Gravity Model and Trade Flow of Selected 20 Countries

Sanjoy Kumar Saha[#1], NilufarEasmin[*2],ParthoSarathi Laskar[#3]
[#]*Associate Professor, MawlanaBhasani Science and Technology University, Santosh, Tangail, Bangladesh.*
[*]*Lecturer, Department of Economics, Gangni Government Degree College, Meherpur, Bangladesh.*
[#]*Assistant Professor, Department of Economics, Islamic University, Kushtia, Bangladesh.*

Abstract

The paper attempted to estimate trade potential for 20 countries (among those countries 19 are OECD countries and China) using the gravity model approach. The gravity model has been estimated using the OLS technique with balanced panel data of 20 countriesincluding South Korea, China and Japan from year 2001 to 2014.The dependent variable in this study is the bilateral trade flows (in US dollars), in log form, between pairs of countries. Traditional gravity models presented in the paper proved that GDP, distance and exchange rate are major significant factor for increasing international trade between those countries. Moreover we used a long set of control variables like area, population, common language, common religion, number of hours difference between the origin and destination countries, GDP per capita and entry cost to start the business etcto investigate the role of the factors that helps rising trade among those countries. Estimation results showed that common religion, entry cost, area of origin countries, population are significantly affected trade flows.

Keywords: *Gravity, landlocked, distance, exchange, trade.*

I. INTRODUCTION

Trade has an important role in development as it is deeply related to industrial development, so countries with low levels of industry by inhabitant usually have low levels of national and foreign trade per capita, and very often they have problems of deficit in their balances of payments which lead to increasing external debt and difficulties in promoting development. Relatively open economies grow faster than relatively closed economies, and salaries and working conditions are generally better in companies that trade than those that do not (OECD, 2012). Global trade and gross domestic product (GDP) growth are positively correlated: times of low growth have been those when economic integration was slowing or had reversed (OECD, 2016d) (3). Rising trade ratios are also broadly correlated with overall increases in productivity over the long run (Newfarmer and Sztajerowska, 2012).

By boosting growth, trade has contributed to lifting hundreds of millions of people out of poverty: the share of the world's population living on less than PPP USD 1.90 per day fell from around 35% in 1990 to less than 11% in 2013 (WBG, 2016). Evidence on the impact of trade on poverty in developing countries over 1993-2008 shows that the change in the real income of the bottom 20% of the population is strongly correlated with the change in trade openness over the same period (IMF et al., 2017). Inequality among countries has also fallen (Dabla-Norris et al., 2015). Developing and emerging economies are also playing a more important role in trade today than ever before. This has not only improved lives and created new opportunities in poor countries, but also created new markets and opportunities for advanced economies too. And more prosperity and opportunity around the world also helps promote greater stability and security for everyone.

Foreign trade has become very important in terms of the development of an economy, as the economic integration on the world scale is very deep. Export and import emerge as a complementary element to development and growth for an economy of an individual, and economic development can only be achieved by sustaining a sustained and high rate of income growth over the long run. In this process, besides other factors, especially foreign trade plays the most important role. Foreign trade is particularly important for small countries, or for countries with low levels of production of raw materials. They need to sell goods and services to foreign countries in order to finance some intermediate goods and services necessary for their production, which are not produced in the country and have to be bought in international markets.

Foreign trade strengthens the position of the state in the world arena. The basic effects of the development of trade between countries, presented by the first theoreticians of international economics, include the mutual benefits related to the improvement of international trade. Due to day by day increasing importance of globalization bilateral trade is getting an extraordinary value at present. To raise competition, production efficiency, specialisation and scale

economies, and helps resource allocation based on comparative advantage international trade plays an important role. International trade has grown faster than income in the post-war period (Hill, 2009, p. 22). The identification of main sources of international trade flows has been a subject of considerable interest to academics for decades.

Along with the increase in the integration of states, they are characterized by increasing homogeneity, facilitating better communication. This change in the perception of independent, but open to exchangeable, states implies a wider perspective on international trade and attempts to update traditional determinants of contemporary trade flows between states.

