (not enough condition) and additional sources of export growth should be studied.

Georgia should explore further geographic diversification opportunities by orienting on countries and regions with large GDP and population and good growth prospects.

Commodity patterns of Georgia's exports is also important when interpreting research results. Georgia's exports are dominated by agricultural products and raw materials. Srivastava & Green (1986) argue that gravity variables have greater explanatory power for manufactured goods than for foods and raw materials, so further research on the drivers and impediments of exports should focus on micro-determinants of trade such as firm and industry peculiarities in the export sector. The reaserch can be further extended by the application of various methods of calculation of cultural and institutional distances to compare whether their effects on exports are dependent on the measuring method of the variables.

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## Appendix

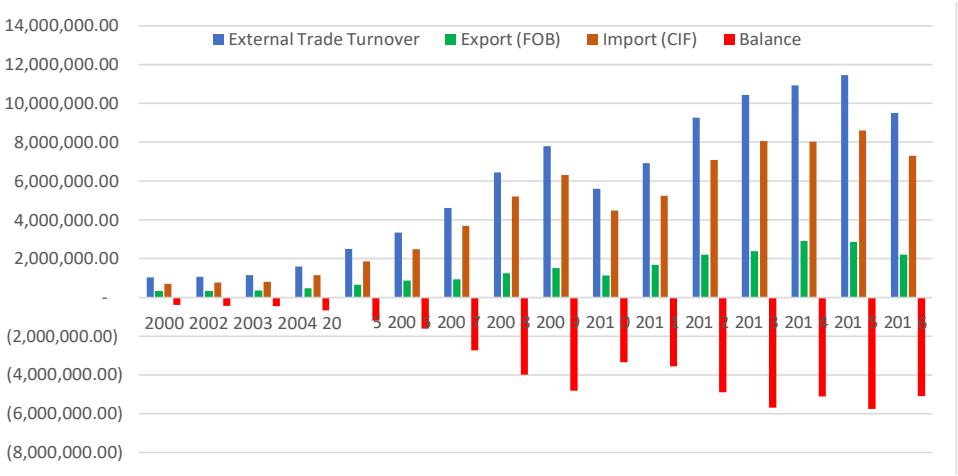


**Figure 1.** *External Trade of Georgia, 2000-2016, Thous. USD*
*Source:* http://www.geostat.ge

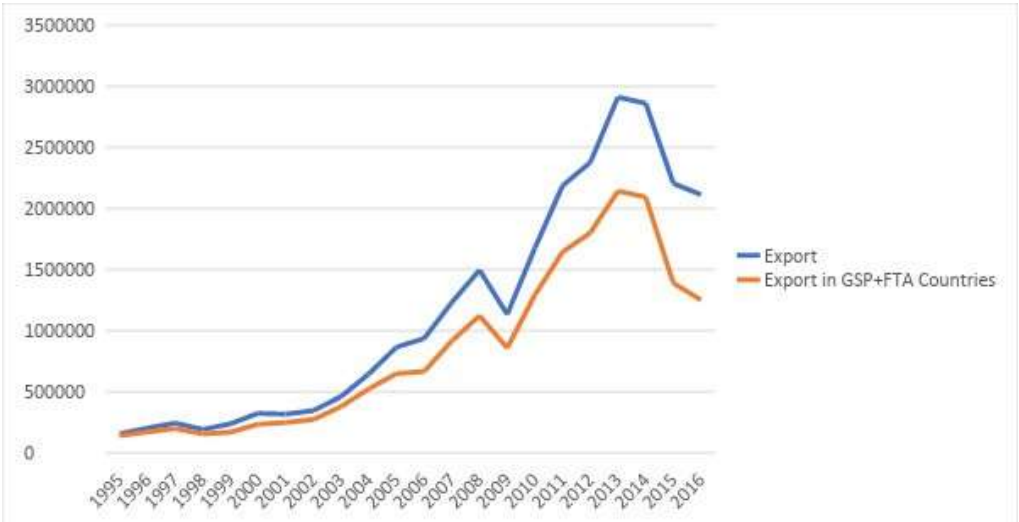


**Figure 2.** *Comparison of the Dynamics of Georgia's Exports, Total vs GSP+FTA Countries, 1995-2016, Thous. USD*
*Source:* http://www.geostat.ge

