

Mongolia's International Trade: Impact of Its Geographical Location

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Mongolia's International Trade: Impact of Its Geographical Location

Jinhwan Oh & Orgilbold Tumurbaatar¹

Abstract

This paper examines the influence of Mongolia's landlocked location between Russia and China on the country's international trade patterns through the use of an augmented gravity model. The results are basically consistent with the prediction of the gravity model with some unexpected results on per capita GDP and the WTO dummy. Further, this paper discusses relevant policy implications.

Key words: Mongolia; International trade; Trade patterns and determinants; Geographic location; Gravity model

JEL Classification: F14, F15, O18, R40

1. Introduction

Mongolia's geographical location is not favorable for international trade, for it is landlocked and 1724 kilometers away from the nearest seaport.² Moreover, its borders are shared only with China and Russia. Nonetheless, after 1990, when Mongolia transitioned from a centrally oriented economy to a market-based open economy, the country has attempted to reform its trade structure and to diversify its trading partners, a reform that was accelerated after Mongolia joined the World Trade Organization (WTO) in 1997. As a result, the country's average tariff rate has been significantly reduced from 18% to 5% since then (Batsaikhan, 2009). Also, Mongolia signed bilateral trade and economic cooperation agreements with several countries including Russia, China, the United States, Canada, Indonesia, Malaysia and regions such as the European Union (EU) (Shagdar, 2005). Furthermore, the United States, Japan, the EU, New Zealand, Norway, Switzerland, and

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Turkey have offered Mongolia a GSP (Generalized System of Preference),³ mainly for textiles and garment products (UNCTAD, 2008).

The goal of this study was to identify the determinants of Mongolia's trade flows using the data of the country's bilateral trade⁴ with 59 countries between 1995 and 2008. The main tools of investigation were augmented gravity models. We followed what is known as the $N \times 1$ approach, first used by Wall (1999) and extended by Sohn (2005) who argued that "the $N \times N$ gravity models deal with symmetric trade policies that are equally applicable to all N countries such as free trade areas, whereas the $N \times 1$ model can deal with country-specific trade policy measures" (Sohn, 2005, p. 1).

Furthermore, we attempted to capture Mongolia's unique geographical location. First, we paid extra attention to distance. A large number of gravity model studies use sea route distances between seaports. However, in the case of a landlocked country like Mongolia, where access to the sea is relatively expensive, distance should be measured using a different method (See Appendix 1 for a detailed method for measuring distances). Second, we focused on China and Russia because Mongolia shares borders only with these countries. Therefore, they remain Mongolia's top two trading partners even though Mongolia has other trading partners. We conducted regressions with and without these countries to check the robustness of the gravity model.

This paper is comprised of five chapters. The background analysis of Mongolia's economy and trade is given in Chapter 2. Next, the methodology and data used in the empirical analysis are introduced in Chapter 3, while the regression analyses and empirical results are presented in Chapter 4. Finally, conclusions are given in Chapter 5.

³ "Generalized System of Preferences (GSP) is a preferential tariff system extended by developed countries (also known as preference-giving countries or donor countries) to developing countries (also known as preference-receiving countries or beneficiary countries). [GSP] involves reduced tariffs or duty-free entry of eligible products exported by beneficiary countries to the markets of donor countries" (Export Inspection Office of India, 2010).

⁴ These data are from IMF DOTS.

2. Mongolia's International Trade Overview

Mongolia's trade volume has increased, and trade flow has diversified since the country initiated reforms in 1990 and joined the WTO in 1997; however, its landlocked trade is mostly carried out with only a few neighboring countries.

