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The Impact of Immigration on U.S. Trade: A Comparative Study

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The Impact of Immigration on U.S. Trade:

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(TITLE)

BY

Janice Yuen Lai Yap

THESIS

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ABSTRACT

Immigrants play an important role in affecting bilateral trade. Immigrant links to the home country include knowledge of home country markets, language, preferences, and business contacts.

This paper investigates the link between immigration and trade using United States trade data. It analyzes the original study by Gould and the reduced trading partners' study, compares two different time period, and analyzes the role of new variables in the trade equation. The results of this study are divided into three sections.

The first section of this study which compares Gould's original study to the modified Gould's study reveals that immigrants influence loses its significance when the sample size decreases.

The second section compares the immigrants' effect for the two different time period. Immigrant information variable is found to have minimal significance for the 1970 - 1986 time period but are found to affect exports in the 1987 - 1999 time period. Contrary to previous studies, immigrant information variable does not facilitate exports but reduce it.

In the final section, *Distance* and *English-Language* variable are included in the study. Empirical results suggest that *Distance* affect import flows but have no effect on export flows. *English-Language* is found to be statistically insignificant in the model.

Specially Dedicated to Mom

*(*以此文敬献给我挚爱的母亲*)*

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CHAPTER 1

Introduction

The United States has been increasingly populated with immigrants of various national origins, cultures, languages, and races. According to the Immigration and Naturalization Service (INS), new immigrants constituted 32.5 percent of the population increase between 1990 and 2000.

The United States is an important player in the immigration market through its immigration policies. It competes with other countries, such as the other potential host countries and the immigrants' home countries for the immigrant's physical and human capital. As a result of that, international trade not only involves movement of goods and services, but also the movement of people in an immigration market (Borjas, 1990).

Immigration has a great potential to exert a significant influence on United States trade. For instance, United States has received relatively large numbers of immigrants from Asia, which has accounted for an increasing share of world trade. Exports from China, Japan, and South Korea alone constituted 13.9 percent of total U.S. exports in 2000. In addition to that, immigration has been an

important policy issue in United States, especially since the rapid increase in immigrants over the past few years. Immigrants increased about 200,000 from 1999 to 2000.

According to Gould (1994), most economic models of labor migration assume that immigrants will not provide any degree of differences in terms of economic impact since they add to the labor stock in the same way current residents do. However, these models somehow ignore the important aspects of international labor flows. Gould (1994) believes that international labor flows are perhaps the key to the linkage to the home-country market. Some of the immigrants' links to the home country include home country market knowledge, business contacts, and languages.

Head and Reis (1998), on the other hand, mentioned that immigrants may expand trade with their country of origin due to the superior knowledge of, or preferential access to, market opportunities.

With the increasing immigrants' population and the continuous debate on whether immigrants have an adverse impact on the earnings and employment opportunities of the native born, this thesis aims to reexamine the current impact of immigration on international trade. This research is consists of three steps:

1. Firstly, I will extend the study done by Gould (1994) over the 1987 - 1999 period using the same variables as he did.
2. Secondly, I will expand the model by including the *distance* and *English-Language* variables which Gould (1994) has omitted. The latter omitted these variables because these country-specific variables, he believes, do not change over time and if included jointly in the analysis will create perfect multicollinearity.
3. Thirdly, I will perform a comparative study between Gould (1994) and the present one and analyze the differences due to the time periods involved.

The structure of this study is as follows. The introduction will provide an overview of the research. Chapter 2 consists of a review of the literature concerning the various studies done in the immigration and international trade areas. The hypothesis of this study will also be discussed in this chapter. Chapter 3 presents the definition of variables, the modeling framework of the current research, and the reasons for the independent variables included in the model. Regression results will be reported and analyzed in Chapter 4. The final chapter includes a summary of the whole study, weaknesses and

strengths of the study, and suggestions for any improvement or future study.

CHAPTER 2

Review of Literature

In this chapter, I will first provide an overview of general immigration studies and concerns that are found important in this area. Then, I will delve further on discussions specifically on immigration and international trade. This chapter concludes with my own hypothesis of this study.

2.1 General Immigration Studies and Concerns

Immigration flows arise as a result of international differences in economic opportunities, and sometimes in response to political upheavals in source countries. According to Borjas (1990), more than 2 million people migrated to the United States as refugees or asylees between 1946 and 1987.

Immigration is always a controversial issue not only in the United States, but throughout the world. Some view immigration as a benefit to a country while others think of it as something harmful. Higham (1955) presents an interesting account of how economic fears of job

displacement and unemployment interacted with natives' feelings and led to increasing restrictions on immigration. This presumption that immigrants have an adverse impact on the domestic labor market continues even today. As a result of that, this presumption brings forth the main justification for policies designed to restrict the number of immigrant flows to the United States.

Michael Piore (1979) believes that immigrants cause very little displacement of natives because they "take on a distinct set of jobs, jobs that the native labor force refuses to accept." When we are focusing on the labor market of host country, the increase in immigrants is mainly due to an increase in the demand for them. If the supply of the local labor is sufficient to fulfill the local demand, there should not be any increase in immigrants, holding everything else constant. Producers or companies do not need to hire any immigrants to take up the jobs.

One of the major economic considerations in immigration studies is the anticipated effect of immigration on wages especially since factor income is a major determinant of individual economic welfare. Economists Michael Greenwood and John McDowell[1] conclude in their literature that

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[1] Michael J. Greenwood and John M. McDowell. "The Factor Market Consequences of Immigration". Journal of Economic Literature 24 (December 1986): 1750

"substantive empirical evidence regarding the effects of immigration is generally scarce…Little direct evidence is available on immigration's impact on the employment opportunities and wages of domestic workers." This statement mainly suggests that the measurements of the presumed effect that immigrants have on the U.S. labor market simply does not exist. Discussions of whether immigrants reduced the earnings and employment opportunities of natives were typically conducted in a factual vacuum, without any supporting evidence in the arguments (Borjas, 1990).