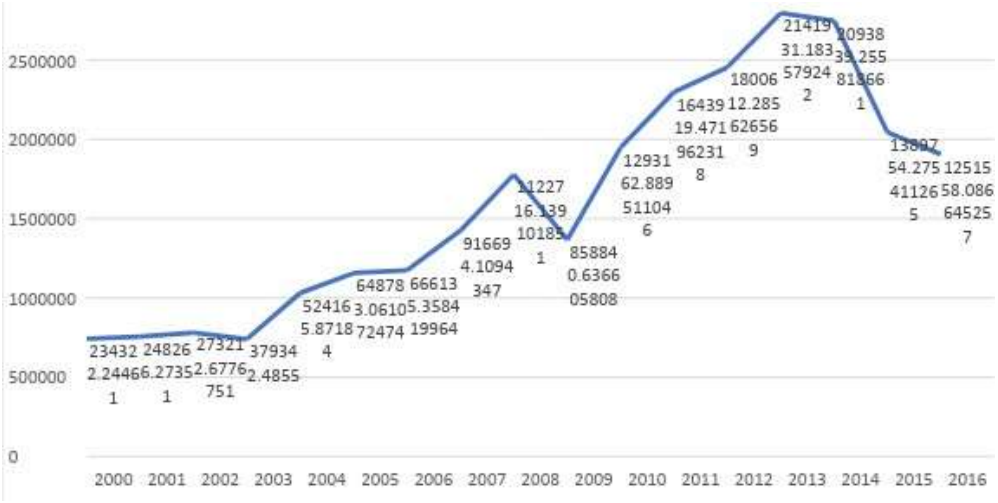


**Figure 3.** *Georgia's Exports to Preferential and Free Trade Countries, 1995-2016 , Thous. USD*
*Source: http://www.geostat.ge*

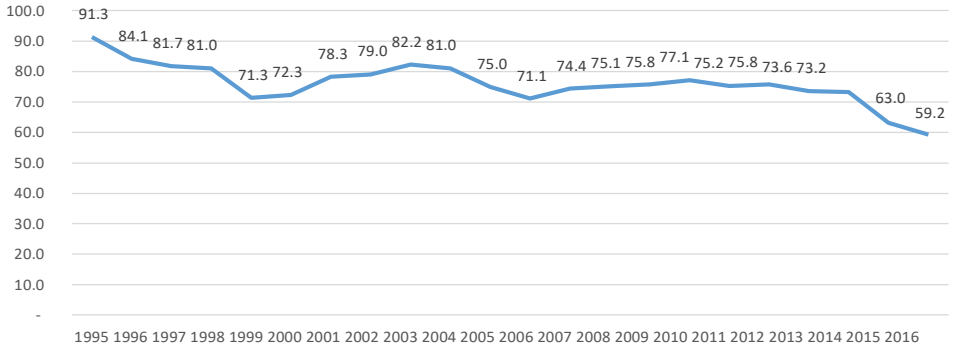


**Figure 4.** *Georgia's Exports to Preferential and Free Trade Countries, Percentage Share in Total Exports, 1995-2016*
*Source: http://www.geostat.ge*

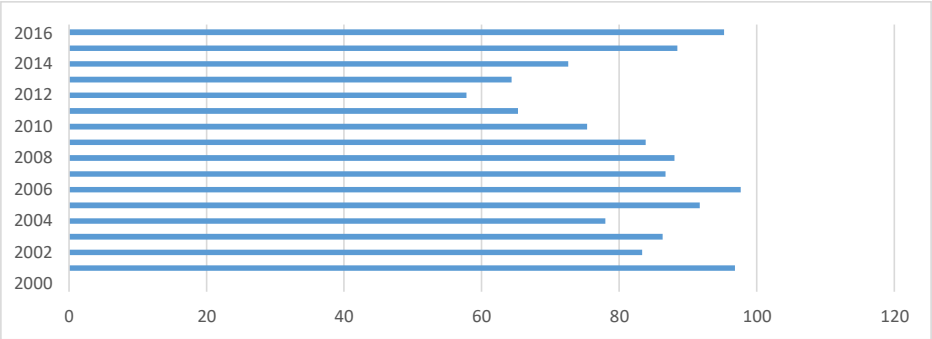


**Figure 5.** *Sample Country Percentage Share in Georgia's Exports to all FTA and GSP Countries, 2000-2016, % Source:* http://www.geostat.ge

