COMPETITION AND THE DISTANCE PUZZLE

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COMPETITION AND THE DISTANCE PUZZLE

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Competition and the Distance Puzzle

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DECLARATION OF ORIGINALITY

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ABSTRACT

Competition and the Distance Puzzle

This thesis aims to investigate the empirical relevance of the impact of sectoral competition on the increasing negative impact of geographic distance on international trade flows vis-a-vis the secular decline in the transportation and communication costs, which is known as the distance puzzle. Using disaggregated trade data, I find that as the international markets become more competitive; bilateral trade becomes more elastic to distance. My analysis reveal that increasing competition explains 20% of changes in the distance elasticity of trade between 1976 and 2016.

I examine alternative hypothesis to explain the rising distance effect. My results imply that declining average tariff rates reduce the importance of distance on trade. I find that goods with increasing elasticity of substitution are likely to be more distance elastic over time. I also find that differentiated products are less distance sensitive compared to homogenous goods.

ÖZET

Rekabet ve Uluslararası Ticarette Uzaklık Etkisi

Bu yüksek lisans tezinde uluslararası ticaretteki rekabet seviyesi ile literatürde uzaklık yapbozu olarak adlandırılan ve zaman içerisinde düşmekte olan taşıma ve iletişim maliyetlerine rağmen artış gösteren uzaklığın ticaret üzerindeki negatif etkisi ampirik olarak incelenmiştir. Sektör seviyesinde ticaret verisi ile yapılan analizler uluslararası ticaret piyasaların rekabet düzeyindeki artışın ticaretin uzaklık elastikiyetini arttırdığını göstermiştir. Yaptığım analizler rekabetteki artışın 1976 ve 2016 yılları arasında artan uzaklık etkisinin 20%'sini açıklayabildiğini göstermiştir.

Artan uzaklık etkisini açıklamak amacıyla farklı hipotezler de incelenmiştir. Analizlerime göre gümrük vergilerindeki düşüş uzaklığın uluslararası ticaret üzerindeki negatif etkisini zaman içerisinde azaltmıştır. Ayrıca zaman içerisinde ikame esnekliği artan ürünlerin ticaretinde uzaklığın daha önemli hale geldiği gözlenmiştir. Bir diğer bulgu da, farklılaştırılmış ürünlerin ticaretinde uzaklığın öneminin diğer ürünlere göre daha az olduğu saptanmıştır.

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CHAPTER 1

INTRODUCTION

One well-known trade cost is the distance that a product travel to reach a particular market. Distance increases the cost of trade distinctly/directly via transportation costs. On the other side, accessing information in more distant markets are also more costly. Over the second half of the twentieth century distance related costs of trade decreased dramatically.[1] Besides the cost of transportation, thanks to the advances in technology, the cost of information, communication, and search also fell over second half of the twentieth-century. One way to measure the changing effect of distance on trade is to estimate distance elasticity of trade from gravity regressions in different periods. Despite the major advancements in communication technology and dramatically decreasing transportation costs, most studies, using gravity models, emphasize an increase in the negative effect of distance on trade.[2] In international trade literature, this phenomenon called as distance puzzle or missing globalization puzzle.

In this study, we aim to explore the relation between global competition and increasing negative effect of distance on trade. As international trade barriers moderate countries with limited access to international markets will start to export more to remote markets. On the other hand, the countries previously protected by high trade costs will shift their trade to closer markets as a result of their relatively declining competitive power. In other words, as the international trade markets become more competitive; trade is expected to become more elastic with respect to

[1]Commercial jet air transport costs fell by 90% from 1955 to 2004 (Hummels (2007, figure 1)).

[2]Disdier and Head (2008) perform a meta-analysis estimates of the distance coefficient using data from 51 papers that employ gravity equations. Their results imply that there is an increasing impact of distance on trade on the order of about 20%.

trade costs. We, therefore, hypothesize that as the international competition increases the negative effect of distance on trade increase as well.

I firstly estimate gravity equations for each sector at 4-digit SITC level covering 1976 to 2016 periods. I use Herfindahl-Hirschman's market concentration ratio to measure international competition at 4-digit sector level. In the second step of my analysis, I investigate the relations between distance coefficients estimated via gravity equations and calculated Herfindahl-Hirschman Indices. To do so, I regress Herfindahl-Hirschman Index on estimated distance coefficients. Regression results are in line with my initial hypothesis which points out a positive relationship with competition and the negative effect of distance on trade. In other words, results reveal that increasing competition raises the distance sensitivity of trade.

Furthermore, I investigate the evolution of distance elasticities accordingly to their elasticity of substitution, product types (differentiated products or not), and exposed tariff rates. Findings show that more elastic products are tend to be more distance elastic. Similarly, differentiated product are also inclined to be more distance elastic. On the other hand, higher tariff rates also leads to more distance elasticity.

In the Appendix A, I analyze the relationship between competition and distance effect by segmenting products accordingly to their product type, mean and median levels of tariff rate and elasticity of substitution, in order to have more deeper understanding on the relationship.

In the Appendix B, I extend my study to investigate the impacts of China's WTO accession on calculated Herfindahl-Hirschman Index and estimated distance coefficients. To do so, I calculate Revealed Comparative Advantage Index of China at 4-digit industry-level for the period before the WTO accession. I hypothesize that, by using his competitive power, China will change the competition structure of industries in his priorly advantageous sectors. In this manner, I investigate the impact of China's deeper penetration to global markets on the distance coefficients, especially for the products in which China has comparative advantage.

The most important and distinctive contribution of my thesis to the literature is, I am exploring the relationship between the industry-level competition and distance elasticity of trade for the first time in this thesis.

This paper organized as follows. First section introduces related literature on the puzzling effect of distance and examines the gravity theory and discusses most relevant methodology to employ in this paper. Following section explains the empirical methodology applied in analysis. Third section introduces the features of data and summary statistics. Fourth chapter represents the findings and discussion on the results. Last chapter concludes.

CHAPTER 2

RELATED LITERATURE ON THE DISTANCE EFFECTS

2.1 Declining Distance Related Trade Costs

Several studies are documenting the evidences for the decreasing distance related costs of trade. There is a tremendous increase in total world trade around 70s, which goes hand in hand with the significant developments in international transportation sector. One of the major technological development over the 20th century is containerization; which transformed the transportation industry as Bernhofen, El-Sahli and Kneller (2016) claims. Authors document that containerization dramatically lowered the cost and time of shipping of manufactured goods especially after the 1970s. Besides the advancement of containerization, transportation costs also fell in aviation sector. Hummels (2007) documents that commercial jet air transport costs fell by 90% from 1955 to 2004. OECD Economic Outlook Report (2007) also documents that international calling costs, passenger air transportation and sea freight costs are falling down since 1930.

Another important aspect of technological advancement is the spread of Internet-based communication. Internet-based communication technologies (e-mail, price comparison, retail and wholesale web sites, cloud technologies, etc.) let information to flow fast and almost cost-less over long-distances. Accordingly to OECD data, use of broadband internet connection doubled between 2004 to 2010.

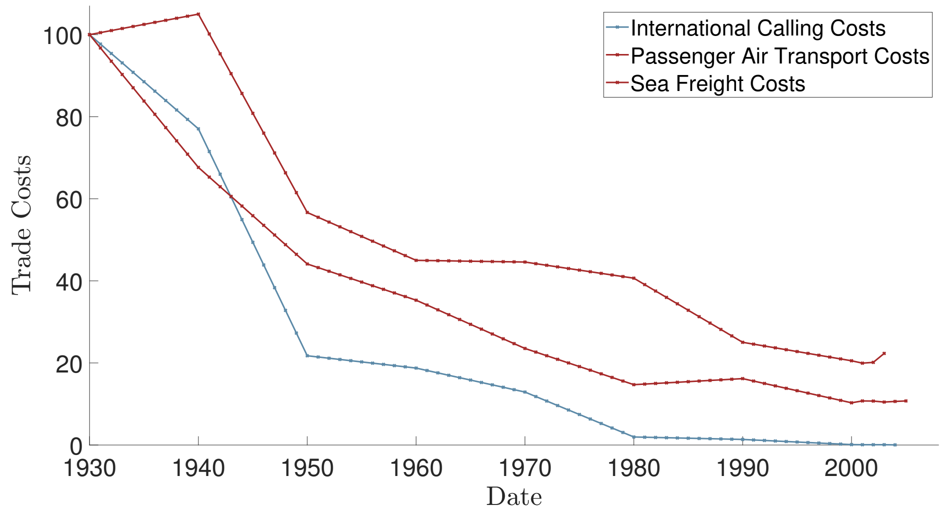

Figure 1. International calling, passenger air transportation, sea freight costs relative to 1930.

2.2 Literature on Rising Distance Effect

Despite the decreasing distance related cost of trade, number of studies document evidence on the increasingly negative impact of distance on international trade.

Frankel et. al. (1997) estimates the naive form of gravity equation using OLS and finds that a 10% increase in the distance would have led between 4.4% and 4.8% less trade in the 1960s and around 7.3% and 7.7% less trade in the 1990s.

Disdier and Head (2008) perform a meta-analysis on the estimates of the distance coefficients using data from 103 papers that employ gravity equations. Authors derive 1467 different gravity results from these papers. Accordingly to authors calculations, mean value of distance coefficients from 103 paper is -0.63 before 1969, -0.90 for the 1970s and -0.95 after 1990. Their calculations imply that there is an increasing impact of distance on trade on the order of about 50 percent since 1969. Authors employ a meta-regression model to systematically analyze the results of different studies. In their model, they control for the specification of the gravity model, set of control variables used in the estimation, set of econometric corrections and journal quality of publications. Meta-regression estimation results reveal that the negative effect of distance on trade is 37% higher after 1990 compared to the 1970 to 1969 period. They also document that industry-level estimation of gravity equations tend to yield higher distance effect compared to the use of aggregated trade data.

Another approach to analyze market integration is examining the relative price movements across regions. Engels and Rogers (1998) explore the market integration by analyzing relative price movement across regions and countries. They find evidence that distant markets are less integrated compared to closer markets.

Carrera and Schiff (2005) calculate the average distance of trade by weighting bilateral distances to share of the trade flow in total trade for a country. They use Comtrade data to calculate the average of distance trade for 150 countries from 1962 to 2000. They find that the average distance of trade is around 5500 kms for an average country in world whereas it is about 4390 km for OECD countries and 6540 km for non-OECD countries. They also document the changes of average distances of trade by estimating the trend of average distance of trade over time. Their estimation results show a negative trend of average distances of trade especially for the developed economies. Their findings verify rising distance elasticity of trade over time estimated via gravity equations.

Carrère et al. (2013) calculate a ratio to measure the potential trade between countries based on the ratio of gross-domestic products and distance between countries. They analyze the evolution of the ratio, called actual versus potential average distance of trade (ADR), by income groups of countries. They find that ADR is falling for low-income countries on the other hand it fluctuates around 1 for rich countries between 1970 and 2006. A falling ADR for poor countries implies that poor countries increase their trade with relatively closer countries. Carrere et al. discuss that puzzling distance effect is only pertinent for poor countries.

There are different explanations and solution attempts for the puzzling effect of distance on trade. I mention several of them in the following part of this section.

In related work, Brun et al. (2005) implement panel estimation of gravity model over 1962 to 1996 period including 130 countries using IMF DoTS dataset. They find that the coefficient on distance has increased 11% in absolute terms over the last 35 years. Furthermore, Brun et al. define an augmented transport cost function based on the indexes of infrastructure, price of oil and trade composition. They add the augmented trade function into the log-linear form of gravity equation. Additionally, they split their dataset into high-income and low-income countries. They find that elasticity of trade with respect to the distance has no trend for low income countries whereas it has a falling trend only for high-income countries.