Finally, in his book, entitled "Friends or Strangers: The Impact of Immigrants on the U.S. Economy" (1990), George Borjas mentioned that:

> "Some of the most important and most emotional questions in the debate over immigration policy are the following: What is the impact of the immigrant flow on the earnings and employment opportunities of natives? Do immigrants truly have an adverse effect on these opportunities? If so, how large is the loss in the economic welfare of natives? Finally, are all native groups equally affected by the entry of immigrants into the labor market?"

2.2 Immigration and International Trade

The relationship between immigration and trade has been recently investigated. According to the article by Ivan, Zhou, and Kim (2002), the first systematic study on trade and immigration was found in Durand, Parrado, and Massey (1992). Durand et.al noticed that international labor migration from nine countries in 1981 was associated with increases in the originating countries' aggregate earnings from merchandise exports in 1988.

Borjas, Freeman, and Katz (1991) examine the contribution of the continuing inflow of less-skilled immigrants and the increasing importance of imports in the U.S economy. Their empirical evidence suggests that both trade and immigration augment the nation's supply of less-skilled workers, particularly workers with less than a high school education.

Gould (1994), however, pioneered the general research linking immigration to international trade. He uses a gravity model to study United States' trade with forty seven partners. Gould proposes that immigrant link influences bilateral trade flows mainly because:

1. Immigrants tend to bring with them a preference for home-country products. In this case, immigrants'

consumption of their home-country products will bring forth an increase in the host-country's imports of those goods.

2. Immigrants bring with them foreign market information and contacts that assist in lowering transaction costs. This scenario predicts an increase in both export and import flows between the home and host countries due to a reduction in transaction costs. The reduction in transaction costs is associated with foreign market information and the establishment of trade relationship.

Gould mentions that immigrants can assist in the reduction of transaction costs through several ways. First, the immigrants who are fluent in both the native language and the host country's language will help diminish transaction costs due to communication barriers. Secondly, if products are found to be differentiated across countries and immigrants bring information about their preferences for home-country products, the costs of obtaining foreign market information in the host country will be reduced. Thirdly, since trade depends on contracts for delivery and payment, the development of trust through immigrant contacts can decrease the cost associated with negotiating trade and contracts. The results of his studies revealed a positive

relationship between the volume of immigration, skill levels of the immigrants, the immigrant group's average duration of settlement abroad and lagged increase in trade volume. This shows that the better skilled the immigrants from any country, the longer they had resided abroad, the more the international trade developed later between the immigrants' homeland and their adoptive country.

Rauch (1996) explores the importance of imperfect information as a barrier to trade. He finds that the impact of distance on bilateral trade volumes varies according to the type of good. Proximity is found to be more trade-stimulating for differentiated and specialized goods than for goods with organized markets. Rauch believes that this effect might be due to informational barriers and he suggests that immigrants may serve a role in reducing these barriers.

Head and Reis (1998) test the proposition of trade expansion by immigrants using Canadian trade data with 136 partners from 1980 - 1992. Their idea of potential linkage between immigration and trade are similar to the one explained by Gould (1994). Their study finds that immigration has a significant positive impact on Canadian bilateral trade. This result is consistent with the idea that immigrant knowledge and connections to home country

lower the transaction costs associated with international trade. Since their result also shows that immigrants increase imports more than exports, preferences for home country goods also play an important role.

In addition to that, Head and Reis (1998) also found out that the effect of immigration on trade varies with the class of immigrant and region of last permanent residence. Independent immigrants have the largest influence on trade, while refugees the least.

In a study by Dunlevy and Hutchinson (1999), they uncovered evidence of pro-trade impact of immigration on U.S imports in the late nineteenth and early twentieth centuries. Their idea of the linkage between immigrants and trade is somewhat different from Gould (1994). According to them, immigrants may serve to link trade in the following ways:

1. Immigrants may have a taste or preference for their home-country goods
2. Immigrants recognize opportunities of trade between their home country and the host country. The awareness of cost differentials, product differentiation, and immigrants' tastes may promote trade links between two countries

3. Pro-trade effect of ethnic networks. Immigrants are usually at an advantage when it comes to dealing with issues in their home country.
4. Trade diverting effect. Immigrants might cause production in the host country to be substituted for goods that had previously been imported. This could be true to the extent that immigrants possess specialized skills or that domestic producers accommodate immigrant tastes by local production.

The results of their study show that the stock of immigrants is estimated to play a significant role in determining the volume of U.S. imports when the observations are aggregated over all goods, countries, and years.

Following the lead of Gould (1994), Rauch and Trindade (1999) study the impact of ethnic Chinese networks on bilateral trade. Their findings suggest that: (1) ethnic Chinese facilitate international trade primarily by matching international buyers and sellers in characteristics space when the Chinese communities are relatively large fractions of the home countries' populations, and (2) Chinese communities that are smaller in fractions are close-knit and facilitate international trade mainly by enforcing community sanctions that deter opportunistic behavior.

Girma and Yu (2000) did a study that investigates the link between immigration and trade using recent data from United Kingdom. They broadly classified the possible mechanisms through which immigrants can reduce the transaction costs of bilateral trade into two: individual-specific and non-individual-specific.

The mechanism is individual-specific when the effect of the immigrant-link would be 'universal'. This mainly denotes that the transaction costs of bilateral trade are reduced due to individual immigrants' business connections or personal contacts with his/her home country. A non-individual-specific mechanism is where the effect of the immigrant-link would be 'non-universal'. Under this mechanism, transaction costs of bilateral trade are reduced because of additional knowledge brought by immigrants about foreign markets and different social institutions. This mechanism highly depends on which country the immigrants come from. For instance, if they are from a country whose social and political institutions are similar to those in the host country, the reduction of transaction cost will be minimal.

Empirical evidence in their paper suggests that immigration from Commonwealth countries is found to have no substantial impact on exports. Besides that, the study also

reveals a pro-imports effect of immigration from the non-Commonwealth countries, while immigration from the Commonwealth countries is found to reduce imports, reflecting trade-substituting activities by the immigrants.