Table 1: Export Share of Mongolia's Partners between 1996 and 2007

Partners	1996	1998	2001	2004	2007
China	19.1%	29.3%	44.4%	47.8%	72.8%
Russia	20.6%	11.8%	8.6%	2.1%	2.7%
United Kingdom	4.5%	3.7%	2.4%	15.7%	0.6%
USA	4.2%	8.5%	27.7%	17.9%	4.8%
Canada	0.0%	0.0%	0.2%	1.7%	11.0%
Italy	2.5%	2.9%	3.2%	2.0%	2.8%
Korea, Republic of	8.0%	9.6%	3.9%	0.9%	0.5%
Japan	8.2%	3.7%	3.0%	3.9%	0.7%
Germany	0.0%	0.0%	0.4%	1.3%	0.7%
Hong Kong	0.0%	0.0%	1.3%	0.1%	0.1%
France	0.0%	0.0%	0.1%	1.7%	0.7%
Others	32.9%	30.5%	4.8%	4.9%	2.6%

Source: IMF, DOTS Database

Table 1 shows that China has become Mongolia's single largest export market by far, while Russia's share has continuously declined. The United Kingdom, the United States, Canada, Korea, and Japan follow but with considerably smaller shares. In terms of export products, mining products such as gold, copper, and other minerals comprised approximately 80% of Mongolia's exports on average (NSO, 2009); furthermore, manufactured goods that include livestock-origin, raw materials, and miscellaneous manufactured articles like textiles and garments represented approximately 20% of Mongolia's exports. As for import markets, Russia and China constitute the largest proportion; in fact, Russia supplies almost all of Mongolia's petroleum products (92% as of 2007) (UN-COMTRADE, 2009).

Table 2: Import Share of Mongolia's Partners between 1996 and 2007

Partners	1996	1998	2001	2004	2007
Russia	34.4%	29.8%	35.4%	33.3%	29.1%
China	14.6%	11.6%	18.8%	23.6%	32.1%
Japan	17.3%	11.8%	8.8%	7.4%	7.5%
Korea, Republic of	4.0%	7.5%	9.1%	6.0%	3.6%
Germany	4.8%	5.2%	4.8%	3.3%	3.7%
Singapore	3.0%	3.4%	1.6%	1.5%	1.9%
USA	2.5%	7.2%	2.3%	4.6%	1.3%
Kazakhstan	0.2%	0.7%	3.3%	2.6%	1.6%
Hong Kong	0.0%	0.0%	2.5%	1.5%	0.5%
France	0.3%	5.3%	1.0%	1.4%	0.8%
Ukraine	0.6%	0.3%	0.4%	1.5%	1.3%
Italy	5.1%	0.7%	0.5%	0.3%	0.4%
Others	15.2%	22.9%	13.4%	12.9%	10.6%

Source: IMF, DOTS Database

3. Model and Data

3.1. The Gravity Equation

In this study, the augmented gravity model by Rose (2002) is applied. In addition to the standard explanatory variables in gravity literature, we used exchange rate volatility, foreign direct investment, trade freedom index, trade openness, and other dummy variables.

The equation is as follows:

$$\begin{aligned}
\ln TRADE_{ijt} = & \beta_0 + \beta_1 \ln GDP_{it} + \beta_2 \ln GDP_{jt} + \beta_3 \ln GDPperCap_{it} + \beta_4 \ln GDPperCap_{jt} \\
& + \beta_5 \ln RER_{ijt} + \beta_6 \ln FDI_{it} + \beta_7 \ln Openness_{it} + \beta_8 \ln Openness_{jt} + \beta_9 \ln DIST_{ij} \\
& + \beta_{10} \ln TFI_{it} + \beta_{11} \ln TFI_{jt} + \beta_{12} DUMMY_{jt} + \varepsilon_{ijt}
\end{aligned} \quad (1)$$