Rauch (1999) classifies commodities as differentiated, reference priced and organized exchange goods and estimates gravity equation for each class of goods. Rauch finds that the negative effect of distance on trade declined between 1970 to 1990.

In the standard estimation procedure of gravity equation using ordinary least squares (OLS), non-trading country pairs are excluded from the estimation due to log-linearization. It is argued that excluding country pairs with zero trade would result in selection bias. There are studies incorporating zero trade flows into the estimation. Disdier and Head (2008) examine these researches and documents that including zero trade flows leads to a less rise in the distance effect over time. Santos

Silva and Tenreyro (2006) introduce a new methodology to estimate gravity equation with Poisson pseudo maximum likelihood (PPML) which allows including zero trade linkages into the analysis. They discuss gravity equations should be estimated in their multiplicative form rather than log-linearized form. Santos Silva and Tenreyro's discuss that that log-linearization of gravity model leads to biased estimators under the presence of heteroscedasticity. They document that using the multiplicative form of gravity model and estimating it with PPML is robust to heteroscedasticy. Santos Silva and Tenreyro apply PPML only to 1990 data and find smaller level of distance effect compared to findings in the literature. Coe et al. (2007) employ PPML to estimate gravity model using IMF DoTS dataset for 1975-2000 period, and find declining distance effect between 1990-2000.[3] On the other hand, Bosquet and Boulhol (2015) estimate gravity equations of bilateral trade between 1948 and 2006. Their estimation results suggest a stationary or slightly rising distance effect contrary to Coe et al. findings.

Berthelon and Freund (2008) examine bilateral trade data to decompose increasing distance effect into two components. They argue that overall share of short distance traded goods in trade may increase and they name it as compositional effect. They also discuss that increasing distance sensitivity of large number industries may dominate the distance elasticity of trade. They document that compositional changes towards to short distance traded goods do not explain the puzzling distance phenomena. Their evidences show that increasing effect of distance is due to rising distance sensitivity in about 40% of industries.

This thesis differ from the previous literature by exploring the relationship

[3]Coe et al. find declining distance effect between 1980 and 1989 but the coefficient is statistically insignificant. They also conduct panel estimation using IMF DoTS dataset for 1975-2000 and find rising distance effect by using OLS.

between competition and distance elasticity of trade for the first time to solve the so-called distance-puzzle. Another distinctive feature is the use of 4-digit industry level data for wide range of period. Thanks to use of industry level data, the rising effect of distance and market concentration compositions are documented in detail. Also, as a preliminary for future research, the impact of China's WTO accession on the distance elasticity of trade and international competition are explored for the first time in this thesis.

2.3 Gravity Theory

Most prevalent way of identifying movements in the effect of distance on trade over time is by comparing the distance coefficients obtained from the estimation of gravity equations in different years. Thus, I introduce the features of gravity equations in this section.

Gravity model has used widely in applied international trade literature to analyze the regularities and the effects of trade related policies in international trade and production, for a long time. The basic gravity model describes bilateral trade as proportional to the product of the incomes of the two countries and inversely related to the distance between them. Therefore, gravity model enable us to calculate the magnitude of the distance effect on trade. Gravity equations are widely used for the analysis of bilateral trade determinants for a long time since it firstly introduced by Tinbergen (1962). Basic form of gravity equation express bilateral as the following.

$$X_{ni} = G\frac{Y_i^a Y_n^b}{\phi_{ni}} \tag{1}$$

Where X_{ni} is the export of country i to country n, Y_n and Y_i are economic sizes of country n and i, G is gravitational constant. ϕ_{ni} stands for the bilateral trade costs between two countries like distance, adjacency, tariff barriers etc.

One of the advantage of gravity equation is it is easy to apply it to the real world data. Basic gravity equations can be easily estimated in its log-linear form rather than multiplicative form by using ordinary least squares. Empirical applications of basic gravity model captures the facts that bilateral trade is roughly proportional to economic sizes of countries and inversely related to the bilateral distances. Leamer and Levinson (1995) have discussed that gravity model of trade is one of the most successful empirical models in economics. Ease of application and successful fit in data made gravity model of trade so popular among economist for a long time. However, basic form of gravity model has pitfalls.

Basic form of gravity model concentrates on only one specific trade route excluding the impacts of other trade routes on that particular trade route. More clearly, bilateral trade between country n and i is also related to the bilateral trade between country n and j. For example, consider the bilateral trade between countries i and n in case of a major change (such as a preferential trade agreement between n and j) in trade cost between countries n and j. In that case, it is possible for country i to export more from country j rather country n. In the basic gravity model, reducing trade costs on one bilateral route does not have an impact on any other trade routes which contradicts to the economic theory. [4] Another problem with the basic gravity model is it do not consider the impact of relative price changes on bilateral trade. For example, a fall in price of oil, which lowers transportation costs, leads to a proportional increases of trade on all the routes. However, in reality, such a

[4]Note that from equation (1), $\frac{\partial X_{ni}}{\partial \phi_{ji}} = 0$.

fall in transportation cost would increase within country trade while not affecting international trade of a country.

Anderson and Van Wincoop (2003) construct the theoretical foundations of gravity equations called as structural gravity model in their seminal ”Gravity with Gravitas” paper. Their model address the pitfalls of basic gravity model. Anderson and Van Wincoop derives a demand function for trade by using constant elasticity of substitution for consumer preferences and following Krugman (1979) on the production side. In their model, consumers’ utility is increasing as the variety of product increases. In other words, consumer side have the ‘love of variety’. On the production side, large number of firms produce unique products under the increasing returns to scale. Producers can sell their goods to their country and also able to export to other countries. Exporting locally produced goods involves transportation cost, but selling goods locally do not involve transportation cost for the sake of simplicity. Therefore, consumers can consume variety of goods both produced locally or imported from all other countries. Anderson and Van Wincoop aggregates the firms production functions to derive the export function of the country.

Structural gravity model is expressed in mathematical forms as in the follows;

$$X_{ni} = \underbrace{\frac{Y_i}{\Omega_i}}_{S_i} \underbrace{\frac{X_n}{\Phi_n}}_{M_n} \phi_{ni} \tag{2}$$

where $Y_i = \sum_n = X_{ni}$ is the exporter’s total value of production and $X_n = \sum_i X_{ni}$ is the value of importer’s expenditure on all imported goods. ϕ_{ni} is the bilateral accessibility of importer n to exporter i or vice versa. Φ_n and Ω_i are ”multilateral resistence” terms defined as follows. In a simple denotation of equation (2) S_i and M_n stands for exporter capabilities and importer capabilities, respectively.

$$\Phi_n = \sum_{\ell} \frac{\phi_{n\ell} Y_\ell}{\Omega_\ell} \quad \text{and} \quad \Omega_i = \sum_{\ell} \frac{\phi_{\ell i} X_\ell}{\Phi_\ell} \tag{3}$$

Inclusion of multilateral resistance terms is the most distinctive feature of Anderson and Van Wincoop's structural gravity model. Φ_n stands for inward multilateral resistance and it captures dependence of country n to all the other possible import routes. Ω_i is called outward multilateral resistance term which stand for the exporters dependence on all the other export markets. These two terms resolve the problems of basic gravity model discussed in the above. [5] Multilateral terms include trade costs across all bilateral trade routes into the model. In other words, bilateral trade flows are affected from the changes in trade costs in alternative trade routes in structural gravity model of trade.

Common practice for estimating of structural gravity model involves taking logs of equation (2) and using country specific importer and exporter fixed-effects for the multilateral resistance terms. Head and Mayer (2013) discuss that using fixed-effect estimation method for exporter and importer has also advantage of controlling for the country specific unobservable tendencies which shifts the level of exports or imports of a country. I estimate gravity equation using fixed-effect methodology; details are discussed in the following section.

[5] Note that from equation (2), $\frac{\partial X_{ni}}{\partial \phi_{ji}} \neq 0$.

CHAPTER 3

METHODOLOGY

We estimate log-linear form of structural gravity model as the following.

$$\ln x_{z,ij} = \alpha_i + \alpha_j + \sigma \ln Distance_{ij} + \mu_{ij} + \varepsilon_{ij} \tag{4}$$

where $\ln x_{z,ij}$ is the logarithm of exports of country i to country j and $Distance_{ij}$ is the distance between these countries. α_i and α_j stand for exporter and importer country fixed effects, respectively. Country fixed effects capture country specific determinants of trade such as income,comparative advantage, openness, inward and outward multilateral resistances. σ is the elasticity of bilateral trade with respect to distance. μ_{ij} is a set of variables controlling for bilateral 'linkages' between two countries. [6] I estimate gravity equation at 4-digit product level and store the distance coefficients for the second step analysis. I estimate gravity equations separately for each sector in each year; thus, I do not include time-specific product fixed effects and time-specific product fixed effects into log-linear form gravity equation.

I estimate equation (1) for each year and industry separately to track the changes of the distance coefficient over time and between industries. In other words, we are not pooling the data.[7]

I use one of the well-known concentration measure, Herfindahl Hirschman Index, as a proxy for product level competition on international markets. I calculate

[6]Another way of controlling for country pair specific determinants of trade is to use dummy variables for each country instead of dyadic set of variables.However, it would lead to too many dummy variables to estimate. In some sectors, number observations are insufficient to estimate that many variables.

[7]If I prefer to pool the data, than I should employ time-varying exporter and importer fixed-effects and industry-fixed effects. Therefore, it would lead to vast number of dummies to be estimated.

Herfindahl-Hirschman Index (HHI) based on the market share of each country in international markets for each particular product at 4-digit level.

$$\text{HHI}_{i,t} = \sum_{i}^{n} s_j^2 \tag{5}$$

where j is exporter and s_j is the market share of exporter j for the product i in year t. HHI is calculated between zero to one range and a sector is perfectly competitive if HHI is equal to zero and there is only one producer if it is equal to one.

I analyze the relation between calculated market competitiveness and estimated distance effect by estimating the following equation.

$$\sigma_{i,t} = \beta_0 + \beta_1(\chi_{i,t}) + \mu_i + \gamma_t + \varepsilon_i \tag{6}$$

Where $\sigma_{i,t}$ is the distance coefficient in industry i in period t estimated in the first step, and χ_i stands for other variables including the industry concentration ratio (HHI), Rauch's product classification, elasticity of substitution and average tariff rates. Use of additional variables have the advantage of preventing omitted variables bias.

Additionally μ_i is the time-specific industry fixed effect, γ_t is year fixed effect and ε_i is the error term. Year fixed effect and time-specific product fixed effects control for industry and time-specific determinants of elasticity of trade.

Regression estimates based on the equation (2) investigates the overall relation between distance coefficient and aforementioned variables including calculated market concentration indices, namely Herfindahl Hirschman Indices (HHI). I examine the interactions between the change of distance coefficient and the change of market concentration indices over time by estimating following equation to investigate the underlying reasons behind the rising distance effect over time.

$$\Delta\sigma_{i,t} = \beta_0 + \beta_1(\chi_{i,t-1}, \Delta\chi_i) + \mu_i + \varepsilon_i \tag{7}$$

Where Δ represents the change of variable.[8] Additionaly μ_i is industry fixed effect, γ_t is year fixed effect and ε_i is the error term.