Light, Zhou, and Kim (2002), on the other hand, investigate the relationship between immigration, middleman minority status, transnationalism, and U.S. foreign trade. Their models are found to have mixed results. As expected, transmigrants, middleman minority status, and immigrant entrepreneurship all increased exports. The volume of immigration did indeed have a positive effect on exports but it is considered minimal compared to Gould's. Social and economic characteristics of immigrants have negligible effects upon U.S. imports even though they do increase exports. Light, Zhou, and Kim mention that the discrepancy between imports and exports exists because the U.S. economy needs the assistance of immigrants to export, but does not need assistance in imports.

The studies mentioned above are essential because they assist me in understanding the economic impact of immigrants on both host and home countries. Besides that, they also provide me with a clearer understanding of the impact of immigrants on bilateral trade.

2.3 Hypothesis

As mentioned in the beginning, this study is divided into three steps. First, I perform an extension of Gould (1994) study with the same variables but using a different time period. Second, two variables, *distance* and *English-Language,* will be included in the statistic model. Finally, a comparative study between the latter and the new study will be analyzed.

Since the main study of this thesis is an extension of Gould's, I hypothesize that immigrants will continue to influence both import and export flows.

Transportation costs are generally higher when trading partners are far apart geographically. Hence, the inclusion of *distance* will help to explain how extensive the trade between two countries is. Countries that share a border are likely to have more extensive trade than those over a similar distance if an ocean or another country poses an intermediate obstacle to trade (Head and Reis, 1998). Given that my focus is on the role of immigrants in facilitating trade, I hypothesize that the further the distance between two countries, the higher the transaction costs, and hence, the lower international trade between these two countries.

The *English-Language* variable is a dummy variable which is designed to capture the transaction costs advantages that might exist between trading partners that share a similar language. It may also capture the protrade effects of the shared culture and legal system among English-speaking countries that might affect trade among these countries (Dunlevy and Hutchinson, 1999). Therefore, I hypothesize that international trade between U.S and English-speaking countries is higher than that between the former and non-English-speaking countries.

As mentioned above, I hypothesized that both these two new variables would play a role in the Gravity Equation in estimating bilateral trade flows.

CHAPTER 3

Modeling Framework

3.1 Introduction to the Gravity Model

The gravity model has been called the '…workhorse for empirical studies…' in international economics (Eichengreen and Irwin, 1998). The reason for this is because selective breeding practices tend to improve the performance of racehorses, and so does the gravity model.

According to Anderson (1979), the most successful empirical trade device of the last twenty-five years is probably the gravity equation. The gravity equation is used to apply to a wide variety of goods and factors moving over regional and national borders under different circumstances.

Robert Feenstra (2002) addresses a variety of issues related to the effect of borders on trade between the United States and Canada as well as within each country utilizing the gravity model. He compares three methods using published price indexes and following the computation method of Anderson and van Wincoop[2].

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[2]Anderson, J.A. and van Wincoop, E. Gravity with gravitas: a solution to the border puzzle. NBER Working Paper No. 8079.

Wagner, Head, and Reis (2002) examine the effect of the presence of immigrants on trade for Canada at the provincial level. They use the country fixed effects at the national level to capture the effect on trade resulting from the presence of immigrants that came from the trading partner. Their results show that immigrants have a larger impact on imports than exports, which is consistent with the 'immigrant taste effect' argument.

Loungani, Mody, and Razin (2002), on the other hand, analyze the ability of the gravity model to explain financial and trade flows. The authors show that accounting for transactional distance results in a positive relationship between physical and Foreign Direct Investment (FDI) flows.

Hutchinson (2002) employs data for those who speak English as a first language and those who speak English as a second language to examine the impact of language commonality on the volume of trade between United States and 33 other trading partners. His study reveals that controlling for the ability to communicate reduces the size of the estimated distance coefficient in a gravity model. Those who speak English as a second language in a country have a larger proportional impact on both US exports and imports than those who speak English as a first language.

The papers mentioned above assess the methodologies for estimating the gravity equation as well as demonstrate how this 'workhorse' can be applied to address international economic issues such as the determination of trade flows.

The gravity equation ordinarily is specified as[3]:

$$M_{ijk} = \alpha_k Y_i^{\beta k} Y_j^{\gamma k} N_i^{\xi k} N_j^{\epsilon k} d_{ij}^{\mu k} U_{ijk}$$

where M_{ijk} is the dollar flow of good or factor k from country or region i to country or region j, Y_i and Y_j are incomes in i and j, N_i and N_j are population in i and j, and d_{ij} is the distance between countries (regions) i and j. The U_{ijk} is a lognormally distributed error term with $E(ln\ U_{ijk}) = 0$.

This equation is normally estimated using cross-section data and sometimes pooled data.

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[3] Refer to Anderson (1979).

3.2 Empirical Model

As mentioned above, the gravity model is a standard and empirically successful tool in international economics. It is also a proven model in evaluating the determinants of aggregate trade flows between two countries. Since the primary focus of this empirical analysis is to compare the study performed by former and the latter in a different time period, I will follow the model use by Gould.

In order to examine immigrant-link effects on U.S. bilateral trade flows both over time and across countries, the model in this thesis will use pooled time series data. I will apply the Nonlinear Least Squares (NLIN) technique in SAS to estimate the parameters of this model.

In accordance with the basic theoretical gravity model, the volume of trade between two countries is a function of the size and the distance between them. Size is measured differently in various studies as some combination of population and gross domestic product (Dunlevy and Hutchinson, 1999). Hence, both of these variables will be included in the statistical model.

The basic gravity model does not include relative prices in determining trade patterns. Bergstrand (1985) derives a gravity equation from a general equilibrium model

of the economy and argues that trade depends on relative prices in the two economies and the exchange rate. He uses GDP price deflators, nominal exchange rates, and import and export price indices in his study and finds that they belong in the trade equation. In order to be consistent with Gould's model, I will only include the GDP price deflators and the import and export price indices in my model.