$TRADE_{ijt}$	Bilateral trade flow (total trade, exports or imports) between Mongolia (i) and its trading partner (country j) in year t
GDP_{it}	Gross domestic product of Mongolia (i) in year t
GDP_{jt}	Gross domestic product of the partner country (j) in year t
$GDPperCap_{it}$	Gross domestic product per capita of Mongolia (i) in year t
$GDPperCap_{jt}$	Gross domestic product per capita of the partner country (j) in year t
RER_{ijt}	Real exchange rate of Mongolian currency against the partner country's (j) currency in year t
FDI_{it}	Foreign direct investment to Mongolia in year t
$Openness_{it}$	Trade openness ratio of Mongolia in year t
$Openness_{jt}$	Trade openness ratio of the partner country in year t

$DIST_j$	Distance (transport distance and trade cost) between Mongolia and the partner country (j)
TFI_{it}	Trade freedom index of Mongolia in year t
TFI_{jt}	Trade freedom index of the partner country (j) in year t
$DUMMY_j$	Set of dummy variables related to the partner country (j), including adjacency and WTO membership
ε_{ijt}	Residuals

Among the explanatory variables, GDPs serve as a proxy for the economic size of the two countries, both in terms of production capacity and markets. Big countries with a large production capacity are more likely to achieve economies of scale and increase their exports on the basis of comparative advantage. Furthermore, their large domestic markets attract greater imports. Therefore, an increase in the GDP is expected to increase bilateral trade volumes. On the other hand, GDP per capita measures the income level and purchasing ability of a partner country. According to Bergstrand (1989), signs of this coefficient depend on whether trading goods are labor intensive or capital intensive. The real exchange rates of the currency of partner countries against Mongolia's tug rug are examined because exchange rate is one of the main factors influencing international trade (Kandogan, 2004). The coefficient of the real exchange rate is expected to be negative for exports and positive for imports because when a currency depreciates in real terms, prices of domestic goods become cheaper than foreign goods, and then exports increase. In contrast, when a currency appreciates, imports increase. We also examined the foreign direct investment (FDI) of Mongolia; its expected sign is positive. The distance variable was added, representing trade resistance factors, transport costs, transport time, cultural unfamiliarity, and market access, and its expected sign is negative (see Appendix 1 for detailed information on the distances used in this study).

Apart from distance, both tariff and non-tariff barriers restrict world trade. In order to study these barriers, the trade freedom index calculated annually by the Heritage Foundation, on the basis of a country's tariff and non-tariff barriers, is also included in the examination. A

score of 100 implies perfectly free trade, whereas a score of zero implies the opposite. Therefore, the coefficient sign of the index is expected to be positive, meaning that countries with a freer trade policy than others tend to trade more. In addition, trade openness measurement, which is derived from the ratio trade over GDP, was tested with a hypothesis that the more an economy is open, the more it trades with Mongolia, and vice versa. Furthermore, the WTO member dummy variable, which takes the value of one if a partner is a member of the WTO for a given observation and takes the value of zero otherwise, was added to evaluate Mongolia's involvement in the WTO. The sign of this variable is expected to be positive, which means that Mongolia tends to trade more if a partner is a member of the WTO. Moreover, the adjacency dummy variable (it takes the value of one if the partner is Russia or China, and zero otherwise) was added to identify neighboring partners' deviations on trade flow from other partners.

The general methodology used in this analysis was previously employed by Wall (1999) and applied on a single country's bilateral trade data to analyze its particular trade patterns. Analyses were performed separately on total trade, exports, and imports to detect different effects of determinants on trade flow. In addition, in order to check the robustness of the results, a sensitivity analysis was conducted by running regressions for all models without considering Mongolia's trade with Russia and China. If the two results are significantly different, it can be concluded that Mongolia's geographical location between Russia and China has resulted in a distortion of its trade patterns.