I prepare different datasets and apply different econometric setting to address several empirical problems. I discuss the details of all datasets in the following data section but I introduce the empirical causation for the need for this datasets in this part. Firstly, I prepare a balanced dataset to make data comparable across periods and to exclude new trade from data to have a deeper understanding about relationship between estimated distance coefficient and Herfindahl Hirschman Indices. Secondly, I take the averages of bilateral trade for 4 consecutive years for two different time intervals. Using averaged data has the advantage of minimizing the effects of idiosyncratic shocks to an industry or country in any given year. [9]

To address the fact that the dependent variable is estimated with error; we use the weighted least squares, where the weights are based on the inverse of the standard errors of the distance coefficients from the first stage. Thus we attached more weight to observations with more precisely estimated distance coefficients. I also present the results with unweighted least squares.

[8] I calculate changes of variables through taking straight differences of two consecutive period.
[9] Averaged dataset actually yields more significant results compared to other datasets.

CHAPTER 4

DATA

I use Standard International Trade Classification Revision 2 (Sitc Rev.2) 4-digit industry-level bilateral trade data between 1976 and 2016 from Comtrade. Comtrade data includes import, export, re-import and re-export values between countries for each industry. It is generally believed that the importer-reported data are more reliable because customs authorities require accurate record of imports. Following the common belief, I use importer reported bilateral trade values in gravity estimations.

I use a set of dummy variables in the estimation of gravity equation to identify the particular links between country pairs. I use CEPII's GeoDist database for these dyadic control variables. I use GeoDist's simple distance variable in the estimations of gravity equations.[10] Also, several other measurable factors affecting bilateral trade such as two trading country shares a common land border or not, or existence of colonial relationships are controlled using the GeoDist dataset. [11]

We use Rauch's (1999) work to divide goods into different types. Rauch classify goods into two main separate categories : homogeneous goods and differentiated goods. Homogeneous goods are the well-defined goods where brand and producer are relatively not important. It is vice versa for the differentiated goods. Furthermore, he divides homogeneous goods into two sub-types: referenced priced goods and goods traded on an organized exchange, such as metals. Reference priced

[10] GeoDist defines simple distance variable as the distance between most populated cities of two trading partners. There are also other distance measures such as weighted distance or distance between capitals of two countries. Using any of these distance measures do not yield significantly different outcomes.

[11] Followings are included as dummy variables, $contig_{ij}$: Common land border, $comlangoff_{ij}$: Common official language, $comlangethno_{ij}$: A language is spoken by at least 9% of the population, $colony_{ij}$: Colonial relationship, $comcol_{ij}$: Colonized by the same power, $curcol_{ij}$: Currently in colonial relationship, $col45_{ij}$: Colonial relationship post 1945.

goods are not branded goods and not traded on an organized exchange but price information for such goods are known by the market. I group reference priced goods and homogeneous goods and name all the left as differentiated products following Berthelon and Freund (2008). Summary statistics on the product classification are available in Table 3.

Broda and Weinstein (2006) calculates elasticity of substitution values by industry for 1972-1988 and 1990-2001 periods by using Sitc Rev.2 for the first period and Sitc Rev.3 for the second period. I use Broda and Weinstein's 1972-1988 data with my 1985-1989 datasets. Also, I use their 1990-2001 data with 2001-2004 datasets. In the second datasets, I just use industries in which 4-digit codes remain unchanged. In the estimation of elasticity of substitutions, they follow the Feenstra (1994) methodology. They apply a structural estimation based on the constant elasticity demand function. Summary statistics on the elasticity of substitution are reported in Table 3.

I use average most-favored nations (MFN) tariff data by industry from World Integrated Trade System (WITS). I use 1988-1990 average tariff data (earliest period available) with my 1985-1989 datasets and 2001-2004 average tariff data with my 2001-2004 datasets. [12] I present summary statistics for average MFN tariff data for both period in Table 3.

In the estimation of gravity equation at industry-level, I drop some sector due to lack of observations. I have 10 explanatory variables in gravity estimation. In order to have decent results, I drop sectors with observations lower than 100 in a year.

[12] WITS defines MFN as follows "In current usage, MFN tariffs are what countries promise to impose on imports from other members of the WTO unless the country is part of a preferential trade agreement (such as a free trade area or customs union). This means that, in practice, MFN rates are the highest (most restrictive) that WTO members charge one another".

Before moving on the second step, I drop the results obtained from first step above or below the 1 and 99 percentiles to eliminate outliers. I document the details of dropped observations in Table 1.

Table 1. Number of Outliers

	1976-2016	1985-1989	2001-2004	1985-1989*	2001-2004*	1985-1989**	2001-2004**
Distance Coefficients	618	76	60	74	58	14	14
Herfindahl Hirschman Index	606	74	60	72	58	14	14
Observation	30,929	3,800	3180	3,710	2,968	742	742

* Balanced Datasets.
** Averaged Datasets.

As it is stated above, I estimate gravity model of trade in the first step estimation. I keep track of significance of estimated distance coefficients in the first step. As I mentioned before, I use weighted least squares in my second procedure based on the inverse of the first step standard errors of the estimated distance coefficients. Table 2 reports the number of significant and insignificant number of distance coefficients in each dataset estimated in the first step of my work. Percentage of significance is almost identical among all datasets except for averaged datasets. Averaged datasets has the highest significance ratio; indicating that distance coefficients are estimated more precisely using averaged datasets.

Table 2. Significance Statistics for Estimated Distance Coefficients

	1976-2016	1985-1989	2001-2004	1985-1989*	2001-2004*	1985-1989**	2001-2004**
Significant	27,865	3,420	2,751	3,309	2,692	707	700
	[93.81]	[93.70]	[93.57]	[92.85]	[94.39]	[99.02]	[98.04]
Insignificant	1,840	230	189	255	160	7	14
	[6.19]	[6.30]	[6.43]	[7.15]	[5.61]	[0.98]	[1.96]
Observation	29,705	3,650	2,940	3,564	2,852	714	714

Percentages in brackets.
* Balanced Datasets.
** Averaged Datasets.

Table 3. Descriptive Statistics

	Mean	Standard Deviation	Min	Median	Max	NOI	Observations
1976 - 2016							
Distance Coefficients	-0,95	0,32	-1,72	-0,98	0,01	780	29,705
HHI	0,14	0,08	0,05	0,12	0,54	780	29,705
1985 - 1989							
Distance Coefficients	-0,91	0,30	-1,60	-0,93	0,01	759	3650
HHI	0,15	0,07	0,05	0,12	0,51	759	3650
Differentiated Goods*	0,60	0,49	0,00	1,00	1,00	602	2913
Elasticity of Substitution	5,59	10,49	1,15	2,80	103,03	602	2913
Average Tariffs	19,50	10,02	2,14	17,36	63,23	568	2748
2001 - 2004							
Distance Coefficients	-0,97	0,32	-1,68	-1,00	-0,02	755	2940
HHI	0,13	0,07	0,05	0,10	0,55	755	2940
Differentiated Goods	0,59	0,49	0,00	1,00	1,00	493	1935
Elasticity of Substitution	4,52	7,07	1,13	2,49	92,26	493	1935
Average Tariffs	10,47	6,25	2,03	8,60	54,55	471	1851
1985 - 1989**							
Distance Coefficients	-0,90	0,29	-1,59	-0,93	0,01	739	3564
HHI	0,166	0,09	0,06	0,14	0,56	739	3564
Differentiated Goods*	0,60	0,49	0,00	1,00	1,00	599	2899
Elasticity of Substitution	5,62	10,67	1,15	2,78	103,03	599	2899
Average Tariffs	19,51	10,06	2,14	17,30	63,23	565	2734
2001 - 2004**							
Distance Coefficients	-0,98	0,31	-1,71	-1,00	-0,04	730	2852
HHI	0,16	0,10	0,04	0,13	0,82	730	2852
Differentiated Goods*	0,59	0,49	0,00	1,00	1,00	487	1911
Elasticity of Substitution	4,42	6,90	1,13	2,45	92,26	487	1911
Average Tariffs	10,55	6,25	2,03	8,71	54,55	464	1823
1985 - 1989***							
Distance Coefficients	-1,06	0,28	-1,69	-1,09	-0,24	714	714
HHI	0,17	0,08	0,06	0,14	0,55	714	714
Differentiated Goods*	0,60	0,49	0,00	1,00	1,00	580	580
Elasticity of Substitution	5,86	11,69	1,15	2,78	103,68	580	580
Average Tariffs	19,50	10,05	2,14	17,30	63,23	580	580
2001 - 2004***							
Distance Coefficients	-1,12	0,30	-1,79	-1,14	-0,21	714	714
HHI	0,15	0,10	0,05	0,13	0,58	714	714
Differentiated Goods*	0,60	0,49	0,00	1,00	1,00	480	480
Elasticity of Substitution	4,44	6,94	1,13	2,45	92,26	480	480
Average Tariffs	10,52	6,24	2,03	8,69	54,55	457	457
Changes of Variables****							
Distance Coefficients	-0,06	0,19	-0,87	0,07	0,72	742	742
HHI	-0,01	0,09	-0,45	-0,10	0,59	742	742
Elasticity of Substitution	-0,17	8,2	-36,82	-0,21	84,33	451	451
Average Tariffs	-8,54	5,57	-30,37	-7,59	4,37	451	429

* Binary Variable.
** Balanced Datasets.
*** Averaged Datasets.
**** Changes of Variables between 1985-1989 to 2001-2004.

During the merge process of my first step results with Rauch's product classification, elasticity of substitution and average MFN tariff data, a number of observations are lost. I lose 737 observations due to merging with product classification and elasticity of substitutions and extra 165 observation are lost as a result of merging with tariff data for the 1985-1989 period. In the second dataset, I lose 1005 observations after merging my first step results with product classification and elasticity of substitution and other 84 observations while merging them with tariff data. I lose more observations in the second dataset; since the elasticity substitution data is only available in Sitc Rev.3 format on the other hand my dataset is Sitc Rev.2. Number of lost observations can be calculated using the number of observations column in the Table 3 for each type of dataset.

CHAPTER 5

RISING DISTANCE EFFECT

I firstly analyze the aggregated trade data to measure movements of distance coefficient. There is an increase in the absolute value of distance effect in trade around 24% between 1976 and 2016, as shown in Figure 2.[13] My gravity estimation results using aggregate trade data are in line with the findings in the literature. Rest of our analysis based on the disaggregated (industry-level) trade data.

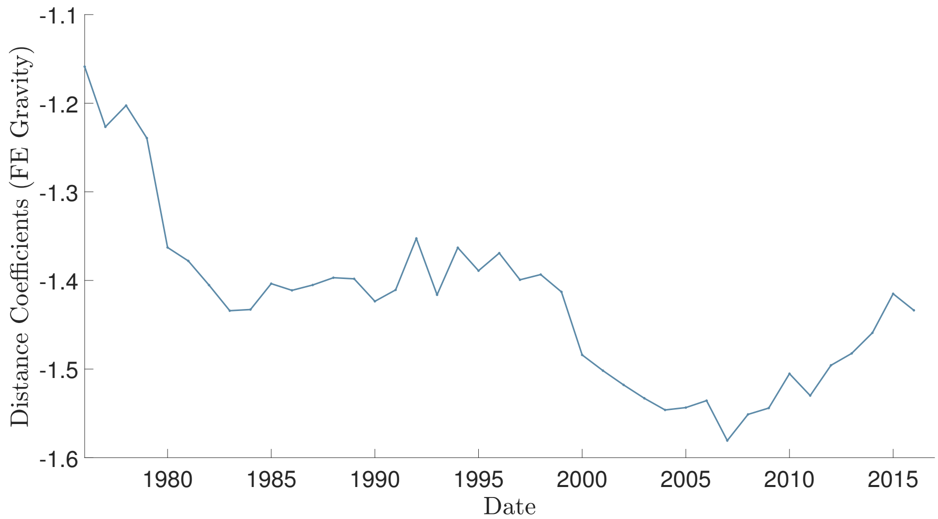

Figure 2. Falling distance coefficients between 1976 and 2016

I estimate gravity equation to track the sectoral changes in distance elasticity of trade and Herfindahl-Hirschman indices over time using trade data for 780 different industries for the period between 1962 and 2016. There are 29.705 number of observations for the period. I prefer to visualize the evolutions of means, medians, weighted averages and distributional shifts of the variables in order to summarize and introduce the data in a basic way.