Transaction costs in trade are assumed to be a function of foreign market information brought forth by immigrants. Gould hypothesized that immigrants provide foreign market information that decreases the transaction costs in trade at a decreasing rate. It is shown in the following functional form of the stock of immigrants from country j into the United States[4]:

$$Z_{us,j} = Ae^{-\rho[M_{us,j}/(\theta+M_{us,j})]},$$

$$\rho > 0, \theta > 0, A > 0,$$

where $Z_{us,j}$ represents the transaction costs to trade related to obtaining foreign market information about country j in the United States. The parameter ρ determines the size of the immigrants' effects on transaction costs; θ determines the curvature of the function, and A is simply a constant. Since θ determines the sensitivity of transaction

[4] Refer to Gould (1994).

costs to the size of the immigrant stock, its value can be used to explain something about the size of the immigrant stock at which most of the marginal benefit from an additional immigrant is exhausted[1].

The size of the immigrant stock is the key variable in this study; it represents the number of immigrants from country *j* living in the United States. According to Gould (1994), the effect of the immigrants' length of stay is addressed by including the average length of stay of the immigrant stock. In order to account for the possibilities of nonlinearities in the effects of length of stay, both the length of stay variable and its squared value are included in the regressions. Gould mentioned that as the length of stay increases, the ability of immigrants to incorporate their foreign market information into the United States increases as well. The rate of this increase, however, may diminish if immigrant foreign market information from immigrants becomes obsolete over time.

Deardorff (1984) finds that countries in which skilled labor is abundant tend to export skilled-labor-intensive manufactured goods. Maskus (1983) observes that the relationship between net exports of various U.S. manufacturing industries and their use of skilled labor is getting stronger over time. In order to capture the effects

of the immigrants' skill level, the ratio of skilled immigrants to unskilled immigrants will be included in the model.

Finally, Gould (1994) uses a simple flow-adjustment specification to approximate the possible dynamic effect. In this model, I will exclude the lagged value of imports and exports[vi].

The preliminary equation in the nonlinear form describing export flows is as follows[5]:

$$\log EX_{us,j} = \alpha_0 \log Y_{us} + \alpha_1 \log Y_j + \alpha_2 \log POP_{us} + \alpha_3 \log POP_j + \alpha_4 \log P_{us}$$
$$+ \alpha_5 \log P_j + \alpha_6 \log Px_{us} + \alpha_7 \log Pi_j + \alpha_8 (M_{us,j} / \alpha_9 M_{us,j})$$
$$+ \alpha_{10}(SKUK) + \alpha_{11}(STAY) + \alpha_{12}(STAY^2) + \varepsilon$$

while the import equation is:

$$\log IM_{j,us} = \beta_0 \log Y_{us} + \beta_1 \log Y_j + \beta_2 \log POP_{us} + \beta_3 \log POP_j + \beta_4 \log P_{us}$$
$$+ \beta_5 \log P_j + \beta_6 \log Px_j + \beta_7 \log Pi_{us} + \beta_8 (M_{us,j} / \beta_9 M_{us,j})$$
$$+ \beta_{10}(SKUK) + \beta_{11}(STAY) + \beta_{12}(STAY^2) + \nu$$

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[5] Refer to Gould (1994)

where

$EX_{us,j}$ = exports of goods from the United States to the home country, j,

$IM_{j,us}$ = imports of goods from the home country j to the United States,

β and α = the estimated parameters

Y_{us} *and* Y_j = the U.S and home country GDPs,

POP_{us} *and* POP_j = the U.S and home country population,

P_{us} *and* P_j = the U.S and home country GDP deflators,

Px_{us} *and* Px_j = the U.S and home country export unit value indexes,

Pi_{us} *and* Pi_j = the U.S and home country import unit value indexes,

$M_{us,j}$ = the number of immigrants from home country j in the United States,

$SKUK_{us,j}$ = the ratio of skilled immigrants to unskilled immigrants from home country j in the United States,

$STAY_{us,j}$ = the average length of stay of the immigrants in the United States,

$STAY^2_{us,j}$ = the squared value of the average length of stay of the immigrants in

the United States,

ε and ν = error terms

Note that the only difference between the export and import equation comes from the included price variables. In the export equation, the country j's unit import values and the U.S export unit values are included. In the import equation, however, the country j's export unit values and the U.S. import values are included. According to Gould, the number of immigrants from the United States in the home countries is omitted due to the unavailability of data.

3.2.1 Inclusion of New Variables

According to Gould, there are many country-specific institutional, language, distance, and factor endowment differences that may influence bilateral trade flows. He argues that all these variables should not be included jointly in the pooled cross-sectional time series analysis due to perfect multicollinearity. In order to test whether his arguments hold true, I will include two additional variables (distance and English-Language) in the second section of my study.

As mentioned earlier, distance between the trading partners is a standard element of the gravity model. Since transportation costs are generally higher when trading partners are far apart geographically, I will include the distance between the capital cities of two countries as an explanatory variable. Considering the distance between capital cities of two countries does not change over time except for a few due to political reasons, I hypothesized that effect of distance on trade flows to be the same in both studies.

Besides the distance variable, I will also include the English-Language dummy variable in the model. Light, Zhou, and Kim (2002) state that immigrants' fluency in English increased American exports to sending countries, but immigrants' fluency in English did not increase American imports from the sending countries. I hypothesize that international trade between U.S and English-speaking countries would be higher than that between the former and non-English-speaking countries.

Following is the new equation after taking into account the addition of the *distance* and the *English-Language* dummy variables.