In empirical studies of international trade flows, the gravity model has been widely used (Disdier and Head, 2008). In its original form, the gravity equation specifies that bilateral trade flows are determined by the economic sizes of and the distance between the two countries (see e.g. Tinbergen, 1962; Poyhonen, 1963). Trade theories based upon imperfect competition and the Heckscher– Ohlin (H-O) model justify the inclusion of the core variables – income and distance (Ghosh and Yamarik, 2004). Since then, the gravity model has been extended by adding variables such as border effects (e.g. Aitken, 1973; Frankel and Wei, 1998; Frankel and Rose, 2002; de Groot et al., 2004; Rose, 2004; Melitz, 2007), infrastructure availability and ⁄ or landlocked⁄island effects (e.g. Rose, 2000; Frankel and Rose, 2002; Wilson et al., 2003; Longo and Sekkat, 2004; Rose, 2004), historical or colonial ties (e.g. Frankel and Wei, 1998; Feenstra et al., 2001; Frankel and Rose, 2002; Anderson and van Wincoop, 2003; de Groot et al., 2003), exchange rate or currency risk (e.g. Frankel and Wei, 1993), trade or economic policy (e.g. Coe and Hoffmaister, 1999; Wilson et al., 2003; Longo and Sekkat, 2004; Baier and Bergstrand, 2009), economic development (e.g. Frankel, 1997; Frankel and Rose, 2002), and relative factor endowment (e.g. Frankel et al., 1995; Egger and Pfaffermayr, 2004).

The aim of the article is to estimating a gravity model of bilateral trade flows between OECD countries in the period 2001-2014. Among the factors determining the level of trade, the national income measure of countries, i.e, GDP, geographical distance and exchange rate were adopted.

As part of the pursued goal, two research hypotheses were put forward. The first assumes that countries with the highest level of GDP and exchange rate have a tendency to achieve positive balances in the trade balance. According to the second hypothesis, the poor use of transport infrastructure hampers the exchange of trade from abroad - increasing the distance between countries.

II. AN OVERVIEW OF TRADE FLOWS BETWEEN SELECTED 20 COUNTRIES:

Three of the biggest economic European partners of the United States are Germany, Britain and France. These are the three largest economies in the European Union; meaning have the highest values of gross domestic product (GDP) among other EU countries. On the other hand, the biggest partners of Europe are USA, China, Japan and Brazil who are the most powerful economies in the world. The above two facts may be indicative of the role of the economic size in international trade direction. Hence, a strong relationship between a country's economic size and the volume of trade flows is expected. Each country will naturally choose to trade with economically powerful countries; however a trend of powerful countries with emerging economies has been noticed recently. A large state has economies of scale because the cost per unit of produced output is lower. This is because the major economies have a large number of populations which pays more taxes that directly impact the product cost. Lower costs per unit will bring increasing revenue of scale. Moreover, being a great state give the possibility of having more human capital which will transmit more knowledge. If being a great country would only have benefits then the world should be organized in a single state (the merging of many different countries in a single market justify this), but this would not be possible because the administrative costs would outweigh the above benefits.

Distance is the second important component of the gravity model. Unlike the size of the country that has a positive impact on trade flows, distance adversely affects them. So as far away are two countries, as lower is the chance that they have commercial exchanges with each other. It is estimated by various econometric models that if the distance between two countries is increases by 1% the trade between them will decrease from 0.7% to 1%. Concrete cases of different countries confirm this. Thus Mexico and Canada prefer to trade more with the U.S. and less with Europe. Also many free trade agreements have been concluded between countries that have geographic proximity. It can be mentioned the EU (European countries), NAFTA (North American countries), APEC (transpacific countries), MERCOSOUR (Argentina, Brazil, Paraguay, Uruguay), CARICOM (Caribbean English-speaking countries), ANCOM (Bolivia, Ecuador, Peru, Colombia) and many other agreements. So in this case the distance more than a driving factor would be considered as a barrier for the trade between two countries.