Analysis of sectoral data indicates that the rising negative effect of distance

[13] I estimate aggregate level gravity using all available SITC Rev.2 data for the period 1976-2016. There are only 16 countries report trade data continuously during the period. Therefore, I do not estimate aggregate level gravity using a balanced dataset.

on trade is prevalent also in industry-level data. Sectoral distance coefficients is slightly constant until 2000s but a considerable decline starts after 2000s as Figure 3 demonstrates. Evolution of sectoral averages of distance elasticities do not coincide with the evolution of aggragate level distance elasticities. Furthermore, aggragate level and sectoral level distance elasticity diverge from each other especially after 2006. Figure 4 shows that distribution of sectoral distance coefficients considerably shifts leftward. Mean of distance coefficient is -0.91 in the first half of our dataset whereas it shifts to -0.99 in the second half indicating a 9% increase in absolute terms.[14]

Sectoral competition peaks lowest value around the beginning of 2000s then starts to increase gradually as shown in Figure 5. After 2000s international competition decreases while distance elasticity of trade rises which is in line with my hypothesis. Figure 6 demonstrates the distributions of Herfindahl-Hirschman Indices for two sub-datasets. Mean of Herfindahl-Hirschman Indices declines 0.16 to 0.14 between two sub-periods which indicates a 12,5% increase in competition.

Figure 7 demonstrates the relation between calculated market competitiveness (HHI) and estimated distance coefficients using all available data between 1976-2016. The correlation coefficient of HHI and distance coefficient is 0.30 and it is statistically significant at 0.99 confidence level.

[14] I divide entire dataset from the half to make a simple comparison about the evolution of variables through time. First half of covers 1976-1995 and second half covers 1996-2016 period. Number of observation is 14902 for the first subset and 16027 for the second one.

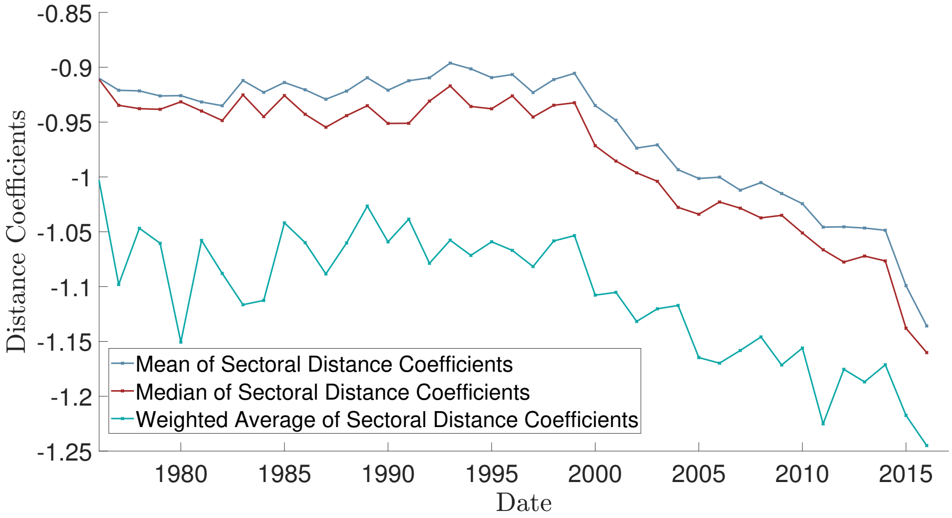

Figure 3. Evolution of sectoral distance coefficient 1976-2016

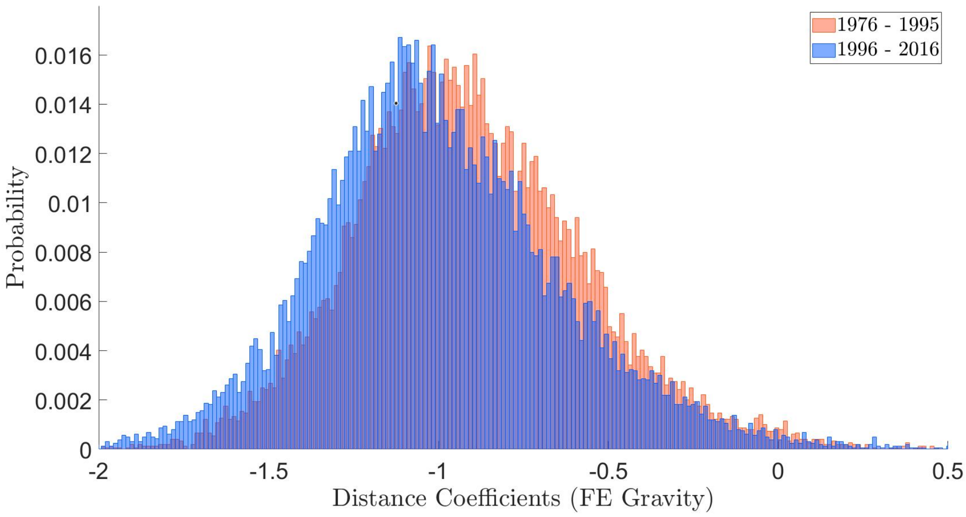

Figure 4. Distributions of distance coefficients (1976-1995 & 1996-2016)

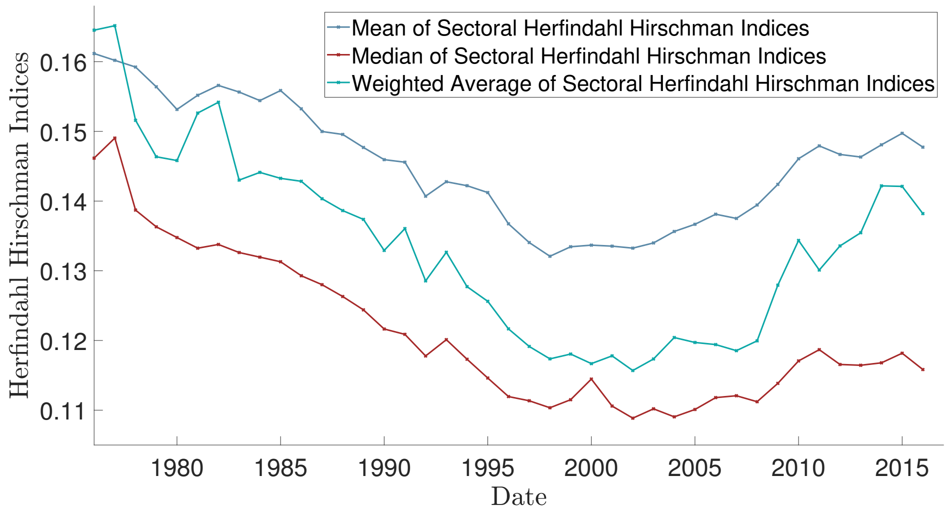

Figure 5. Evolution of sectoral Herfindahl-Hirschman Indices 1976-2016

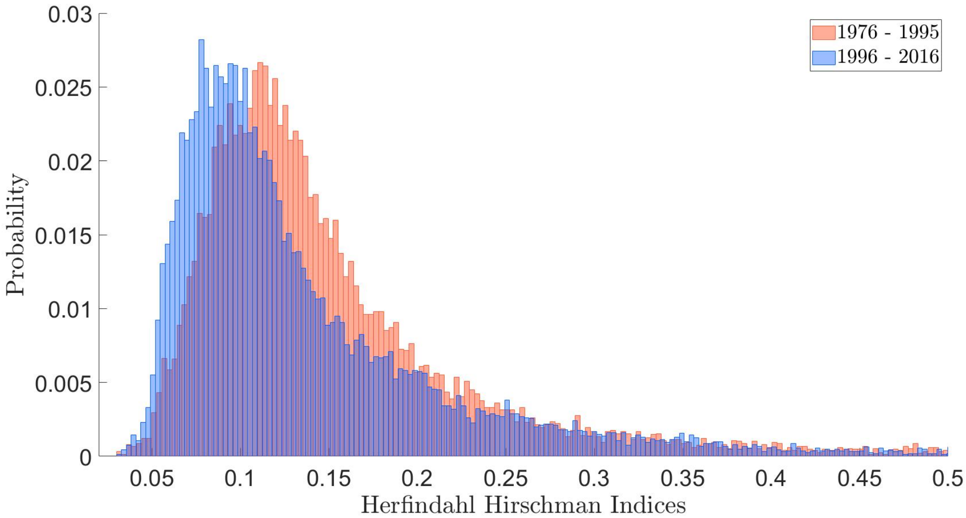

Figure 6. Distributions of Herfindahl-Hirschman Indices (1976-1995 & 1996-2016)

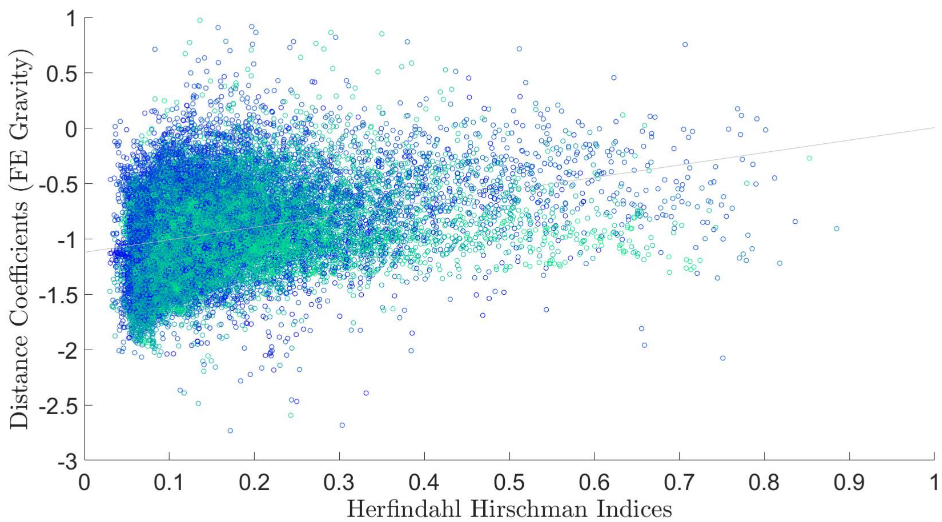

Figure 7. Market competitiveness and distance coefficients (1976-2016)

CHAPTER 6

ON THE RELATION BETWEEN COMPETITION AND DISTANCE EFFECT

This section presents and analyzes the estimated impact of sectoral concentration ratios on the estimated distance elasticity of trade and discuss the underlying mechanism of these results.

I empirically investigate the relationship between distance elasticity of trade and market competitiveness using different datasets and different econometric settings. Accordingly to my hypothesis in this dissertation, there should be a positive relation between competition and distance elasticity of trade since elasticity of trade is negative while competition index is positive.

In this section, I, firstly, start my analysis using all the available data between 1976 and 2016. Afterwards, I use four different versions of two sub-datasets 1985-1989 and 2001-2004. First version consist of all available data for each period. In the second version, I restrict my sample to be a balanced sample. The sample includes countries reporting data at least 9 years in 1985-1989 and 2001-2004. On the other hand, I keep industries that reported continuously during 1985-1989 and 2001-2004. In the third type of dataset, I calculate average of each bilateral route for each product between 1985-1989 and 2001-2004 using balanced datasets. Lastly, I calculate changes of variables between two sub-period based on averaged datasets.