The estimated export equation is:

$$\log EX_{us,j} = \alpha_0 \log Y_{us} + \alpha_1 \log Y_j + \alpha_2 \log POP_{us} + \alpha_3 \log POP_j + \alpha_4 \log P_{us} + \alpha_5 \log P_j + \alpha_6 \log Px_{us} + \alpha_7 \log Pi_j + \alpha_8 (M_{us,j} / \alpha_9 M_{us,j}) + \alpha_{10}(SKUK) + \alpha_{11}(STAY) + \alpha_{12}(STAY^2) + \alpha_{13} \log DIST_{us,j} + \alpha_{14}(ENG) + \varepsilon$$

The estimated import equation is:

$$\log IM_{j,us} = \beta_0 \log Y_{us} + \beta_1 \log Y_j + \beta_2 \log POP_{us} + \beta_3 \log POP_j + \beta_4 \log P_{us} + \beta_5 \log P_j + \beta_6 \log Px_j + \beta_7 \log Pi_{us} + \beta_8 (M_{us,j} / \beta_9 M_{us,j} + \beta_{10}(SKUK) + \beta_{11}(STAY) + \beta_{12}(STAY^2) + \beta_{13} \log DIST_{us,j} + \beta_{14}(ENG) + \nu$$

where

$DIST_{ij}$ = the distance between the capital cities of countries j and United States

ENG = the zero-one English-Language dummy variable, zero indicates non-English speaking country while one indicates English-speaking country

3.3 Data Collection

In Gould's study, he collected annual data for 47 U.S. trading partners for the years 1970 through 1986. Since my study is an extension of Gould's for the time period from 1987 through 1999, I have to omit 12 out of the 47 trading partners due to unavailability of data. Appendix A.1 and A.2 list these countries and the years for which data is available for both time periods. There should not be any systematic bias on the country selection since the countries selected is widely ranged from both developed and developing countries.

Trade data on consumer and producer manufactured imports and exports are excluded in this study even though they are originally included in Gould's. This is due to the difficulty of classifying the goods in accordance with Gould's study since the current four-digit International Standard Industrial Classification (ISIC) codes which is Revision 3.1 is quite different from the ISIC code Revision 2.0 that Gould uses.

Aggregate trade data on imports and exports are collected from the International Monetary Fund (IMF) Direction of Trade Statistics Yearbook. All the variables are in millions of U.S. dollars.

Data on annual immigrant stock, the immigrants' length of stay, and skilled and unskilled immigrants are retrieved from both the Immigration and Naturalization Service (INS) and the census. For the years from 1996 to 1999, immigrant stock data are available at www.immigration.gov. Data prior to 1996 are constructed from the Statistical Yearbook of the INS.

According to Gould, there is difficulty in estimating the actual stock of immigrants on an annual basis. This is mainly due to the problem of illegal immigrants which causes under-counting as well as emigration which causes over-counting. In addition to that, INS excludes illegal immigrants completely. Greenwood (1983) estimates that more than 2 million immigrants are excluded from the count in the 1980 census.

Data on both skilled and unskilled workers are retrieved from the table entitled "Immigrants Admitted by Major Occupation Group and Region and Selected Country of Birth" in the Statistical Yearbook of INS. Skilled workers are defined as immigrants whose occupation is classified as "professional, specialty, and technical". Unskilled workers are those classified as "operator, fabricator, and laborer", "farming, forestry, and fishing", and "service."

The average length of stay of the immigrants is constructed using the "Calendar Year of Entry" table. The measure consists of the average length of stay of the immigrants who arrived between 1970 and 1986, and between 1987 and 1999 for the second section of my study[ii]. Gould mentioned that the statistics could be overestimated because decreases in the immigrant stock from return emigration or death are not reported.

Data on income, prices, and population are gathered from the IMF's International Financial Statistics yearbook as well as www.imfstatistic.org. Income is in millions of U.S dollars, and prices are export and import unit value indexes that are scaled to 100 in 1985 for the years 1970 - 1986 and scaled to 100 in 1990 for the years 1987 - 1999. For the years 1970 - 1986, GDP deflator data come from IMF's International Financial Statistics. For the years 1987 - 1999, I retrieve them from the World Development Indicators 2001 (World Bank).

Following Girma and Yu (2000), I use the Great Circle distance between capital cities[6]. Distance is measured in kilometers (km). Finally, the English-Language data are gathered from the CIA World Factbook. A value of zero

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[6] The data is available at http://www.wcrl.ars.usda.gov/cec/java/capitals.htm

indicates non-English speaking countries while one indicates an English speaking country. An English speaking country is one that uses English either as the first or main language or official language.

Notice that Mexico is excluded from the analysis. This is mainly due to the lack of data. The data on its unit-value export and import prices are not available. In addition, Gould mentioned that the exclusion of Mexico could be desirable for the empirical study because it shares a border with United States and has an immigrant stock that is far above that of all other countries.

CHAPTER 4

Regression Results and Analysis

This analysis is designed to study the impact of immigration on U.S. bilateral trade. The empirical results of this analysis will be presented in three subsections:

1. Comparison of results between Gould's original and modified models,
2. Comparison of results between the two different time periods (1970 - 1986 and 1987 - 1999),
3. Comparison results between the two different time period with the inclusion of new variables (*Distance* and *English-Language*)

In order to examine the relationship between immigrant and bilateral trade flows, I will present the results of each subsection based on the following:

1. The hypothesis of immigrant links against alternative hypothesis which is the immigrant preference for home product hypothesis[iv],
2. The roles that length of stay and the skill level of immigrants play in the immigrant-link effects[iii].

4.1 Comparison of results between Gould's original and modified models

In the study conducted by Gould, he uses a sample of 47 United States trading partners for the period from 1970 through 1986. The results of his study, presented in Table 4.1 below, show positive coefficients on the immigrant information variable. The coefficients on the immigration information variable are 4.960 for exports and 1.928 for imports. This variable is significant at the 2.5 percent significance level in explaining the variations in exports and imports. This seems to support the immigrant preference for home-country products hypothesis as well as the immigrant-link hypothesis[iv]. The length of stay and the immigrant skilled-unskilled ratio variable are found to be statistically insignificant.