3.2 Data

This study used bilateral trade data to analyze trade between Mongolia and its 59 main trading partners from 1995 to 2008. The data on bilateral trade flows (imports, exports, and total trade turnover) were obtained from the Direction of Trade Statistics of IMF (DOTS). The data of GDP, per capita GDP, foreign direct investment (FDI), trade openness, and real

exchange rate were obtained from the World Development Indicator database. Trade freedom indexes were downloaded from the Index of Economic Freedom by the Heritage Foundation⁵ and Wall Street Journal. The transportation distance variable was calculated by the authors on the basis of time-cost analysis on North East Asian railroads by UNESCAP and the ship voyage distance calculator at portworld.com (see Appendix 1: Calculated Distances and Calculation Procedure).

3.3. Methodology

Before running regressions, observations with zero trade value were adjusted by changing them by a very small number (0.0001), following the method used by Kalbasi (2001). This method was recommended by several researchers such as Anderson and Wincoop (2003) and Butt (2008).

In the preliminary regressions, the GDP per capita and FDI inflows in Mongolia were highly correlated with its GDP, causing collinearity problems (see Appendix 2: Correlation Matrix and Variance Inflation Factor Estimation of Explanatory Variables). Therefore, these variables were no longer considered for further analysis. To prevent multicollinearity, variance inflation factors (VIF) were estimated for each regression and means of VIFs for all Ordinary Least Squares (OLS) regressions were found to be lower than five.

This study adopts the pooled OLS instead of fixed or random effect to analyze the panel data. Initially, we conducted the Hausman Test and found that the fixed effect model is superior to the random effect model. Nevertheless, the fixed effect model had two problems. First, it did not capture the effect for distance and adjacency for time-invariant reasons. Second, the estimated coefficients were somewhat distorted⁶ due presumably to multicollinearity. Consequently, it would be safe to use the pooled OLS approach in spite of the

⁵ For a detailed explanation of the Index of Economic Freedom, see <http://www.heritage.org/Index/Default.aspx>

⁶ Total trade elasticity with respect to the partner's GDP in the fixed effect model is more than 10 times larger than that of the pooled OLS model. For example, a 1% increase in a partner's GDP results is approximately a 15% increase of Mongolia's GDP, which is not very realistic.

potential problem of biased estimators. Additionally, to consider heteroskedasticity, robust standard errors are used throughout all of the regressions.

4. Results and Discussion

The regression result on Mongolia's total trade is explained in Table 3. First, as predicted by the gravity model, it can be estimated that the coefficients of the GDP of partner countries and Mongolia are significant at the 1% level with a positive sign and that distance has a negative effect. With regard to statistically significant factors, trade openness and the trade freedom index have positive effects on Mongolia's trade, a finding that is also consistent with the expected results. However, results for per capita GDP and the WTO dummy are a bit complicated; their signs are negative. The negative sign of per capita GDP is presumably because of Mongolia's dominant trade with China, whose per capita income is still low. Regarding the WTO dummy, a possible reason could be that Mongolia has a stronger economic connection with non-WTO member nations than those under the WTO.

The adjacency dummy variable, which represents Russia and China, is added in the second equation of OLS regressions and is estimated to be significant at the 1% level. In particular, the estimate of 1.46 for the adjacency dummy implies that Mongolia's trade flows with Russia and China are more than 4.3 ($< \exp(1.46)$) times larger than those with other countries.

Because Russia and China are very important to Mongolia's trade, we ran regressions excluding these two countries to check the robustness of the gravity model, that is, to determine whether or not the gravity model would still be consistent. The regression results do not show a considerable difference in comparison with the previous results in terms of coefficient significance, coefficient values, and R-squares, confirming the robustness of the model.