**Table 1.** *Georgia's Trade Partner Countries Covered by the Analysis*

| | | | | | |
|---|---|---|---|---|---|
| 1 | Austria | 12 | France | 23 | Portugal |
| 2 | Belgium | 13 | United Kingdom | 24 | Romania |
| 3 | Bulgaria | 14 | Greece | 25 | Russian Federation |
| 4 | Switzerland | 15 | Croatia | 26 | Slovak Republic |
| 5 | Cyprus | 16 | Hungary | 27 | Slovenia |
| 6 | Czech Republic | 17 | Ireland | 28 | Sweden |
| 7 | Germany | 18 | Italy | 29 | Turkey |
| 8 | Denmark | 19 | Latvia | 30 | Ukraine |
| 9 | Spain | 20 | Netherlands | 31 | Japan |
| 10 | Estonia | 21 | Norway | 32 | United States |
| 11 | Finland | 22 | Poland | 33 | Canada |

**Table 2.** *Descriptive statistics of variables.*

| **GDP** | **Population** | **Geographic Distance** | **Export (NA's:30)** |
|---|---|---|---|
| Min. :21.84 | Min. :13.76 | Min. : -Inf | Min. :-1.204 |
| 1st Qu.:24.89 | 1st Qu.:15.46 | 1st Qu.:7.627 | 1st Qu.: 6.087 |
| Median :26.23 | Median :16.14 | Median :7.808 | Median : 8.095 |
| Mean :26.16 | Mean :16.34 | Mean : -Inf | Mean : 7.815 |
| 3rd Qu.:27.21 | 3rd Qu.:17.65 | 3rd Qu.:8.042 | 3rd Qu.: 9.701 |
| Max. :29.46 | Max. :18.80 | Max. :8.966 | Max. :12.506 |

**Table 3.** *Fixed-effects regression*

```
Fixed-effects (within) regression               Number of obs      =       482
Group variable: countries                       Number of groups   =        31

R-sq:                                           Obs per group:
     within  = 0.4435                                         min =        12
     between = 0.4642                                         avg =      15.5
     overall = 0.2791                                         max =        16

                                                F(17,434)          =     20.35
corr(u_i, Xb)  = -0.9786                        Prob > F           =    0.0000
```

| log_exp | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| log_GDP | .77223 | .3110214 | 2.48 | 0.013 | .1609346 | 1.383525 |
| log_pop | -5.812584 | 1.654917 | -3.51 | 0.000 | -9.065232 | -2.559936 |
| log_dist | 0 | (omitted) | | | | |
| log_cult_dist | 0 | (omitted) | | | | |
| years | | | | | | |
| 2001 | -.0858726 | .2856454 | -0.30 | 0.764 | -.6472929 | .4755478 |
| 2002 | -.156133 | .294514 | -0.53 | 0.596 | -.7349842 | .4227181 |
| 2003 | -.0211132 | .3053075 | -0.07 | 0.945 | -.6211784 | .5789519 |
| 2004 | .7170731 | .3339512 | 2.15 | 0.032 | .0607103 | 1.373436 |
| 2005 | .9161303 | .349653 | 2.62 | 0.009 | .2289066 | 1.603354 |
| 2006 | .8935399 | .3697892 | 2.42 | 0.016 | .1667396 | 1.62034 |
| 2007 | 1.066496 | .4118383 | 2.59 | 0.010 | .2570506 | 1.875942 |
| 2008 | .958154 | .4450413 | 2.15 | 0.032 | .0834498 | 1.832858 |
| 2009 | 1.172761 | .4138033 | 2.83 | 0.005 | .3594534 | 1.986069 |
| 2010 | 1.337425 | .4193248 | 3.19 | 0.002 | .5132656 | 2.161585 |
| 2011 | 1.609594 | .4436888 | 3.63 | 0.000 | .7375477 | 2.48164 |
| 2012 | 1.385971 | .4334781 | 3.20 | 0.001 | .5339934 | 2.237948 |
| 2013 | 1.83539 | .4447509 | 4.13 | 0.000 | .961256 | 2.709523 |
| 2014 | 1.980239 | .4472879 | 4.43 | 0.000 | 1.101119 | 2.859358 |
| 2015 | 2.010856 | .4147847 | 4.85 | 0.000 | 1.19562 | 2.826093 |
| _cons | 82.44099 | 30.4298 | 2.71 | 0.007 | 22.63288 | 142.2491 |
| sigma_u | 9.6809747 | | | | | |
| sigma_e | 1.0846678 | | | | | |
| rho | .9876024 | (fraction of variance due to u_i) | | | | |

```
F test that all u_i=0: F(30, 434) = 38.89                     Prob > F = 0.0000
```