Table 4.1 - Bilateral Trade Flows Between United States and 47 Trading Partners

	1970-1986 Aggregate	
Dependent Variable	**Exports**	**Imports**
Lagged Dependent Variable	0.624	0.472
	(20.41)*	(11.86)*
Immigrant information variable	4.960	1.928
	(5.39)*	(3.48)*
Immigrant skilled-unskilled ratio	-0.034	-0.037
	(-1.15)	(-0.85)
Immigrant stay	-0.033	0.042
	(-1.47)	(1.24)
Immigrant stay2	4.3E-3	-1.5E-4
	(1.05)	(-0.24)
Home-country GDP	0.154	0.052
	(2.86)*	(0.63)
U.S. GDP	0.718	2.205
	(1.60)	(3.30)*
Home-country population	-0.720	-0.754
	(-3.04)*	(-2.26)*
U.S. population	4.100	-3.457
	(1.10)	(-0.55)
Home-country GDP deflator	0.003	0.038
	(0.18)	(1.48)
U.S. GDP deflator	-2.618	-2.330
	(-4.11)*	(-2.69)*
U.S. export unit value index	1.428	
	(7.09)*	
U.S. import unit value index		0.204
		(1.10)
Home-country export unit value index		-0.008
		(-0.15)
Home-country import unit value index	-0.095	
	(-2.51)*	
Adjusted R2	0.998	0.997
Observations	716	708

Table from Gould (1994).
Note: *t*-values are in parentheses
*Significant at the 2.5 percent.
**Significant at the 5 percent.

In order for my analysis to be consistent in both time periods, I have to exclude 12 out of the 47 U.S. trading partners due to the unavailability of data. Appendix A.3 lists the countries that have been excluded. With a reduced sample, the immigrant information variable became statistically insignificant[vii]. The immigrant length of stay and the squared of immigrant length of stay, however, are found to be significant at 2.5 percent significance level for both exports and imports. For exports, the coefficient of the immigrant length of stay variable is -0.129 and the coefficient of the square of immigrant length of stay is 0.004. This result for aggregate exports suggests that immigrant-link effects only increase after the immigrants have been in the United States for some time and gain enough knowledge about this country.

For imports, the coefficient of the immigrant length of stay variable is -0.125 while the coefficient for the square of immigrant length of stay is 0.006. These estimated parameters for import flows indicate an immigrant-link effect that increases at a decreasing rate over time.

Similar to the results of Gould's study, the immigrant skilled-unskilled ratio variable are found to be statistically insignificant. The results for the reduced sample trading partners are shown in Table 4.2 below.

Table 4.2 - Bilateral Trade Flows Between United States and 35 Trading Partners (1970 - 1986)

	1970-1986	
	Aggregate	
Dependent Variable	**Exports**	**Imports**
Immigrant information variable	0.530	1.251
	(0.42)	(1.78)
Immigrant skilled-unskilled ratio	0.017	-0.059
	(0.62)	(-1.45)
Immigrant stay	-0.129	-0.125
	(-3.73)*	(-2.44)*
Immigrant stay2	0.004	0.006
	(2.78)*	(2.88)*
Home-country GDP	0.304	0.141
	(5.32)*	(1.68)
U.S. GDP	1.479	3.504
	(2.85)*	(4.76)*
Home-country population	-0.350	-0.628
	(-1.36)	(-1.70)
U.S. population	-10.302	-2.577
	(-2.53)*	(-0.37)
Home-country GDP deflator	-0.043	0.051
	(-2.54)*	(2.10)**
U.S. GDP deflator	-0.798	-3.531
	(-1.20)	(-3.84)*
U.S. export unit value index	2.106	
	(7.72)*	
U.S. import unit value index		0.733
		(3.17)*
Home-country export unit value index		0.049
		(0.71)
Home-country import unit value index	-0.114	
	(-2.30)*	
Adjusted R2	0.999	0.997
Observations	548	544

Note: *t*-values are in parentheses
*Significant at the 2.5 percent.
**Significant at the 5 percent.

4.2 Comparison of Results between the Two Different Time Periods (1970 -1986 and 1987 - 1999)

In Chapter 2 of this thesis, I hypothesize that the immigrant information variable will continue to have an effect on both import and export flows for these two time periods. Since the empirical results have shown that the immigrant information variable is not significant after 12 trading partners have been excluded, this finding has highly affected my hypothesis. This is because immigrant information variable which originally thought to have an impact on U.S bilateral trade flows in the first period no longer holds true.

As mentioned in the previous subsection, immigrant information, the length of stay for imports, and the immigrant skilled-unskilled ratio variables are found to be statistically insignificant while the length of stay for exports is found to be statistically significant for the period from 1970 through 1986 (Refer to Table 4.2).

For the period from 1987 through 1999, the immigrant information variable for aggregate exports is found to be significant at the 2.5 percent significance level. This seems to support the immigrant-link hypothesis. However, contrary to the hypothesis that immigrants facilitate

exports, the estimated negative coefficient of -1.048 suggests just the opposite. A one-percent increase in immigrant information will decrease exports by 1.048 percent.

The immigrant skilled to unskilled ratio variable for aggregate exports is significant at the 2.5 percent significance level with an estimated positive coefficient of 0.054. This result shows that a one-percent increase in the skilled to unskilled immigrant labor ratio will enhance exports by 0.054 percent. This positive effect could be due to the increase of foreign market information coming from the highly skilled immigrant.

Immigrant information for import, immigrant skilled and unskilled ratio for imports, and length of stay variables are all insignificant. (Refer to Table 4.3 below for the complete regression results.) Table B.1 and B.2 in the appendix present the estimated country-specific intercepts for the import and export equation.

In comparing the results for the two time periods, immigrant information variable is found to have low significance in the first time period but it does influence exports in the second time period. These results show that my original hypothesis of obtaining similar results for both time periods has to be rejected. One interesting finding

suggests that contrary to previous study, immigrants do not foster exports but seem to impede them.