Table 3: Regression Results on Mongolia's Total Trade

Explanatory variables	Model (1)			Model (2)			Model (3)		
	Coef.	t-statistic		Coef	t-statistic		Coef	t-statistic	
log(GDP - Partners)	1.37	15.37	***	1.31	13.84	***	1.34	13.93	***
log(GDP - Mongolia)	0.71	3.74	***	0.72	3.77	***	0.76	3.88	***
log(GDP per Capita - Partners)	-0.03	-0.19		-0.02	-0.16		-0.07	-0.50	
log(Distance)	-2.02	-13.41	***	-1.82	-10.15	***	-1.88	-10.02	***
log(Openness - Partners)	1.29	6.20	***	1.28	6.17	***	1.31	6.23	***
log(Openness - Mongolia)	4.01	3.24	***	3.95	3.20	***	4.07	3.21	***
log(Freedom - Partners)	1.50	2.61	***	1.74	2.81	***	1.85	2.77	***
log(Freedom - Mongolia)	-1.06	-0.67		-1.04	-0.66		-1.00	-0.61	
log(RER)	-0.07	-1.33		-0.04	-0.83		-0.06	-1.04	
WTO - dummy	-1.19	-3.07	***	-1.03	-2.53	**	-0.87	-1.99	**
Adjacency - dummy				1.46	2.70	***			
Constant	-28.82	-4.73	***	-30.89	-5.05	***	-32.79	-5.01	***
observations	728			728			702		
Adj R-squared	0.47			0.48			0.42		

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% levels.

Pooled OLS Regression

Model (1): All countries; without adjacency dummy

Model (2): Full set model (all countries, all variables)

Model (3): Excluding China and Russia

Table 4 provides the regression results of export and import flows. These results are slightly different from that of total trade flows. For instance, Mongolia's GDP is estimated to be insignificant in all regressions, and a partner's GDP per capita is estimated to be significant with a positive sign in the OLS regressions. The sign of real exchange rate (RER) is negative on the export side but positive on the import side, which is consistent with expected results. The adjacency dummy is estimated to have a positive sign and is significant at the 1% level on the export side. In comparison with the results for total trade, this coefficient is much larger, indicating that Mongolia's exports go mainly to its two neighbors (China and Russia); thus, Mongolia is highly dependent on their markets.

Table 4: Regression Result on Mongolia's Exports/Imports

Explanatory variables	Exports						Imports					
	Model (1)			Model (2)			Model (1)			Model (2)		
	Coef.	t-statistic		Coef.	t-statistic		Coef.	t-statistic		Coef.	t-statistic	
log(GDP - Partners)	1.91	16.25 ***		1.82	1.83 ***		1.32	13.28 ***		1.27	11.98 ***	
log(GDP - Mongolia)	0.23	0.76		0.23	0.29		0.74	3.31 ***		0.74	3.33 ***	
log(GDP per Capita - Partners)	0.54	3.07 ***		0.55	0.56 ***		-0.15	-1.01		-0.15	-0.98	
log(Distance)	-2.29	-12.06 ***		-1.96	-1.99 ***		-2.12	-12.31 ***		-1.93	-9.85 ***	
log(Openness - Partners)	1.52	5.40 ***		1.51	1.50 ***		1.34	6.12 ***		1.33	6.04 ***	
log(Openness-Mongolia)	3.65	2.49 **		3.56	3.68 **		3.01	2.24 **		2.96	2.21 **	
log(Freedom - Partners)	-0.91	-1.53		-0.51	-0.55		1.61	2.72 ***		1.84	2.87 ***	
log(Freedom - Mongolia)	-2.03	-1.14		-2.01	-2.08		0.12	0.07		0.14	0.08	
log(RER)	-0.22	-4.45 ***		-0.18	-0.18 ***		-0.03	-0.55		-0.01	-0.17	
WTO - dummy	-2.22	-5.32 ***		-1.96	-1.97 ***		-0.70	-1.50		-0.55	-1.11	
Adjacency - dummy				2.44	4.31					1.38	2.19 **	
Constant	-14.79	-1.97 *		-18.23	-18.42 **		-29.94	-4.67 ***		-31.90	-4.95 ***	
Observations	729			729			731			731		
Adj R-squared	0.55			0.55			0.40			0.41		

Note: *, **, and *** indicate significance at the 10%, 5%, and 1% level respectively.