*Shapiro-Wilk normality test indicates residual normality.*
*Fixed-Effects model residuals normality*

Shapiro-Wilk W test for normal data

| Variable | Obs | W | V | z | Prob>z |
|---|---|---|---|---|---|
| resid_fixed | 496 | 0.93885 | 20.421 | 7.249 | 0.00000 |

*Fixed-Effects model residuals normality*

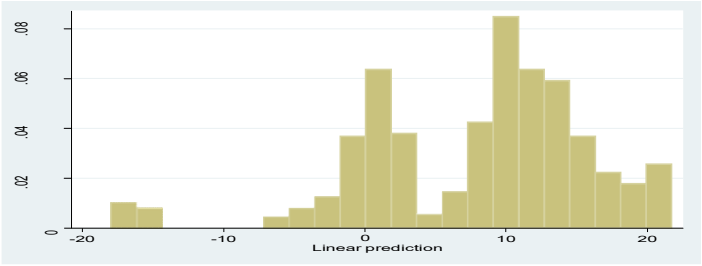

**Table 5.** *Hausman test fixed vs random effects*

| | ---- Coefficients --- (b) fixed | (B) random | (b-B) Difference | sqrt(diag(V_b-V_B)) S.E. |
|---|---|---|---|---|
| log_GDP | .77223 | .9158252 | -.1435952 | .2007318 |
| log_pop | -5.812584 | .418559 | -6.231143 | 1.635994 |
| years | | | | |
| 2001 | -.0858726 | -.1073728 | .0215002 | . |
| 2002 | -.156133 | -.1850944 | .0289614 | . |
| 2003 | -.0211132 | -.1056076 | .0844943 | .0474983 |
| 2004 | .7170731 | .5927204 | .1243527 | .0954065 |
| 2005 | .9161303 | .7427144 | .173416 | .1264463 |
| 2006 | .8935399 | .6828378 | .2107022 | .1538154 |
| 2007 | 1.066496 | .8049416 | .2615545 | .1977841 |
| 2008 | .958154 | .6554469 | .3027071 | .228254 |
| 2009 | 1.172761 | .86724 | .305521 | .2046796 |
| 2010 | 1.337425 | 1.013854 | .3235715 | .2114377 |
| 2011 | 1.609594 | 1.265491 | .3441023 | .2334569 |
| 2012 | 1.385971 | 1.035759 | .3502115 | .2261207 |
| 2013 | 1.83539 | 1.465199 | .370191 | .2374299 |
| 2014 | 1.980239 | 1.595023 | .385216 | .2412281 |
| 2015 | 2.010856 | 1.629404 | .3814523 | .2148441 |

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(17) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 17.12
Prob>chi2 = 0.4465
(V_b-V_B is not positive definite)

**Table 6.** *Breusch-Pagan LM test*

Breusch and Pagan Lagrangian multiplier test for random effects

log_exp[countries,t] = Xb + u[countries] + e[countries,t]

Estimated results:

| | Var | sd = sqrt(Var) |
|---|---|---|
| log_exp | 6.779305 | 2.60371 |
| e | 1.176504 | 1.084668 |
| u | 2.1604 | 1.46983 |

Test: Var(u) = 0
chibar2(01) = 1353.59
Prob > chibar2 = 0.0000