Table 4.3 - Bilateral Trade Flows Between United States and 35 Trading Partners (1987 - 1999)

	1987-1999	
	Aggregate	
Dependent Variable	**Exports**	**Imports**
Immigrant information variable	-1.048	-0.132
	(-2.80)*	(-0.44)
Immigrant skilled-unskilled ratio	0.054	-0.029
	(3.54)*	(-1.59)
Immigrant stay	0.059	0.033
	(0.60)	(0.29)
Immigrant stay2	-0.007	-0.010
	(-0.47)	(-0.55)
Home-country GDP	0.799	0.318
	(9.44)*	(3.01)*
U.S. GDP	1.615	1.025
	(1.85)	(1.00)
Home-country population	0.039	-0.678
	(0.12)	(-1.85)
U.S. population	-7.254	7.897
	(-1.58)	(1.42)
Home-country GDP deflator	0.029	-0.038
	(2.94)*	(-3.26)*
U.S. GDP deflator	0.298	-2.874
	(0.24)	(-1.71)
U.S. export unit value index	0.233	
	(0.42)	
U.S. import unit value index		-0.130
		(-0.21)
Home-country export unit value index		-0.060
		(-1.68)
Home-country import unit value index	0.032	
	(1.10)	
Adjusted R2	0.999	0.999
Observations	381	375

Note: *t*-values are in parentheses
*Significant at the 2.5 percent.
**Significant at the 5 percent.

4.3 Comparison of Results between Two Different Time Periods with the Inclusion of New Variables

For this subsection, I hypothesize that both Distance and the English-Language variable play a significant part in explaining trade flows.

Distance plays an important role in international trade since transportation costs are generally higher when trading partners are far apart geographically. The higher the transaction costs, the lower the international trade between two countries. For aggregate imports during the 1987 - 1999 period, distance appears to be significant at 2.5 percent significance level. The negative coefficient of -4.464 shows that a one-percent increase in distance will reduce imports by 4.464 percent, holding other variables constant. The result is consistent with the hypothesis that the further apart the U.S and its trading partners, the lower U.S imports between them. Distance appears to have minimal significance on U.S. exports. Hence, my hypothesis is supported for imports in the second period but has to be rejected for exports in both periods and import for the first period.

The *English-Language* variable is used to capture the transaction costs advantages that might exist between

trading partners that share a similar language. As mentioned earlier, I hypothesize that international trade between United States and other English-speaking countries would be higher than with non-English-speaking countries. By using the results in Table 4.4 below, English-Language variable is found to be of very low statistical significance. Thus, my hypothesis has to be rejected since *English-Language* did not play a role in influencing trade flows between the U.S. and other trading partners.

In Gould's study, he believes that country-specific variables such as distance and language do not change over time and inclusion of these variables will only create perfect multicollinearity. Contrary to his belief, the results of my study show that these variables are independent from others included and the inclusion of these variables does not create any multicollinearity. (Refer to Table 4.2, Table 4.3 and Table 4.4 for comparison). Table B.3 and B.4 in the appendix presents the estimated country-specific intercepts for the import and export equation with the inclusion of the new variables.

Table 4.4 - Bilateral Trade Flows Between United States and 35 Trading Partners with Inclusion of New Variables

	1970-1986		1987-1999	
	Aggregate		Aggregate	
Dependent Variable	**Exports**	**Imports**	**Exports**	**Imports**
Immigrant information variable	0.530	1.251	-1.031	-0.153
	(0.42)	(1.78)	(-2.75)*	(-0.51)
Immigrant skilled-unskilled ratio	0.017	-0.059	0.054	-0.028
	(0.62)	(-1.45)	(3.49)*	(-1.51)
Immigrant stay	-0.129	-0.125	0.058	0.037
	(-3.73)*	(-2.44)*	(0.58)	(0.32)
Immigrant stay2	0.004	0.006	-0.007	-0.011
	(2.78)*	(2.88)*	(-0.46)	(-0.58)
Home-country GDP	0.304	0.141	0.798	0.318
	(5.32)*	(1.68)	(9.43)*	(3.02)*
U.S. GDP	1.479	3.504	1.543	1.195
	(2.85)*	(4.76)*	(1.75)	(1.16)
Home-country population	-0.350	-0.628	0.038	-0.685
	(-1.36)	(-1.70)	(0.12)	(-1.87)
U.S. population	-10.302	-2.577	-6.860	7.072
	(2.53)*	(-0.37)	(-1.48)	(1.27)
Home-country GDP deflator	-0.043	0.051	0.029	-0.038
	(-2.54)*	(2.10)**	(2.91)*	(-3.23)*
U.S. GDP deflator	-0.798	-3.531	0.272	-2.862
	(-1.20)	(-3.84)*	(0.22)	(-1.70)

Table 4.4 - continued

	1970-1986		1987-1999	
	Aggregate		Aggregate	
Dependent Variable	**Exports**	**Imports**	**Exports**	**Imports**
U.S. export unit value index	2.108		0.230	
	(7.72)*		(0.42)	
U.S. import unit value index		0.733		-0.106
		(3.17)*		(-0.17)
Home-country export unit value index		0.049		-0.060
		(0.71)		(-1.68)
Home-country import unit value index	-0.114		0.032	
	(-2.30)*		(1.10)	
Distance	3.635	-3.750	1.017	-4.464
	(1.71)	(-1.02)	(0.79)	(-2.77)*
English-Language	0.392	-0.494	-0.042	1.748
	(1.86)	(-1.37)	(-0.05)	(1.78)
Adjusted R2	0.998	0.996	0.999	0.999
Observations	548	544	380#	374#

Note: *t*-values are in parentheses
*Significant at the 2.5 percent.
**Significant at the 5 percent.
#Due to missing values, one observation is omitted from the regression.

CHAPTER 5

Conclusion and Agenda for Future Research

5.1 Conclusion

This thesis analyzes the effect of immigration on bilateral trade. It consists of first duplicating Gould's study using different time periods and extending his model with inclusion of two new variables.

The empirical results in the first subsection of the previous Chapter indicates that the immigrant information variable seems to lose its significance when the sample size decreases from 47 trading partners to 35 in Gould's study.

In the second subsection of the previous Chapter, the immigrant information variable is found to play an important role in determining export flows for the 1987 - 1999 time period even though its significance is very minimal for the 1970 - 1986 time period. Although the result in the second time period does show an immigrant-link effect on exports, contrary to Gould's hypothesis, immigrant information actually reduces exports instead of facilitating it.