Model (1): Without Adjacency dummy

Model (2): Including Adjacency dummy

Unlike in Table 3, we did not provide the result when we excluded China and Russia. In fact, this result is almost the same as the result of Model (2).

5. Conclusion

The determinants of trade flows between Mongolia and its trading partners have been investigated in this paper, and the influence of Mongolia's geographical location between Russia and China on its international trade patterns has also been examined. We have employed an augmented gravity model with panel data from 1995 to 2008 and econometric tools such as pooled OLS and fixed effect regressions. The empirical results are consistent with the implication of the gravity model, and the main variables were derived as expected, with only a few exceptions, including a negative sign for GDP per capita and the WTO dummy.

The impact of Mongolia's geographical location between China and Russia on its trade flow has been analyzed in two different ways in this paper. First, an adjacency variable was introduced to observe the deviations between other partners and the two neighbors. Second, we checked the robustness of the results by running regressions that omit Russia and China. The adjacency dummy shows a positive relationship with Mongolia's trade and the gravity model is robust irrespective of the inclusion of the two influential neighboring countries to Mongolia.

On the basis of the above empirical results, several policy implications can be drawn. First, Mongolia's trade policy may need to focus on the irresponsiveness of trade to its main factors, which makes Mongolia's trade insensitive enough to these key factors to take advantage of them or to lessen the risks caused by those factors. In addition, those making trade policy should consider the evidence supporting the dependency of Mongolia's trade on a few neighboring partners as well as the fluctuation of total trade and import flows stemming from RER.

In contrast, this paper also reveals some opportunities that could possibly be used as a solution for the abovementioned problems. Mongolia has an untapped potential to trade with high-income economies and expand its exports to those countries by developing the production of its good quality and high-priced products. In addition, Mongolia can expand its trade to farther countries by reducing transportation costs and diversifying its trade partners. Last, in terms of the relationship between domestic production and international trade, it has been revealed in this paper that Mongolia's import-substitution production is still weak. Therefore, apart from Mongolia's trade policy, even its economic policy can be focused on this aspect.

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APPENDICES

Appendix 1: Calculated Distances and their Calculation Procedure

Partners	Starting point	Middle and final destination	Distance between middle ports (km)	Total distance (km)	Mode
China	Ulaanbaatar	Beijing	1573	1573	rail
Russia	Ulaanbaatar	Weighted	5021	5021	rail
Japan	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Japan	2284	4008	sea
United States	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	San Francisco	10379		sea
	Tianjin	New York	19967	16897	sea
Korea	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Seoul	840	2564	sea
Germany	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Hamburg	20844	22568	sea
Canada	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Vancouver	9582		sea
	Tianjin	Montreal	19027	16028.5	sea
Switzerland	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Venice (Italy)	16764		sea
	Venice (Italy)	Bern	614	19102	land
United Kingdom	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Portland (GB PTL)	19953	21677	sea
Italy	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Naples (IT NAP)	16394	18118	sea
Kazakhstan	Ulaanbaatar	Ulan Ude	565		rail
	Ulan Ude	Yekaterinburg	3826		rail
	Yekaterinburg	Astana	825	5216	rail
Singapore	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Singapore (SG SIN)	5048	6772	sea
France	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Marseilles (FR MRS)	17142	18866	sea
Hong Kong	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Hong Kong (CN HOK)	2508	4232	sea
Australia	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Sydney (AU SYD)	9273	10997	sea
Ukraine	Ulaanbaatar	Ulan Ude	565		rail
	Ulan Ude	Yekaterinburg	3826		rail
	Yekaterinburg	Kiev	2093	6484	rail
Poland	Ulaanbaatar	Brest, Belarus	7200		rail
	Brest, Belarus	Warshaw	202	7402	train/ road
Netherlands	Ulaanbaatar	Tianjin	1724		rail