Firstly, I only regress the distance coefficients on the Herfindahl-Hirschman Index without including other variables. Thereafter, I include Rauch's product classification, elasticity of substitution and average tariffs into regressions. Lastly, I regress distance coefficient and other explanatory variables using changes data. In Appendix A, I segment datasets accordingly to median and median values of product classification, elasticity of substitution and average tariff to explore the dynamics of HHI and distance coefficients relationship.

6.1 Second Step Estimation using only Herfindahl Hirschman Index as an Explanatory Variable

In all tables, there are four different econometric models. First model regress distance coefficient on explanatory variables without time-specific industry effect and time fixed. Second model contains time-specific industry effect and time fixed effects. Third model is the weighted least square estimation and weights are based on the standard errors of estimated distance coefficient from the first step. It also contains fixed effects. Last model exclude insignificant distance coefficient from the regression and contains fixed effects. In all regressions, the results are evaluated based on clustered standard errors at 4-digit industry-level to have robust standard errors and overcome the problems which may arise due to heteroscedasticity.

Table 4 reports impact of industrial concentration on the level of distance elasticity of bilateral trade using all available data between 1976 and 2016.

Table 4. Regressions on Distance Coefficients (1976-2016)

	(1)	(2)	(3)	(4)
Herfindahl-Hirschman Index	1.175*** [0.092]	1.075*** [0.089]	0.963*** [0.091]	0.882*** [0.087]
Observations	29,705	29,705	29,705	27,865
R-squared	0.086	0.209	0.203	0.161
Insignificant Distance Co.	Included	Included	Weighted	Excluded
Industry FE (1-Digit)	No	Yes	Yes	Yes
Time FE	No	Yes	Yes	Yes

Robust standard errors in brackets
Statistical Significance *** p<0.01, ** p<0.05, * p<0.1
Data source: COMTRADE.

The estimates from all four model remain significant with clustered standard errors at 4-digit industry-level in Table 4. The effect of market concentration lies within 1.175 and 0.882 points respectively, and they are significant at 1 percent level for all models. The interpretation is that when market concentration increases 0.1 points, distance elasticity of trade raises 0.096 points; using the results of weighted least square estimations in column 3. Another explanation is that when a sector is monopolized by one country, in which case HHI is equal to 1, estimated distance coefficient is become higher between 1.175 to 0.882 points. In other words, if there would be only one producer of a particular product then distance will be little or no effect on the trade of that product considering the mean of distance coefficient is -0.95 between 1976-2016.[15] My estimations for distance coefficients and calculations for market competitiveness indices indicate that negative effect of distance increase around 9% (-0.91 to -0.99) on the other hand competitiveness rise almost 12,5% (0.16 to 0.14) between two sub-period of 1976 - 2016. These results illustrate that increasing competition can explain the 20% of changes in the distance coefficient during the 1976 and 2016 period considering the regression results. All results using only HHI as an explanatory variable can be explained using these interpretations.

Table 5, 6 and 7 report the impact of sectoral concentration ratios on estimated distance coefficients between 1985-1989 and 2001-2004 using different types of datasets. The estimates from all four model are significant with clustered standard errors at 4-digit product level in all regressions. Table 5 present the regression results using all available data for both periods and the effect of market concentration on distance elasticity lies between 1.199 and 0.860 for the first period and 1.426 and 1.082 for the second period. Table 6 documents balanced dataset results and the effect of market concentration is between 0.728 and 0.578 for the first period and 1.059 and 0.798 for the second period. Table 7 reports averaged datasets regression results and HHI coefficients lies between 0.928 and 0.578 for the first period and

[15] See Table 3.

1.059 and 0.798 for the second period.

Table 5. Regressions on Distance Coefficients 1985-1989 & 2001-2004

	(1) 1985-1989	(2) 1985-1989	(3) 1985-1989	(4) 1985-1989	(5) 2001-2004	(6) 2001-2004	(7) 2001-2004	(8) 2001-2004
Herfindahl-Hirschman Ind.	1.199***	1.038***	0.921***	0.860***	1.426***	1.328***	1.266***	1.082***
	[0.121]	[0.122]	[0.148]	[0.121]	[0.146]	[0.137]	[0.163]	[0.127]
Observations	3,650	3,650	3,650	3,420	2,940	2,940	2,940	2,751
R-squared	0.096	0.164	0.152	0.116	0.114	0.228	0.246	0.153
Insignificant Distance Co.	Included	Included	Weighted	Excluded	Included	Included	Weighted	Excluded
Industry FE (1-Digit)	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Time FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes

Robust standard errors in brackets
Statistical Significance *** p<0.01, ** p<0.05, * p<0.1
Data source: COMTRADE.

Table 6. Regressions on Distance Coefficients with Balanced Datasets 1985-1989 & 2001-2004

	(1) 1985-1989	(2) 1985-1989	(3) 1985-1989	(4) 1985-1989	(5) 2001-2004	(6) 2001-2004	(7) 2001-2004	(8) 2001-2004
Herfindahl-Hirschman Ind.	0.928***	0.782***	0.578***	0.686***	1.059***	0.996***	0.798***	0.802***
	[0.105]	[0.107]	[0.131]	[0.102]	[0.122]	[0.119]	[0.153]	[0.115]
Observations	3,564	3,564	3,564	3,309	2,852	2,852	2,852	2,692
R-squared	0.080	0.143	0.118	0.106	0.088	0.183	0.181	0.116
Number of Industries	742	0.742	742	742	742	742	742	742
Insignificant Distance Co.	Included	Included	Weighted	Excluded	Included	Included	Weighted	Excluded
Industry FE (1-Digit)	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Time FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes

Robust standard errors in brackets
Statistical Significance *** p<0.01, ** p<0.05, * p<0.1
Data source: COMTRADE.

Table 7. Regressions on Distance Coefficients with Averaged Datasets 1985-1989 & 2001-2004

	1985-1990				2001-2004			
Dependent Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Herfindahl-Hirschman Ind.	0.980***	0.794***	0.591***	0.781***	1.155***	1.068***	0.951***	0.986***
	[0.128]	[0.132]	[0.172]	[0.131]	[0.133]	[0.128]	[0.155]	[0.123]
Observations	714	714	714	707	714	714	714	700
R-squared	0.091	0.159	0.152	0.145	0.112	0.207	0.241	0.166
Insignificant Distance Co.	Included	Included	Weighted	Excluded	Included	Included	Weighted	Excluded
Industry FE (1-Digit)	No	Yes	Yes	Yes	No	Yes	Yes	Yes

Robust standard errors in brackets
Statistical Significance *** p<0.01, ** p<0.05, * p<0.1
Data source: COMTRADE.

Regression results using only HHI as an explanatory variable for distance elasticity of trade yield evidence for the negative relation between market competitiveness and negative effect of distance coefficient. However, there are common diagnosis for all regression results. Firstly, inclusion of fixed effects reduce the positive effect of market concentration on the trade elasticity of trade while increasing R-squared statistics in all datasets. In the absence of fixed effects, all the idiosyncratic shocks and industry specific differences are undertaken by the coefficient of HHI. Another common finding is excluding insignificant distance coefficients from regressions or weighting those inversely to their standard errors in regressions lead lower level of coefficients for market concentration index. Next section includes other explanatory variables into regressions.

6.2 Second Step Estimation using All Explanatory Variables

In this section, I estimate equation (6) using all explanatory variables including Rauch's product classification, elasticity of substitution and average tariff rates. Similar to the previous analysis, four different econometric model are estimated for each datasets.

It is expected that goods with high elasticities of substitution will make these types of goods more elastic with respect to trade costs. For that reason, goods with greater elasticities of substitution are likely to have larger distance elasticities. Table 8 represents correlations of all variables. In both periods elasticity of substitution and estimated distance coefficients are positively correlated at 5 percent level, contrary to intuition. On the other hand, differentiated products are also likely to have lower levels of elasticity of substitutions. In the first period, these are negatively correlated but correlation is insignificant. On the other hand, there is a positive and significant correlation in the second period. Following the same logic, differentiated products are tend to be less elastic with respect to trade costs. Therefore, differentiated products are expected to be less distance elastic. Differentiated products are negatively correlated with distance coefficients significantly only in the second period. Impact of average tariff level on the distance elasticities is ambiguous. Assuming all the countries are subject to lower tariff rates then relative importance of distance related trade costs may increase. On the other hand, if average tariff rates fall on the benefit of neighboring countries, lower tariff rates may reduce the importance of distance. Average tariff rates and distance elasticities are negatively correlated in both periods, significantly at 5 percent level.

Table 8. Correlations of Variables

Correlations	HHI	Distance Co.	Elasticity of S.	Differentiated G.	Av. Tariff
1985-1989					
HHI	1	-	-	-	-
Distance Coefficient	0.29*	1	-	-	-
Elasticity of Substitution	0.14*	0.04*	1	-	-
Differentiated Goods	-0.04*	-0.03	-0.13	1	-
Average Tariff	-0.14*	-0.14*	-0.07*	0.20*	1
2001-2004					
HHI	1	-	-	-	-
Distance Coefficient	0.29*	1	-	-	-
Elasticity of Substitution	-0.03	0.08*	1	-	-
Differentiated Goods	0.07*	-0.10*	-0.05*	1	-
Average Tariff	0.03	-0.21*	-0.01	0.07*	1

Statistical Significance * $p<0.05$
Data Source: COMTRADE.
Commodity types are from Rauch (1999).
Product elasticities are from Broda & Weinstein (2006).
Tariff data are taken from WITS.

Table 9, 10 and 11 report the effect sectoral concentration ratios, product type and elasticity of substitution on the distance elasticity between 1985-1989 and 2001-2004 using different types of datasets. The estimates of HHI coefficients are significant at 1 percent level in all regressions. However, level of HHI coefficients are lower compared to previously estimated regressions using only HHI as an explanatory variable. Similar to diagnosis in the previous regressions, excluding insignificant distance coefficient or weighting distance coefficients inversely to their first step standard errors decreases the level of HHI's coefficient.

As mentioned above, goods with higher elasticity of substitution are expected to have higher distance elasticity. However, in all regressions reported in Tables

10, 11, and 12 coefficients of elasticity of substitution is quite small and all are insignificant.

Table 9. Regressions on Distance Coefficients 1985-1989 & 2001-2004

	1985-1990				2001-2004			
Dependent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Herfindahl-Hirschman Ind.	1.067***	0.884***	0.719***	0.801***	1.481***	1.352***	1.170***	1.222***
	[0.146]	[0.144]	[0.173]	[0.140]	[0.199]	[0.195]	[0.238]	[0.188]
Differentiated Products	-0.015	0.060*	0.093***	0.047	-0.081***	0.040	0.081**	0.025
	[0.024]	[0.032]	[0.033]	[0.031]	[0.027]	[0.037]	[0.040]	[0.037]
Elasticity of Substitution	-0.001	-0.001	-0.000	-0.001	0.001	-0.000	0.001	-0.001
	[0.001]	[0.001]	[0.002]	[0.001]	[0.002]	[0.002]	[0.002]	[0.001]
Average Tariff	-0.003**	-0.004***	-0.006***	-0.003**	-0.010***	-0.016***	-0.018***	-0.013***
	[0.001]	[0.001]	[0.002]	[0.001]	[0.003]	[0.003]	[0.003]	[0.003]
Observations	2,748	2,748	2,748	2,633	1,851	1,851	1,851	1,770
R-squared	0.091	0.178	0.185	0.128	0.166	0.292	0.333	0.210
Insignificant Distance Coefficients	Included	Included	Weighted	Excluded	Included	Included	Weighted	Excluded
Industry FE (1-Digit)	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Time FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes

Robust standard errors in brackets
Statistical Significance *** p<0.01, ** p<0.05, * p<0.1
Data source: COMTRADE. Commodity types are from Rauch (1999). Product elasticities are from Broda & Weinstein (2006).
Tariff data are taken from WITS.