The economic and political considerations of moving towards democracy have led OECD countries to expressed preferences towards Western countries. Until 1989, these countries belonged to planned economies with a trade organization based on the monopoly of international trade, import and export planning and currency inconvertibility. Hence, the trade characteristic was a strong concentration inside the Council for Mutual Economic Assistance (CMEA).

But after the fall of the communist regime, these countries gave up their hermetic trade inside CAEM by adopting an open system where Western Europe became one of the most important partners. The economic opening towards Western Europe was very different from one country to another. For instance, in 1989, the trade openness index for Romania was 19.3%, and respectively 18.4% and 43.2% for Bulgaria and Hungary. There was a heterogeneity between Central and Eastern European countries in terms of trade openness level.

EU countries dominate the trade flows between the two zones (the EEC – EU trade represents almost 90% from the total trade with 19 OECD countries). We are interested in analyzing the evolution of mostly OECD countries (china included from outside OECD) trade configurations following their access to a widened market. An examination of the evolution of trade flows over the 2001- 2014 period should highlight a deep trade gap with respect to those countries.

Since 1990 Romania's exports to Western Europe have significantly dropped out, but this tendency has reversed after 1993, and they have increased again since the signature of the association agreement with UE15. Their fall after 1989 is due mostly to the reorientation of EU towards Central European countries to which EU have granted trade preferences since 1991. Since 1992 the trade balance has moved from a trade surplus to a trade deficit. If up to 1996 this deficit was easily negative it has accentuated through time. Indeed, Romania's exports were already directed even during the socialist period towards western countries. An opposite evolution can be observed for Bulgaria. The exports were much lower comparatively with the imports which entailed a permanent deficit in trade balance. Besides, Bulgaria followed an increasing trend of exports and imports with a trade balance in deficit but less accentuated however as during the 1987-1990 period. For the two countries the increasing tendency of trade is due to external trade liberalization and the opening of their economies to world markets. But the trade liberalization policy of external trade has entailed a rise of imports higher than that of exports.

The pattern changes of exported goods were more complicated because it was conditioned by the speed of the reorganization of the overall economic activity. This is why from a structural point of view external trade is characterized by the existence of labor intensive industries. The less expensive cost of labor in OECD economies created an advantage for internal products especially for light industry. Romania textile sectors have significantly increased since 1989, from 19% to 46% in 2004. A similar evolution can be observed for Bulgaria where the same sector has increased since 1989, from 13% to 36% in 2004.

III. THE GRAVITY MODEL

The concepts of gravity equation for trade flows between states were presented by Jan Tinbergen (1962) 9. Inspired by Newton's gravity law, he assumed that the value of trade between any two countries(Y_{ij}) is positively proportional ($X_i^{\alpha_1}, X_j^{\alpha_2}$) to the product of national income (GDP) of these countries and inversely proportional to distances ($D_{ij}^{\alpha_3}$) between them. The general form of the equation can be written as

$$Y_{ij} = \alpha_0 X_i^{\alpha_1} + X_j^{\alpha_2} + D_{ij}^{\alpha_3} \text{----------(1)}$$

or in a logarithm version

$$\log \quad Y_{ij} = \alpha_0 + \alpha_1 logX_i + \alpha_2 logX_j + \alpha_3 logD_{ij} + U_{ij} + \text{----------(2)}$$

Where α_1 and α_2 andα_3 are coefficients to be estimated. The error term captures any other shocks and chance events that may affect bilateral trade between the two countries. Equation (2) is the core gravity model equation where bilateral trade is predicted to be a positive function of income and negative function of distance.