Partners	Starting point	Middle and final destination	Distance between middle ports (km)	Total distance (km)	Mode
Austria	Tianjin	Amsterdam (NL AMS)	20472	22196	sea
	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Venice (Italy)	16764		sea
Czech Republic	Venice (Italy)	Vienna	601	19089	land
	Ulaanbaatar	Brest, Belarus	7200		train
	Brest, Belarus	Warsaw	202		train/road
Belgium	Warsaw	Prague	619	8021	train/road
	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Ghent (BE GNE)	20353	22077	sea
Finland	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Helsinki (FI HEL)	22300	24024	sea
Hungary	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Venice (Italy)	16764		sea
Denmark	Venice (Italy)	Budapest	702	19190	train/road
	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Copenhagen (DK CPH)	21354	23078	sea
Sweden	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Gothenburg (SE GOT)	21226	22950	sea
Belarus	Ulaanbaatar	Brest, Belarus	7200	7200	rail
Malaysia	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Port Klang (MY PKL)	5380	7104	sea
Turkey	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Istanbul	15796	17520	sea
Bulgaria	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Bourgas (BG BOJ)	16050	17774	sea
Vietnam	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Ho Chi Minh City	4150	5874	sea
Spain	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Algeciras (ES ALG)	17966	19690	sea
Indonesia	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Jakarta	5652	7376	sea
Romania	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Constantza (RO CND)	16190	17914	sea
Israel	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Tel-Aviv	14600	16324	sea
India	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Mumbai	9534	11258	sea
Argentina	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Buenos Aires (AR BUE)	21170	22894	sea

Partners	Starting point	Middle and final destination	Distance between middle ports (km)	Total distance (km)	Mode
Kyrgyz Republic	Ulaanbaatar	Ulan Ude	565		rail
	Ulan Ude	Yekaterinburg	3826		rail
	Yekaterinburg	Astana	825		rail
	Astana	Bishkek	1116	6332	rail
Thailand	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Bangkok (TH BKK)	5062	6786	sea
Tunisia	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Tunis (TN TUN)	16533	18257	sea
Slovak Republic	Ulaanbaatar	Brest, Belarus	7200		rail
	Brest, Belarus	Warsaw	202		train/road
	Warsaw	Bratislava	640	8042	train/road
Mexico	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Mazatlan (MX MZT)	12740	14464	sea
Azerbaijan	Ulaanbaatar	Ulan Ude	565		rail
	Ulan Ude	Yekaterinburg	3826		rail
	Yekaterinburg	Baku	1992	6383	land
Latvia	Ulaanbaatar	Ulan Ude	565		rail
	Ulan Ude	Yekaterinburg	3826		rail
	Yekaterinburg	Riga	2199	6590	land
New Zealand	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Auckland (NZ AKL)	10393	12117	sea
Kuwait	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Kuwait (KW KWI)	12129	13853	sea
Lithuania	Ulaanbaatar	Ulan Ude	565		rail
	Ulan Ude	Yekaterinburg	3826		rail
	Yekaterinburg	Vilnius	2202	6593	land
Norway	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Bergen	21255	22979	sea
Ireland	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Dublin	20137	21861	sea
Chile	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	San Antonio	19492	21216	sea
Brazil	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Rio de Janeiro	21207	22931	sea
Saudi Arabia	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Dammam	11834	13558	sea
Slovenia	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Koper	16724	18448	sea
Philippines	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Manilla	3111	4835	sea

Partners	Starting point	Middle and final destination	Distance between middle ports (km)	Total distance (km)	Mode
Georgia	Ulaanbaatar	Ulan Ude	565		rail
	Ulan Ude	Yekaterinburg	3826		rail
	Yekaterinburg	Tbilisi	2028	6419	land
Colombia	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Buenaventura	16548	18272	sea
United Arab Emirates	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Abu Dhabi	11469	13193	sea
Greece	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Athens	15472	17196	sea
Estonia	Ulaanbaatar	Ulan Ude	565		rail
	Ulan Ude	Yekaterinburg	3826		rail
	Yekaterinburg	Tallinn	2101	6492	land
Luxembourg	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Ghent	20353		sea
	Ghent (BE GNE)	Luxembourg	279	22356	rail/road
Sri Lanka	Ulaanbaatar	Tianjin	1724		rail
	Tianjin	Colombo	7921	9645	sea