Table 10. Regressions on Distance Coefficients with Balanced Datasets 1985-1989 & 2001-2004

	1985-1990				2001-2004			
Dependent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Herfindahl-Hirschman Ind.	0.885***	0.691***	0.501***	0.670***	1.000***	0.917***	0.663***	0.765***
	[0.123]	[0.123]	[0.154]	[0.116]	[0.150]	[0.143]	[0.177]	[0.141]
Differentiated Products	-0.016	0.060*	0.094***	0.054*	-0.059**	0.059	0.087**	0.054
	[0.024]	[0.032]	[0.034]	[0.030]	[0.028]	[0.037]	[0.038]	[0.037]
Elasticity of Substitution	0.000	0.000	0.001	-0.000	-0.001	-0.001	-0.002	-0.002
	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]	[0.001]	[0.002]	[0.001]
Average Tariff	-0.002	-0.003**	-0.005***	-0.001	-0.008***	-0.014***	-0.015***	-0.010***
	[0.001]	[0.001]	[0.002]	[0.001]	[0.002]	[0.003]	[0.004]	[0.003]
Observations	2,734	2,734	2,734	2,587	1,823	1,823	1,823	1,733
R-squared	0.082	0.162	0.165	0.122	0.109	0.240	0.250	0.150
Insignificant Distance Coefficients	Included	Included	Weighted	Excluded	Included	Included	Weighted	Excluded
Industry FE (1-Digit)	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Time FE	No	Yes	Yes	Yes	No	Yes	Yes	Yes

Robust standard errors in brackets
Statistical Significance *** p<0.01, ** p<0.05, * p<0.1
Data source: COMTRADE. Commodity types are from Rauch (1999). Product elasticities are from Broda & Weinstein (2006).
Tariff data are taken from WITS.

Table 11. Regressions on Distance Coefficients with Averaged Datasets 1985-1989 & 2001-2004

	1985-1990				2001-2004			
Dependent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Herfindahl-Hirschman Ind.	0.934***	0.702***	0.533***	0.713***	1.101***	1.010***	0.872***	0.973***
	[0.139]	[0.144]	[0.167]	[0.143]	[0.155]	[0.143]	[0.171]	[0.142]
Differentiated Products	-0.006	0.060*	0.082**	0.057*	-0.032	0.073*	0.089**	0.078**
	[0.025]	[0.033]	[0.035]	[0.033]	[0.028]	[0.038]	[0.040]	[0.038]
Elasticity of Substitution	-0.001	-0.001	-0.000	-0.001	-0.001	-0.001	-0.001	-0.002
	[0.001]	[0.001]	[0.002]	[0.001]	[0.002]	[0.001]	[0.002]	[0.001]
Average Tariff	-0.003***	-0.004***	-0.005***	-0.004***	-0.008***	-0.012***	-0.013***	-0.010***
	[0.001]	[0.001]	[0.002]	[0.001]	[0.002]	[0.003]	[0.004]	[0.003]
Observations	549	549	549	546	457	457	457	450
R-squared	0.103	0.179	0.189	0.166	0.132	0.262	0.310	0.222
Industry FE (1-Digit)	No	Yes	Yes	Yes	No	Yes	Yes	Yes

Robust standard errors in brackets
Statistical Significance *** p<0.01, ** p<0.05, * p<0.1
Data source: COMTRADE. Commodity types are from Rauch (1999). Product elasticities are from Broda & Weinstein (2006).
Tariff data are taken from WITS.

In Table 9, differentiated products have one negative and insignificant coefficient and three positive coefficient where two of them are significant, at least, at 10 percent level for the first period.[16] In second period, regression (5) yields negative and significant coefficient for different products whereas regression (7) estimates positive and significant coefficient. In Table 10, there are three positive and significant coefficients for differentiated products for the first period and one negative and one positive statistically significant coefficients for differentiated products in the second period. In Table 11, all statistically significant differentiated product coefficients are positive and significant, at least, at 10 percent level. Most of the significant coefficients for differentiated products are positive which indicates that differentiated products are tend to be less distance sensitive. All regression results indicate that sectors with lower average tariff rates tend to be less distance sensitive.

[16]Berthelon and Freund (2008) estimates the impacts of average tariff, elasticity of substitution and Rauch's homogeneous and referenced priced goods on the estimated distance elasticities. They use averages of all variables for given periods and their datasets cover 1985-1989 and 2001-2005 periods. My results and their results correspond to each other. Elasticity of substitution is insignificant and coefficient is quite small, similarly to my findings. Furthermore, average tariff negatively related with distance elasticity. On the other hand, they employ homogeneous and reference priced product categories instead of differentiated products. Coefficient of homogeneous products are insignificant but reference priced goods yields negative coefficients which confirms our findings for differentiated products.

Magnitude of average tariffs coefficient lies around -0.018 and -0.012.

6.3 Regression on Distance Coefficients using Changes of Variables

Up until now, I examine the determinants of the levels of the distance elasticities, from now on I examine the determinants of the changes in distance elasticities. The explanatory variables are same except for differentiated products.

Changes of variables are calculated as the straight differences of variables between 1985-1989 and 2001-2004 periods using averages of each variables in both periods. All industry codes are not comparable over time since Broda and Weinstein (2006) estimated two different set of elasticities using two different SITC codes (Rev. 2 and 3). Thus, I just keep the industries whose SITC codes remain unchanged between these two periods, yielding 429 industries.

Table 12 reports results from the regressions of changes in industrial distance elasticities on the initial value of variables and on the changes of them. The first column represents the results of the regression using only initial value and changes of Herfindahl-Hirschman Indices. In the second regression estimation, only initial value of distance coefficient in the first period is added to the model. Column (1) and (2) depicts that without the initial value of distance coefficient both initial value and change of HHI is statistically insignificant. Column 2, 3, 4 reports regression results using only HHI's initial and changes values with initial level of distance coefficient as an explanatory variable for the changes of industry distance coefficients between two periods. Column 5 reports the results with all variables without initial value of distance coefficient. Column 6 and 7 are presents results of regressions including all variables initial values and changes of them also including initial value of distance coefficient. The estimates for initial value from all seven model remain significant at least at 10 percent level for the initial value of HHI indicating that highly concentrated sectors are inclined to be less distance sensitive over time. Most important finding of this analysis is coefficients of HHI's change are significant, at least, 5 percent level. The coefficients lies within 0.236 and 0.371 points. The interpretation is that, an increase in market concentration for 0.1 points decreases distance elasticity of trade 0.0371 points in absolute terms. Summary statistics table depicts that the mean of distance coefficients decreases 0.06 points, also, average Herfindahl-Hirschman Index decreases 0.01 points between two periods. Therefore, Herfindahl-Hirschman Index can explain the 0.0371 points of 0.06 point decline in the average distance coefficient. In other words, variations in HHI can explain the 6.18 percent of the changes in distance elasticity.[17]

Another important finding is that negative and significant coefficients for the initial level of distance coefficient point out that more distance elastic industries are tend to be much more distance elastic over time.

The initial level of elasticity of substitution is statistically insignificant in all models. On other hand, column 5 and 6 depict that a rise in elasticity of substitution decreases the distance coefficient 0.002 points which is significant at 5 percent level. Effect of elasticity of substitution is still quite small but significant results are in line with theory and intuition.

[17]In this section, I follow a similar procedure to Berthelon and Freund (2008) to investigate the determinants of changes in distance elasticies of trade. They have additional variables (changes in insurance and freight costs and they use Rauch's homogenous and reference priced goods) but do not analyze the impact of competition on the distance effect. Their data consist the changes of variables between 1985-1989 and 2001-2005 periods. My findings resembles to their findings. In their work, coefficient of change in elasticity of substitution is -0.003 points and significant at one percent level. On the other hand, coefficient of the changes in average tariff lies between -0.011 and 0.004 points, all significant at one percent level. See Table 6 in Berthelon and Freund (2008) for more details.

Table 12. Regressions on Distance Coefficients with Changes Dataset 1985-1989 & 2001-2004

Dependent Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Initial Herfindahl-Hirschman Index	0.231	0.431***	0.346**	0.330**	0.226*	0.405**	0.415**
	[0.142]	[0.125]	[0.111]	[0.105]	[0.122]	[0.135]	[0.132]
Change in Herfindahl-Hirschman Ind.	0.192	0.310**	0.342**	0.352***	0.236**	0.370***	0.371***
	[0.114]	[0.119]	[0.108]	[0.105]	[0.081]	[0.099]	[0.059]
Initial Elasticity of Substitution	-	-	-	-	-0.002	-0.002	-0.003
					[0.002]	[0.002]	[0.002]
Change in Elasticity of Subs.	-	-	-	-	-0.002**	-0.002**	-0.002
					[0.001]	[0.001]	[0.001]
Initial Average Tariff	-	-	-	-	-0.007***	-0.008***	-0.009***
					[0.002]	[0.002]	[0.003]
Change in Average Tariff	-	-	-	-	-0.011***	-0.012***	-0.013***
					[0.003]	[0.003]	[0.003]
Initial Distance Coefficient	-	-0.158***	-0.178***	-0.199***	-	-0.165***	-0.182***
		[0.028]	[0.036]	[0.040]		[0.047]	[0.056]
Observations	714	714	714	714	429	429	429
R-squared	0.013	0.077	0.146	0.161	0.127	0.188	0.210
Insignificant Distance Coefficients	Weighted	Included	Included	Weighted	Included	Included	Weighted
Industry FE (1-Digit)	No	No	Yes	Yes	Yes	Yes	Yes

Robust standard errors in brackets
Statistical Significance *** p<0.01, ** p<0.05, * p<0.1
Data source: COMTRADE. Commodity types are from Rauch (1999). Product elasticities are from Broda & Weinstein (2006).
Tariff data from WITS.

Also, products exposed high tariff rates are tend to be more distance elastic over time and effect of initial tariff on the changes of distance elasticity lies between -0.007 and -0.009 where all coefficients are significant at 1 percent level. Furthermore, changes in tariff rates have considerable impacts on changes of distance elasticity of trade. coefficient of change in average tariff is between -0.011 and -0.013 points, all are significant at one percent level. Average tariff rate falls 8.54 points between 1985-1989 and 2001-2004 periods. Considering the coefficient of average tariff change in regression 7, change in average tariff can explain the 0.09 points change in distance elasticity.

CHAPTER 7

CONCLUSION

Analysis of aggregated trade data and disaggregated data indicate that negative effect of distance on trade rises dramatically between 1976 and 2016. I examine bilateral trade data to look for evidence for the negative relation between market competition and the importance of distance in bilateral trade. I find a strong relationship between calculated market concentration ratios and estimated distance coefficients using levels of HHI and distance coefficients. On the other hand, I analyze 1985-1989 and 2001-2004 periods to investigate the determinants of the changes in distance elasticities of trade. My results indicate that increasing competition over time rises distance elasticity of trade. Besides, investigation on the changes of variables express that more distance elastic products are tend to be more distance elastic over time. Also, in more concentrated markets, products are inclined to be less distance elastic in time.

In this thesis, I, also examine alternative hypothesis as to why the distance effect increased in some industries. I find that declining average tariff rates reduced the importance of distance on international trade. On the other hand, my analysis reveals that differentiated products tend to be less distance elastic. However, I do not find evidence on the relation between the level of elasticity substitution and distance effect, but changes regressions demonstrate that distance elasticity of trade rises as the products became more substitutable.