IV. MODEL AND ANALYSIS

In addition to the basic gravity model equation we estimate an augmented gravity model equation to first analyze international trade flows and then estimate the trade potential for India with its trading partners. The model is "augmented" in that, several conditioning variables that account for other factors that may affect trade have been included over and above the (the natural logarithms of) income and distance. The models basic and augmented as formulated for estimation are as follows:

V. BASIC GRAVITY MODEL

As stated in section II, the gravity model in its most basic form explains bilateral trade (Yij) as being proportional to the product of GDPi and GDPj which are shown by$X_i$and$X_j$and inversely related to the

distance between them. To account for other factors that may influence trade levels, dummy variables have been added to the basic model. The augmented gravity equation is thus expressed as follows:

$$\log \quad Y_{ij} = \alpha_0 + \alpha_1 \, logX_i + \alpha_2 \, logX_j + \alpha_3 \, logD_{ij} + \alpha_4 \, Z_j + U_{ij}$$

Here Z_j represents all the control variables that may have impact on trade flows between the countries.The explanatory variables in the gravity model are defined as follows:

GDP(lgdp)**:** There most standard ways of measuring the size of countries in the gravity model: GDP (output) or population. We have also attempted to supplement the size variables with a measure of land area. This value also significant to our analysis. The focus in this paper is thus on GDP as a measure of size.

Per Capita Income(lgdpcap): The specification with GDP per capita allows us to explore the link between a country's trade and its stage of development. Several explanations have been provided in the literature for inclusion of GDP per capita as an independent variable in addition to GNP. One possible explanation for the independent effect of per capita income is that exotic foreign varieties of goods are superior in consumption.

It is also suggestive to focus mainly on GDP per capita as a determinant of trade flows. The standard gravity model predicts that countries with similar levels of output per capita will trade more than countries with dissimilar levels. This is true of the Helpman- Krugman sort of theory also, as it predicts that the volume of trade should increase with increasingly equal distribution of national income. This however contradicts thetraditionalHecksher-Ohlin theories of trade that predict that countries with dissimilar levels of output will trade more than countries with similar levels.

Distance(ldistw): The distance between country i and country j measured "as the crow flies"- technically called the great-circle distance measured between the two latitude-longitude combinations. A major proportion of trade today goes by air (and not by sea or land) and therefore the air routes provide the most convenient justification for using the straight – line or great -circle measure of distance. The ultimate justification is of course given by the fact that this measure seems to be a reasonable measure of averaging across different modes of transportation and works well in practice.

Exchange rate(lex): It is the one of the most important indicator that can affect trade flows. Generally a country with high exchange rate can have a larger trade flow compare with the countries of low exchange rate.

Common language and religion(comlang_offcomlang_ethno): Those are equal to one when two countries share a commonlanguage (official or commercial): Common language is expected to reduce transactioncosts as speaking the same language helps facilitate trade negotiations.

Besides those above mentioned variables we use some other variables. Such as number of hours distance between origin and destination countries*(tdiff*), population*(lpop*) , area *(area),* cost of business to start up procedures, time required to start a business(*entry_cost* and *entry_time).*

VI. METHODOLOGY

In the first stage we have estimated (equation 4) for world trade flows. Gravity model Equation (4) has been estimated using the OLS technique with cross - section data for the year 2000. The dependent variable is total merchandise trade (exports plus imports in US dollar thousands), in log form, between pairs of countries. All estimates are checked for multicollinearity.

VII.DATA SAMPLE

The dependent variable in our analysis is the natural log of total bilateral trade measured in current international prices (dollar value). Our analysis is based on the maximum possible geographical coverage of world trade flows. Our data source is the CEPII world trade database. CEPII is derived from the trade database of the covers over 90 per cent of world trade. We use a a set of 20 OECD countries. There are 5334 observations in the sample. Observations for all variables started from 2001 and ended in 2014.GDP is measured in current international prices (dollars). Population of all countries is measured in millions. The data source for population, consumer price index is the World Bank published World Development Indicators (CD-ROM, 2003). Exchange rate data are taken from OECD database. Bilateral distance is measured, in kilometers, as the great circle distance betweentwo capital cities of the trading partners.8 Bilateral distance is from the data set developed by Haveman and the CEPII. For language, contiguity, colonial background and othersuch information we have used the CIA World Factbook.

VIII. ESTIMATION RESULTS

Table 1 presents the OLS estimates of the basic and augmented gravity models.The model for both the basic and augmented version fits the data well and explains 70 per cent of the variation in bilateral trade across our sample of countries.