Distance calculation procedure:

- All distances are from Ulaanbaatar and sea distances calculated from Tianjin port in China
- All distances are calculated to capital cities or major ports closest to Ulaanbaatar suggested by data sources
- If railroad connections are not clear, simple road distances by Google Earth are used
- If data on land distances are not available, approximation is used
- Distances to East European countries (those close to Russia) and Central Asian countries are calculated by railway through Russia
- Distances to the United States and Canada are averaged from closest and farthest densely populated areas because of big gaps between main ports
- In the case of Russia, distances are weighted throughout trans-Siberian railway cities from Ulan-Ude to Moscow

Sources:

Distances between sea ports:

- <http://www.portworld.com>
- <http://www.searates.com>

Distances through railroads:

- UNESCAP Project on "Operationalization of international intermodal transport corridors in North-East and Central Asia "
- http://train.spottingworld.com/Trans-Siberian_Railway
- Google Earth 5.0.11733.9347

Appendix 2: Correlation Matrix and Variance Inflation Factor Estimation of Explanatory Variables

a) Correlation Matrix

	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13
1	log(GDP - Partners)	1.000												
2	log(GDP - Mongolia)	0.140	1.000											
3	log(GDP per Capita - Partners)	0.529	0.179	1.000										
4	log(GDP per Capita - Mongolia)	0.141	0.999	0.177	1.000									
5	log(FDI to Mongolia)	0.109	0.858	0.164	0.834	1.000								
6	log(Distance)	0.173	-0.011	0.493	-0.011	-0.008	1.000							
7	log(Trade/GDP ratio - Partners)	-0.501	0.157	0.055	0.151	0.186	-0.135	1.000						
8	log(Trade/GDP ratio - Mongolia)	0.028	0.287	0.069	0.242	0.632	-0.008	0.140	1.000					
9	log(Trade Freedom Index - Partners)	0.085	0.179	0.591	0.174	0.197	0.208	0.266	0.139	1.000				
10	log(Trade Freedom Index - Mongolia)	-0.004	0.149	0.048	0.113	0.421	0.002	0.101	0.713	0.102	1.000			
11	log(RER)	-0.158	-0.004	-0.510	-0.004	-0.011	-0.425	-0.007	-0.009	-0.231	-0.016	1.000		
12	WTO member - dummy	0.291	0.085	0.437	0.083	0.100	0.425	-0.065	0.068	0.251	0.024	-0.239	1.000	
13	Adjacency - dummy	0.190	0.000	-0.187	0.000	-0.008	-0.471	-0.129	-0.011	-0.298	-0.014	0.055	-0.322	1.000

b) Variance Inflation Factor

Variable	VIF	1/VIF	Variable	VIF	1/VIF
log(GDP - Mongolia)	10791.59	0.0001	log(Distance)	2.09	0.4787
log(GDP per Capita - Mongolia)	9839.57	0.0001	log(Trade/GDP ratio - Partners)	1.98	0.5063
log(FDI to Mongolia)	31.55	0.0317	log(Trade Freedom Index - Partners)	1.93	0.5189
log(Trade/GDP ratio - Mongolia)	9.79	0.1022	Adjacency - dummy	1.69	0.5921
log(GDP per Capita - Partners)	4.33	0.2309	log(RER)	1.56	0.6431
log(GDP - Partners)	3.09	0.3233	WTO member - dummy	1.43	0.6972
log(Trade Freedom Index - Mongolia)	2.32	0.4304	Mean VIF	1591.76	