APPENDIX A

CONDITIONAL REGRESSIONS ON DISTANCE COEFFICIENTS

In this section, I investigate the impact of competition on distance coefficient by segmenting sample to the level of other variables. For instance, I regress distance coefficient on Herfindahl-Hirschman Index using only more elastic goods. I use median and mean values of product type, elasticity of substitution and average tariff as threshold points for sample segmentation. Average tariff and elasticity of substitution have skewed distributions. Therefore, using mean values of segmentation variables leads to uneven number of observations for clusters.

Table A1 exhibits the summary statistics for Herfindahl-Hirschman Indices and distance coefficients accordingly to the conditions applied in the regressions. HHI means changes as the condition changes. Thus, I use standardized coefficients for HHI in the regressions. Since, regression coefficients can be interpreted as the impact of one standard deviation of HHI on the distance coefficients.

Regression results using medians as threshold points are presented in Table A2 and Table A3. Table A4 and Table A5 represent the regression results conditional on the mean values of segmentation variables. All regression include time-specific industry fixed effects and errors are clustered at 4-digit product level.

In table A3, column 5 and 6, depict the impact of HHI on distance coefficients for the observations above and below the median average tariff rate. Results in Column 5 reveals that one standard deviation increase in HHI raises distance coefficients 0.075 points if products have average tariff rate below the median.

Table A1. Summary Statistics of HHI and Distance Coefficient Segmented to Other Variables

1985-1989		Obs.	Mean	Standard Dev.	Min.	Max.
HHI	Differentiated	1754	0,14	0,07	0,05	0,51
	Homogeneous	1159	0,15	0,08	0,05	0,50
	EOS>Mean	534	0,16	0,08	0,05	0,50
	EOS<Mean	2379	0,14	0,08	0,05	0,51
	EOS>Median	1375	0,15	0,08	0,05	0,50
	EOS<Median	1538	0,15	0,08	0,05	0,51
	Tariff>Mean	1359	0,14	0,08	0,05	0,51
	Tariff<Mean	1554	0,15	0,07	0,05	0,51
	Tariff>Median	1542	0,14	0,08	0,05	0,51
	Tariff<Median	1371	0,15	0,08	0,05	0,51
Distance Co.	Differentiated	1754	-0,94	0,28	-1,58	-0,07
	Homogeneous	1159	-0,91	0,32	-1,59	-0,06
	EOS>Mean	534	-0,94	0,29	-1,58	-0,07
	EOS<Mean	2379	-0,93	0,30	-1,59	-0,06
	EOS>Median	1375	-0,94	0,31	-1,59	-0,06
	EOS<Median	1538	-0,92	0,28	-1,57	-0,07
	Tariff>Mean	1359	-0,96	0,28	-1,58	-0,07
	Tariff<Mean	1554	-0,91	0,31	-1,59	-0,06
	Tariff>Median	1542	-0,96	0,29	-1,58	-0,06
	Tariff<Median	1371	-0,90	0,29	-1,59	-0,07
2001-2004		**Obs.**	**Mean**	**Standard Dev.**	**Min.**	**Max.**
HHI	Differentiated	1155	0,13	0,07	0,05	0,54
	Homogeneous	780	0,12	0,07	0,05	0,55
	EOS>Mean	413	0,14	0,08	0,05	0,40
	EOS<Mean	1522	0,13	0,07	0,05	0,55
	EOS>Median	969	0,13	0,07	0,05	0,55
	EOS<Median	966	0,13	0,07	0,05	0,54
	Tariff>Mean	848	0,13	0,08	0,05	0,54
	Tariff<Mean	1087	0,13	0,07	0,05	0,55
	Tariff>Median	1020	0,13	0,07	0,05	0,54
	Tariff<Median	915	0,13	0,07	0,05	0,55
Distance Co.	Differentiated	1155	-1,01	0,31	-1,67	-0,05
	Homogeneous	780	-0,95	0,33	-1,66	-0,05
	EOS>Mean	413	-0,93	0,33	-1,65	-0,05
	EOS<Mean	1522	-1,01	0,31	-1,67	-0,08
	EOS>Median	969	-0,98	0,32	-1,66	-0,05
	EOS<Median	966	-0,99	0,31	-1,67	-0,08
	Tariff>Mean	848	-1,07	0,28	-1,67	-0,13
	Tariff<Mean	1087	-0,93	0,33	-1,66	-0,05
	Tariff>Median	1020	-1,06	0,29	-1,67	-0,08
	Tariff<Median	915	-0,90	0,32	-1,66	-0,05

Data source: COMTRADE.
Tariff data from WITS.

Otherwise, one standard deviation increase in HHI raises distance coefficients 0.09 points. All the results can be evaluated using the interpretation.

In both periods, HHI's positive impact on distance coefficient is higher if products are differentiated products in all regressions. By definition differentiated products are branded products. Results are ambiguous when sample is restricted via elasticity of substitutions mean and median values. Accordingly Table A2 and A3, a higher level of market concentration has more positive effect on distance coefficient if products have lower level of elasticity of substitution. However, regression (3) and (4) reveals a opposite findings.

Table A2. Conditional Regressions on Distance Coefficient using Median Values 1985-1989

Dependent Variables	(1)	(2)	(3)	(4)	(5)	(6)
Herfindahl-Hirschman Ind.	0.079***	0.046**	0.022	0.091***	0.074***	0.031
	[0.014]	[0.022]	[0.019]	[0.013]	[0.015]	[0.021]
Observations	1,754	1,159	534	2,379	1,359	1,554
R-squared	0.249	0.114	0.115	0.227	0.170	0.200
Condition	Differentiated G.	Homogeneous G.	EOS>2.8	EOS<2.8	Av. Tariff>17.36	Av. Tariff<17.36

Median of Elasticity of Substitution (EOS) and mean of Average tariff are 2.8 and 17.36, respectively.
Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Table A3. Conditional Regressions on Distance Coefficient using Median Values 2001-2004

Dependent Variables	(1)	(2)	(3)	(4)	(5)	(6)
Herfindahl-Hirschman Ind.	0.114***	0.055**	0.074***	0.109***	0.075***	0.090***
	[0.017]	[0.025]	[0.023]	[0.020]	[0.019]	[0.028]
Observations	1,155	780	969	966	1,020	915
R-squared	0.349	0.208	0.286	0.293	0.125	0.307
Condition	Differentiated G.	Homogeneous G.	EOS>2.49	EOS<2.49	Av. Tariff>8.46	Av. Tariff<8.46

Median of Elasticity of Substitution (EOS) and median of Average tariff are 2.49 and 8.46, respectively.
Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

As it is presented in Table A3 and Table A4, using mean values of the variables as a condition for regressions does not dramatically change the regression results compared to the use of median values as a condition for regressions.

Table A4. Conditional Regressions on Distance Coefficient using Mean Values 1985-1989

Dependent Variables	(1)	(2)	(3)	(4)	(5)	(6)
Herfindahl-Hirschman Ind.	0.079***	0.046**	0.012	0.076***	0.079***	0.034*
	[0.014]	[0.022]	[0.026]	[0.011]	[0.015]	[0.020]
Observations	1,754	1,159	534	2,379	1,359	1,554
R-squared	0.249	0.114	0.115	0.227	0.170	0.200
Condition	Differentiated G.	Homogeneous G.	EOS>5.59	EOS<5.59	Av. Tariff>19.50	Av. Tariff<19.50

Mean of Elasticity of Substitution (EOS) and mean of Average tariff are 5.59 and 19.50, respectively.
Robust standard errors in brackets.
*** p<0.01, ** p<0.05, * p<0.1

Table A5. Conditional Regressions on Distance Coefficient using Mean Values 2001-2004

Dependent Variables	(1)	(2)	(3)	(4)	(5)	(6)
Herfindahl-Hirschman Ind.	0.114***	0.055**	0.110***	0.076***	0.082***	0.088***
	[0.017]	[0.025]	[0.026]	[0.022]	[0.020]	[0.026]
Observations	1,155	780	413	1,522	848	1,087
R-squared	0.349	0.208	0.333	0.249	0.139	0.312
Condition	Differentiated G.	Homogeneous G.	EOS>5.59	EOS<5.59	Av. Tariff>19.50	Av. Tariff<19.50

Mean of Elasticity of Substitution (EOS) and mean of Average tariff are 5.59 and 19.50, respectively.
Robust standard errors in brackets.
*** p<0.01, ** p<0.05, * p<0.1

APPENDIX B

CHINA'S WTO ACCESSION AND DISTANCE PUZZLE

In this thesis, I adopt Herfindahl-Hirschman Index to measure international competition at sector level. Herfindahl-Hirschman Index is, in fact, a market concentration index and it is not a perfect measure of competition. However, It is not easy to perfectly measure international competition, therefore, I use HHI as a proxy to measure competition. In this appendix, I investigate the China's accession to Wto in 2001 as a natural experiment to analyze the impact of a competitive country's penetration to world trade.

China officially became a WTO member on December 2001. At that time China's GDP was at 1.33 trillion USD, ranking the world's 6th economy. Furthermore, export in good was valued at 0.2 trillion USD also ranking 6th in the globe. China's accession to WTO lead China's penetration to world trade accentuate. In 2014, China's gpd reached 10.5 trillion USD, by growing over 8 times, it become world second biggest economy after the United States of America. In 2014 China export 2.34 trillion USD worth goods all over the world which is equal to 12.4% of the world's total of exports. Those facts depicts that China is one of the biggest economies in the world and WTO accession is a milestone for global economic environment. As the number points out China dominates the global trade market after WTO accession which is inevitably changes the level of global competition. In that manner, I investigate the impacts of China's WTO accession on global competition.[18]

As I document in the previous chapters, more concentrated markets are less distance elastic. However, we base our initial hypothesis on the changing

[18] I use The World Bank's World Development Database for the China's macroeconomic indicators.

competitiveness conditions all over the world but we do all the analysis with HHI which actually measures market concentration not exactly competition. We assume that China has a competitive power and China penetrates to world trade after 2001 Wto Agreement. In this chapter, I hypothesize that China dominates sector which he has competitive power. Therefore I expect that market concentration will increase in those sectors. To evaluate this case, I analyze 5 years period before and after China's 2001 Wto agreement.[19] I use average trade between countries for the two sub-period and calculate China's Revealed Comparative Advantage for all sectors between 1995-1999 period which is before the agreement.

The RCA index is used in international economics for calculating the relative advantage or disadvantage of a certain country in a particular class of goods or services. I calculate Revealed Comparative Advantage using Equation 8 for each industry of China during the period using average bilateral trade between 1995-1999 for each industry.

$$RCA = \frac{X_{ij} \backslash \sum_i X_{ij}}{\sum_i X_{ij} \backslash \sum_i \sum_j X_{ij}} \tag{8}$$

The numerator stands for the percentage share of a given sector in countries total exports where X_{ij} is the exports to country j for sector i. The denominator is the share of sector i in world trade. The rca index provides a comparison between the country's export structure with the world export structure for a certain product. If the rca index is equal to 1 for a given sector then percentage share of that country's export is equal to average export of that sector in world trade. If the rca index is above 1 then the country is specialized in the production of that particular sector.

[19] I do not include previous and preceding year of agreement into analysis to capture the impact of accession smoothly.

I estimate industry level gravity equations for 1995-1999 and 2003-2007 periods using average bilateral trade flows. Similar to previous chapters findings, between to periods distance distribution decreases -0.11 points as it documented in Table B1. Also, I calculate China's market share for each particular product at 4-digit level for each period using 4 years averages of bilateral trade flows. Table B1 reports the growth of China's export share in world trade between two consecutive periods indicating that it has almost doubled between two periods.