The standard features of the gravity model work well. Distance, GDP and exchange rate provide most of the explanatory power in all the regressions. The baseline variables are very highly significant, have the expected signs and are of reasonable magnitude.

The coefficient on the GDP variable in our specification is positive, statistically significant and economically reasonable indicating that higher GDP (for the country pairing) increases trade. Given that the coefficient is less than one (0.153), an increase in the size of the country (output) increases trade, though, less than proportionately.

Geographical distance has always theoretically a negative impact being a proxy of transport costs. The estimated coefficient on logdistance(0.106) has the anticipated negative sign, indicating that trade between a pair of countries falls by a little over 1 per cent for every 1 percent increase in the distance between them. On controlling for common language and religion, the magnitude of the coefficient on distance is reduced slightly. The coefficient on the dummy variable for a common language and religion is estimated to be 0.255. As trade is specified in logarithmic form, we interpret the coefficient on the dummy by taking the exponent.

Sharing a language increases trade by economically and statistically significant amounts. The estimated coefficient of the common language dummy is 0.903. The implication is that two countries sharing linguistic links tend to trade roughly 74 per cent more than they would otherwise. The effect of sharing a common language though positive, is not as much as the effect of sharing a common border.

We got positive coefficient for real exchange rate. The more the real exchange rate index increase the more there is a depreciation of the exporter currency with respect to the currency of his partner and export competitiveness is improved.

Concerning the sign of the difference of GDP per capita, the negative or positive impacts of this variable globally compensates. Generally, it has a positive impact on exports for two very different countries if the Heckscher-Ohlin (H-O) assumptions are empirically confirmed. On the contrary, according to the new trade theory, the income per capita variable between countries is expected to have a negative impact. But, we got one positive and one negative coefficient value for per capita GDP. But the coefficient is low (0.186) and it implies that inter-industry trade is reduced in favor of vertical intra-industry trade, which concerns the multinational strategies of production development on segments of quality. Moreover, there is an access to a larger market, the more the volume of trade flows increase.

The variables like common currency, entry cost to start business, time distance have the sign that we expected which explain better the level of bilateral exchanges. The international organization membership has a low influence on trade flows. On the contrary, the distance variable (proxy costs of transport) represents an obstacle for trade. It should be noted that the distance between countries has an important elasticity and hence has an important explanatory capacity. The elasticity of the geographical distance is systematically high indicating that trade flows are extremely sensitive to transport costs. However the impact of the geographical distance remains high, which means that technical improvements (communications, modern transports) did not improve international trade.

IX. CONCLUSION

The gravity model of trade in international economics, similar to other gravity models in social sciences, predicts bilateral trade entries based on GDP, and the distance between the two units). The size in the gravity model in the economy is measured mainly by the country's GDP and it is expressed more as the economic potential of the market. It has a positive impact on international trade, and consequently on foreign direct investment, thus affecting their growth. Distance is an important factor in the inward and the outward of foreign investment, but in this econometric model the statistically importance of distance was not meaningful. The main rationale related to this result may be due to globalization phenomenon, which is supposed to have diminished the inhibitory role of the distance.

REFERENCES

[1] Anderson, J. E and van wincoop (2003), “Graviry with Gravitas- A solution” American Economic Review, 93, 170-92.

[2] Aitken, N. D (1973). “The Effect of the EEC and EFTA on European cross sector Analysis”, American Economic Review, 63, 881- 92.

[3] Coe, D. T and A. w. Hommaister (1999),” North South Trade: Is Africa Unusual?’ Journal of African Economics, 8, 228-56.

[4] Dabla-Norris., E., Y Ji, R. M. Townsend, and D.FiliizUnsal, 2015. Distinguishing Financial Inclusion and impact on GDP and Inequality," NBER working Paper 20821. Cambridge, Massachusetts: National Bureau of Economic Rescarch.

[5] Frankel, J. and S. J. Wei (199s), ‘Open regionalism in a World of Continental Trading Blocs ‘.IMF Staff Papers, 45, 440-53.