Table B1. Summary Statistics for 1995-1999 and 2003-2007

	Period	Mean	Std.	Min	Max	Obs
Distance Coefficients 1	1995-1999	-1,03	0,27	-1,70	-0,26	742
Distance Coefficients 2	2004-2007	-1,12	0,28	-1,71	-0,26	724
Change in Distance C.	-	-0,11	0,13	-0,78	0,59	724
HHI 1	1995-1999	0,13	0,08	0,05	0,53	742
HHI 2	2004-2007	0,13	0,08	0,05	0,53	724
Change in HHI	-	0,00	0,05	-0,29	0,30	724
China's Trade Shares 1	1995-1999	0,07	0,11	0,00	0,72	742
China's Trade Shares 2	2004-2007	0,12	0,14	0,00	0,72	724
Change in Trade Shares	-	0,05	0,07	-0,16	0,47	724
China's Rca	1995-1999	1,26	2,08	0,00	13,28	742

Data source: COMTRADE

Table B2 , reports the correlation coefficients of variables accordingly to the values of China's rca. First two lines show that HHI and China's rca is positively correlated especially for the products where China's Rca is greater than one. In line with these, China's sectoral share changes and both HHI changes and the second period level of HHI are positively correlated. These results depict that sectoral competition decrease especially for the China's advantageous product groups after the accession of China to WTO. On the other hand, changes in distance coefficients and second step distance coefficients are negatively correlated with the China's sectoral share changes before and after the Wto agreement.

Table B2. Correlations of Revealed Comparative Advantage of China, China's Sectoral Share Changes, Herfindahl Hirschman Indices and Distance Coefficients

Variables	(1)	(2)	(3)
RCA & HHI 2	0,43*	-0,26*	0,77*
RCA & HHI Change	0,53*	0,06	0,44*
RCA & Distance Co. 2	0	-0,1*	0,02
RCA & Distance Co. Change	-0,05	-0,06	-0,09
Share Change & HHI 2	0,14*	-0,17*	0,32*
Share Change & HHI Change	0,42*	0,02	0,5*
Share Change & Distance Co. 2	-0,14*	-0,16*	-0,18*
Share Change & Distance Co. Change	0,06	0,04	0,13*
Share Change & RCA	0,32*	0,34	0,04
Revealed Comparative Advantage	All	Rca<1	Rca>1

Statistical Significance * $p<0.05$
Data source: COMTRADE.

Figure B1 include two scatter plots. The one presented in the left demonstrate the relation between sectoral averages of HHI and China pre-WTO period rca calculations for China. Second scatter shows the relation between change in HHI before and after China's accession to Wto and pre-WTO period rca calculations for China. These two scatter plots indicate that entrance of China raise the market concentration ratio for the products in which China has comparative advantage. This interpretation is compatible with correlation results.

Figure B2 analyze the relation between sector share of China and sectoral concentration ratios for the post-WTO period in left placed scatter diagram. In the second scatter plot relation between the changes of these variables are analyzed. These scatter plots show that increasing market shares of China raise the market concentration ratio.

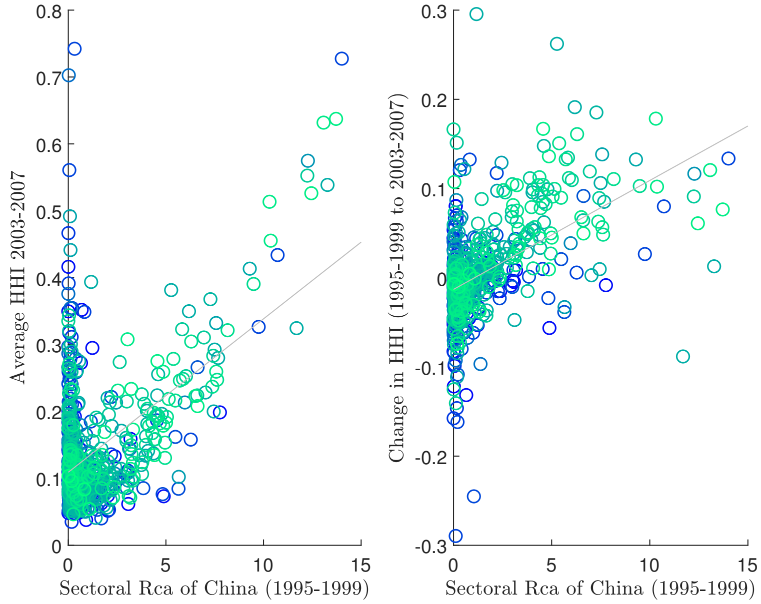

Figure B1. Revealed comparative advantage of China and Herfindahl Hirschman Indices

Figure B3 illustrates the relation between China's market share and distance coefficient for post-WTO era and the changes of these variables. Left sided scatter documents that distance coefficients are comparatively lower if China's sector share change is higher.

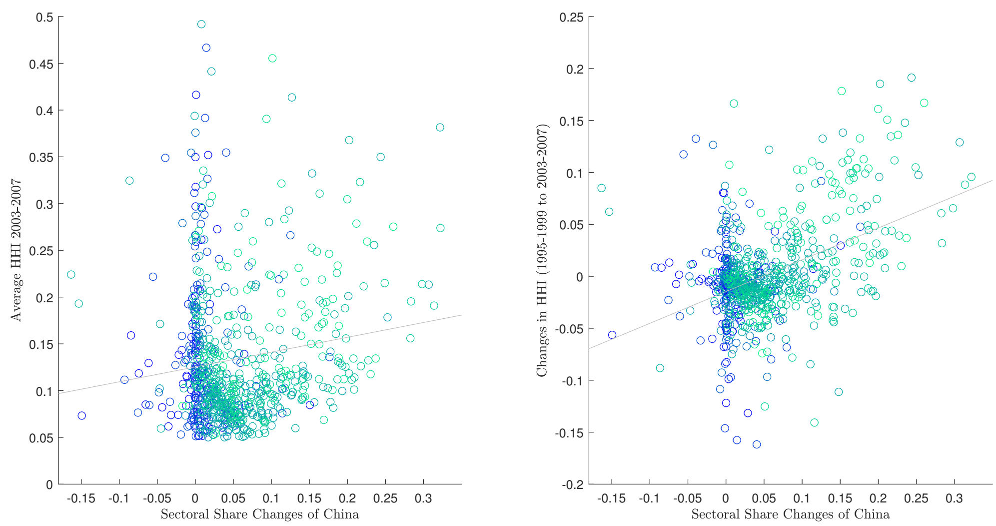

Figure B2. Sector shares of China and Herfindahl Hirschman Indices

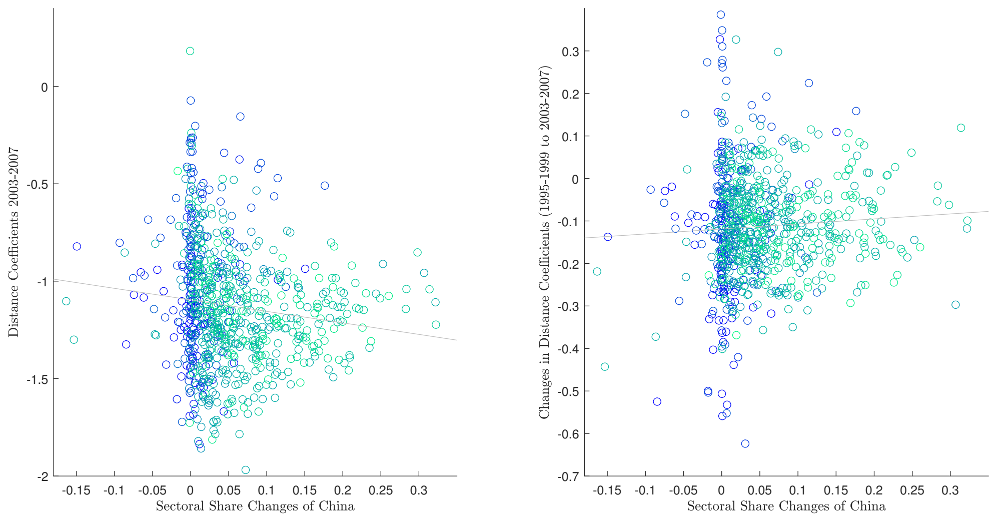

Figure B3. Sector shares of China and distance coefficients

In this appendix, I represent the results of preliminary analysis to evaluate the impact of China's accession to Wto on market concentration indices and distance elasticity of trade.

REFERENCES

Akerlof, G. A., & Yellen, J. L. (1990). The fair wage-effort hypothesis and unemployment. *The Quarterly Journal of Economics*, 105(2), 255-283.

Bernhofen, D. M., El-Sahli, Z., & Kneller, R. (2016). Estimating the effects of the container revolution on world trade. *Journal of International Economics*, 98, 36-50.

Berthelon, M., Freund, C. (2008). On the conservation of distance in international trade. *Journal of International Economics*, 75(2), 310-320.

Bosquet, C., Boulhol, H. (2015). What is really puzzling about the "distance puzzle". *Review of World Economics / Weltwirtschaftliches Archiv*, 151(1), 1-21.

Broda, C., Weinstein, D. E. (2006). Globalization and the gains from variety. *The Quarterly Journal of Economics*, 121(2), 541-585.

Brun, J. F., Carrère, C., Guillaumont, P., & De Melo, J. (2005). Has distance died? Evidence from a panel gravity model. *The World Bank Economic Review*, 19(1), 99-120.

Carrère, C., Schiff, M. (2005). On the geography of trade: distance Is alive and well. *Revue Economique*, 56(6), 1249-1274.

Carrere, C., De Melo, J., Wilson, J. (2013). The distance puzzle and low-income countries: an update. *Journal of Economic Surveys*, 27(4), 717-742.

Coe, D., Subramanian, A., Tamirisa, N. (2007). The missing globalization puzzle: Evidence of the declining importance of distance. *IMF Staff Papers*, 54(1), 34-58.

Disdier, A. C., & Head, K. (2008). The puzzling persistence of the distance effect on bilateral trade. *The Review of Economics and Statistics*, 90(1), 37-48.

Engel, C., Rogers, J. (1998). *Regional patterns in the law of one price: The roles of geography versus currencies. In The regionalization of the world economy* (pp. 153-188). University of Chicago Press.

Frankel, J. A., Stein, E., & Wei, S. J. (1997). *Regional trading blocs in the world economic system*. Peterson Institute.

Head, K., Mayer, T. (2013). What separates us? Sources of resistance to globalization. *Canadian Journal of Economics/Revue Canadienne D'économique*, 46(4), 1196-1231.

Head, K., Mayer, T. (2014). Gravity equations: Workhorse, toolkit, and cookbook. In *Handbook of International Economics* (Vol. 4, pp. 131-195). Elsevier.

Hummels, D. (2007). Transportation costs and international trade in the second era of globalization. *Journal of Economic Perspectives*, 21(3), 131-154.

Huwart, J. and L. Verdier (2013), *Economic globalisation: origins and consequences*, OECD Publishing, Paris, https://doi.org/10.1787/9789264111905-en.

Leamer, E. E., Levinsohn, J. (1995). International trade theory: the evidence. *Handbook of International Economics*, 3, 1339-1394.

Mayer, T. & Zignago, S. (2011). Notes on CEPII's distances measures : The GeoDist Database. *CEPII Working Paper*, 2011-25.

OECD (2007), *OECD Economic Outlook*, Volume 2007 Issue 2, OECD Publishing, Paris, https://doi.org/10.1787/eco_outlook−v2007−2−en.

Silva, J., Tenreyro, S. (2006). The Log of Gravity. *The Review of Economics and Statistics*, 88(4), 641-658.