[6] Feenstra, R.C., J. A. Markusen and A. K Rose (2001), ‘Using the Gravity Equation todifferentiate among Alternative Theories of Trade’, Canadian Journal of Economics, 34, 430 47.

[7] Frankel, J. (1997), Regional Trading Blocs in the World Trading system (Washington DC: Institute for International Economics). Frankel.J. and A. K. Rose (2002), "An Estimate of the Effect of Common currencies on Trade and Income’, Quarterly Journal of Economics, 117.437- 66.

[8] Frankel, J. and S. J. Wei (1993), 'Trading Blocs and Currency Blocs'. NBER Working Paper No. 4335 (Cambridge, MA: NBER).

[9] Ghosh, S. Yamarik (2004), 'Are Regional Trading Arrangements Trade creating?' An Application of Extreme Bounds Analysis, Journal of International Economics, 63, 369-95.

[10] Hill (2009), International Business.

[11] Melitz, J. (2007), "North, South and Distance in the Gravity Model', European Economic Review, 51.971-91.

[12] IMF (2017) World Economic Outlook: Globalisation and international trade.

[13] OECD (2012), Economic Policy Reforms: Going for Growth 2012, Paris.

[14] OECD (2016d) World Economic Outlook.

[15] Longo, R. and K. Sekkat (2004), "Economic obstacles to Explaining Intra-African Trade', World Development, 32, 1309-21.

[16] Poyhonen, P. (1963) "A Tentative Model for the Volume of Trade between Countries',WtwirtschaftlichesArchiv, 90, 93-99.

[17] Rose. A. K. (2004), " Do we Really know that the WTO increases trade?, American Economic Review, 94, 98- I l4.

[18] Tinbergen. J. (1962). Shaping the World Economy: Suggestions for an International Economic Policy (New York: Twentieth Century Fund).

[19] Wilson, J. S., C. L. Mann and T. Otsuki (2003), Trade Facilitation economic development: A New Approach to Quantifying the Impact', World Bank Economic Review, 17.367-89.

[20] World Bank (2006), World Development Report 2006: Equity and Development, Washington DC, World Bank and New York: Oxford University Press.

Table-I Estimation results: Dependent Variable is Log Bilateral Trade Flow.

	(1) lflow	(2) lflow	(3) lflow	(4) lflow	(5) lflow	(6) lflow
lgdp_o	0.153***		0.000591	0.00326	0.0917***	
	(0.0215)		(0.0221)	(0.0222)	(0.0216)	
lgdp_d	0.103***	0.209***	0.0595**	0.0524**	0.147***	
	(0.0186)	(0.0426)	(0.0192)	(0.0201)	(0.0186)	
ldistw	-0.106***	-0.221	-0.179***	-0.179***	-0.255***	-0.0975***
	(0.0244)	(0.137)	(0.0241)	(0.0257)	(0.0273)	(0.0241)
lex	0.0806***	0.0987***	0.0829***	0.0841***	0.0784***	0.0803***
	(0.00932)	(0.0131)	(0.00899)	(0.00902)	(0.00915)	(0.00932)
ltdiff		-0.204				
		(0.114)				
larea_o		0.133***				
		(0.0375)				
larea_d		0.0692				
		(0.0385)				
lentry_cost_o		-0.282***				
		(0.0413)				
lentry_cost_d		0.0436				
		(0.0421)				
comcur		-0.247*				
		(0.123)				
comrelig		-0.539**			-1.029***	
		(0.181)			(0.114)	
lpop_o		-0.194***				
		(0.0414)				
lpop_d						

lgdpcap_o		-1.005***				
		(0.0773)				
lgdpcap_d		0.186*				
		(0.0817)				
comlang_off		-0.903***			-1.167***	
		(0.239)			(0.129)	
comlang_ethno		0.361			1.325***	
		(0.200)			(0.136)	
pop_o			0.00188***	0.00179***		
			(0.0000960)	(0.000120)		
pop_d			-0.000273**	-0.000205		
			(0.000104)	(0.000122)		
area_o				1.33e-08		
				(1.18e-08)		
area_d				-1.12e-08		
				(1.12e-08)		
lag1						7.66e-14***
						(1.69e-14)
lag2						-4.62e-14***
						(8.85e-15)
_cons	20.62***	36.10***	24.02***	23.90***	24.96***	21.92***
	(0.743)	(1.628)	(0.763)	(0.780)	(0.797)	(0.178)
N	4783	2437	4783	4783	4783	4782

Descriptive statistics:

```
Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
      iso3_o |          0
      iso3_d |          0
year |      5,600      2007.5    4.031489       2001       2014
comlang_off |      5,600        .105    .3065808          0          1
comlang_et~o |      5,600        .095    .2932411          0          1
-------------+--------------------------------------------------------
distw |      5,600    4034.618    3651.546   20.25191   11183.43
pop_o |      5,600    112.0735    285.0816    .441525    1364.27
pop_d |      5,600    112.0735    285.0816    .441525    1364.27
gdp_o |      5,600    1.98e+12    3.23e+12   2.09e+10   1.74e+13
gdp_d |      5,600    1.98e+12    3.23e+12   2.09e+10   1.74e+13
-------------+--------------------------------------------------------
gdpcap_o |      5,600    35930.36    21315.56   1041.638   116612.9
gdpcap_d |      5,600    35930.36    21315.56   1041.638   116612.9
area_o |      5,600     1628477     3392538       2586    9976139
area_d |      5,600     1628477     3392538       2586    9976139
```

```
tdiff |      5,600    3.400417    3.639623          0   10.58333
-------------+--------------------------------------------------------
comcur |      5,600    .2557143    .4363009          0          1
comrelig |      5,600    .2986383    .2850998          0    .938962
gsp_o_d |      5,600       .0675    .2509083          0          1
gsp_d_d |      5,600       .0675    .2509083          0          1
flaggsp_d_d |      5,600       .2025     .752725          0          3
-------------+--------------------------------------------------------
entry_cost_o |      4,740    6.875527    6.816826          0       40.4
entry_cost_d |      4,740    6.875527    6.816826          0       40.4
entry_proc_o |      4,740    6.708861    2.836853          2         14
entry_proc_d |      4,740    6.708861    2.836853          2         14
entry_time_o |      4,740    20.72152    20.01005        3.5        138
-------------+--------------------------------------------------------
entry_time_d |      4,740    20.72152    20.01005        3.5        138
exrate_all |      4,966    65.83019    256.4358   .0004868   2054.098
flow |      4,783    7.70e+09    1.92e+10    1660226   2.82e+11
flow_o |          3           0           0          0          0
imp |      5,600        10.5    5.766796          1         20
-------------+--------------------------------------------------------
exp |      5,600        10.5    5.766796          1         20
countrypair |      5,600       200.5      115.48          1        400
lgdp_o |      5,600    27.26879    1.557755   23.76186   30.48709
lgdp_d |      5,600    27.26879    1.557755   23.76186   30.48709
lgdpcap_o |      5,600    10.25961    .7961957    6.94855   11.66662
-------------+--------------------------------------------------------
lgdpcap_d |      5,600    10.25961    .7961957    6.94855   11.66662
larea_o |      5,600    12.29181    2.037088   7.857868   16.11571
larea_d |      5,600    12.29181    2.037088   7.857868   16.11571
lpop_d |      5,600     3.19367    1.745231  -.8175206   7.218375
lpop_o |      5,600     3.19367    1.745231  -.8175206   7.218375
-------------+--------------------------------------------------------
ldistw |      5,600    7.704303    1.226584   3.008249   9.322188
lex |      4,966   -.0044678    3.062961  -7.627592   7.627592
lflow |      4,783    21.17481    1.923521   14.32246   26.36421
ltdiff |      3,752    1.215216    1.052322  -.6931472   2.359281
lentry_cos~o |      4,440      1.3747    1.285493  -2.302585    3.69883
-------------+--------------------------------------------------------
lentry_cos~d |      4,440      1.3747    1.285493  -2.302585    3.69883
   _est_est1 |      5,600    .8541071    .3530303          0          1
   _est_est2 |      5,600    .4351786    .4958246          0          1
   _est_est3 |      5,600    .8541071    .3530303          0          1
   _est_est4 |      5,600    .8541071    .3530303          0          1
-------------+--------------------------------------------------------
   _est_est5 |      5,600    .8541071    .3530303          0          1
        lag1 |      5,599    1.98e+12    3.23e+12   2.09e+10   1.74e+13
        lag2 |      5,599    1.98e+12    3.23e+12   2.09e+10   1.74e+13
        lag3 |      5,598    1.98e+12    3.22e+12   2.09e+10   1.74e+13
        lag4 |      5,598    1.98e+12    3.22e+12   2.09e+10   1.74e+13
-------------+--------------------------------------------------------
   _est_est6 |      5,600    .8539286    .3532093          0 lentry_time_d |      4,740    20.72152
20.01005        3.5        138
exrate_all |      4,966    65.83019    256.4358   .0004868   2054.098
flow |      4,783    7.70e+09    1.92e+10    1660226   2.82e+11
flow_o |          3           0           0          0          0
imp |      5,600        10.5    5.766796          1         20
-------------+--------------------------------------------------------
exp |      5,600        10.5    5.766796          1         20
countrypair |      5,600       200.5      115.48          1        400
lgdp_o |      5,600    27.26879    1.557755   23.76186   30.48709
lgdp_d |      5,600    27.26879    1.557755   23.76186   30.48709
lgdpcap_o |      5,600    10.25961    .7961957    6.94855   11.66662
-------------+--------------------------------------------------------
lgdpcap_d |      5,600    10.25961    .7961957    6.94855   11.66662
larea_o |      5,600    12.29181    2.037088   7.857868   16.11571
larea_d |      5,600    12.29181    2.037088   7.857868   16.11571
lpop_d |      5,600     3.19367    1.745231  -.8175206   7.218375
lpop_o |      5,600     3.19367    1.745231  -.8175206   7.218375
-------------+--------------------------------------------------------
ldistw |      5,600    7.704303    1.226584   3.008249   9.322188
lex |      4,966   -.0044678    3.062961  -7.627592   7.627592
```

```
lflow |      4,783    21.17481    1.923521   14.32246   26.36421
ltdiff |      3,752    1.215216    1.052322  -.6931472   2.359281
lentry_cos~o |      4,440      1.3747    1.285493  -2.302585    3.69883
-------------+--------------------------------------------------------
lentry_cos~d |      4,440      1.3747    1.285493  -2.302585    3.69883
   _est_est1 |      5,600    .8541071    .3530303          0          1
   _est_est2 |      5,600    .4351786    .4958246          0          1
   _est_est3 |      5,600    .8541071    .3530303          0          1
   _est_est4 |      5,600    .8541071    .3530303          0          1
-------------+--------------------------------------------------------
   _est_est5 |      5,600    .8541071    .3530303          0          1
        lag1 |      5,599    1.98e+12    3.23e+12   2.09e+10   1.74e+13
        lag2 |      5,599    1.98e+12    3.23e+12   2.09e+10   1.74e+13
        lag3 |      5,598    1.98e+12    3.22e+12   2.09e+10   1.74e+13
        lag4 |      5,598    1.98e+12    3.22e+12   2.09e+10   1.74e+13
-------------+--------------------------------------------------------
   _est_est6 |      5,600    .8539286    .3532093          0          1
```

Name of the countries

Name	ISO code	Name	ISO code
Austria	AUT	England	GBR
Belgium	BEL	Hungary	HUN
Canada	CAN	Italy	ITA
Switzerland	CHE	Japan	JPN
China	CHN	South Korea	KOR
Germany	DEU	Luxemburg	LUX
Denmark	DNK	Poland	POL
Spain	ESP	Portugal	PRT
Finland	FIN	Slovenia	SVN
France	FRA	United States of America	USA