In the last subsection, distance appears to play a role in influencing aggregate imports for the 1987 - 1999 period. The result is consistent with the hypothesis that the

further apart the trading partner, the lower U.S. imports. On the other hand, the English-Language variable has minimal effect on bilateral trade flows.

5.2 Suggestions for Further Study

This study begins with an interest on the effect of immigrants on U.S. bilateral trade flows. The method applied in this study uses a pooled cross-section time-series data in order to capture this effect over time as well as across different countries.

However, I suspect that the smaller sample used in this study may have led to statistical non significance of such effect. Hence, in order to further improve on this study, a bigger sample size is recommended.

Finally, other variables could be used to explore the immigrant effect on trade such as the immigrants' country origin, trade flows by commodity groups, as well as technology. In this modern technology age, it will be relevant to see whether immigrants lead to an increase in transfer of technology which in turn leads to an increase in trade flows.

APPENDIX

A.1 U.S. Bilateral Trading Partners and Years of Available Data (1970 - 1986)

Country	Years
Australia	1970 - 1986
Austria	1970 - 1986
Brazil	1970 - 1986
Canada	1970 - 1986
Columbia	1970 - 1986
Denmark	1970 - 1986
Finland	1970 - 1986
France	1970 - 1986
Greece	1970 - 1986
Hungary	1970 - 1986
India	1970 - 1986
Ireland	1970 - 1986
Israel	1970 - 1986
Italy	1970 - 1986
Japan	1970 - 1986
Jordan	1970 - 1986
Kenya	1970 - 1986
Morocco	1970 - 1986
Netherlands	1970 - 1986
New Zealand	1970 - 1986
Norway	1970 - 1986
Pakistan	1970 - 1986
Philippines	1970 - 1986
South Africa	1970 - 1986
South Korea	1970 - 1986
Singapore	1972 - 1980
Spain	1970 - 1986
Sri Lanka	1970 - 1986
Sweden	1970 - 1986
Switzerland	1970 - 1986
Syria	1970 - 1986
Thailand	1970 - 1986
Turkey	1970 - 1984
United Kingdom	1970 - 1986
West Germany	1970 - 1986

A.2 U.S. Bilateral Trading Partners and Years of Available Data (1987 - 1999)

Country	**Years**
Australia	1987 - 1999
Austria	1987 - 1993
Brazil	1987 - 1999
Canada	1987 - 1999
Columbia	1987 - 1999
Denmark	1987 - 1993,1998 - 1999
Finland	1987 - 1993,1998 - 1999
France	1987 - 1999
Greece	1987 - 1999
Hungary	1987 - 1999
India	1987 - 1999
Ireland	1987 - 1999
Israel	1987 - 1999
Italy	1987 - 1999
Japan	1987 - 1999
Jordan	1987 - 1999
Kenya	1987 - 1999
Morocco	1987 - 1999
Netherlands	1987 - 1999
New Zealand	1987 - 1994, 1998 - 1999
Norway	1987 - 1993, 1998 - 1999
Pakistan	1987 - 1999
Philippines	1990 - 1997
South Africa	1987 - 1998
South Korea	1987 - 1999
Singapore	1987 - 1993, 1995,1998 - 1999
Spain	1987 - 1999
Sri Lanka	1987 - 1997
Sweden	1987 - 1999
Switzerland	1988 - 1999
Syria	1987 - 1997
Thailand	1987 - 1999
Turkey	1989 - 1999
United Kingdom	1987 - 1999
Germany[7]	1991 - 1999

[7] Note that West Germany and East Germany united in 1990. I did not exclude Germany in the second section of my study because East Germany contributed very little to the overall data after unification.

A.3 List of Excluded Countries

Countries
Cyprus
El Salvador
Ethiopia
Iceland
Malaysia
Malta
Nicaragua
Tanzania
Trinidad
Tunisia
Yugoslavia
Zimbabwe

B.1 Country-Specific Intercepts (1970 - 1986)

	1970-1986			
	Aggregate			
	Exports		Imports	
Country	Estimate	t-value	Estimate	t-value
Australia	30.774	1.65	-34.619	-1.07
Austria	28.459	1.52	-36.796	-1.14
Brazil	31.264	1.68	-32.663	-1.01
Canada	33.045	1.77	-31.925	-0.99
Colombia	30.332	1.62	-35.092	-1.09
Denmark	29.061	1.55	-36.106	-1.11
Finland	28.424	1.52	-36.748	-1.13
France	31.228	1.68	-33.478	-1.04
Greece	29.297	1.57	-37.221	-1.15
Hungary	27.617	1.48	-38.084	-1.18
India	30.913	1.67	-32.824	-1.02
Ireland	29.198	1.56	-37.211	-1.15
Israel	30.113	1.60	-35.899	-1.11
Italy	31.121	1.67	-33.532	-1.04
Japan	32.537	1.75	-31.351	-0.97
Jordan	28.915	1.54	-41.562	-1.28
Kenya	27.894	1.49	-37.109	-1.14
Morocco	29.273	1.57	-37.946	-1.17
Netherlands	31.449	1.68	-34.915	-1.08
New Zealand	28.919	1.54	-36.116	-1.11
Norway	29.131	1.55	-36.204	-1.12
Pakistan	29.976	1.61	-35.929	-1.11
Philippines	30.515	1.64	-34.355	-1.07
South Africa	30.363	1.63	-34.056	-1.05
South Korea	31.259	1.68	-33.458	-1.04
Singapore	30.237	1.61	-35.483	-1.09
Spain	30.729	1.65	-34.561	-1.07
Sri Lanka	27.673	1.48	-36.534	-1.12
Sweden	29.811	1.59	-35.359	-1.09
Switzerland	30.254	1.62	-35.244	-1.09
Syria	27.895	1.49	-39.622	-1.22
Thailand	29.888	1.60	-35.169	-1.09
Turkey	29.778	1.60	-35.970	-1.11
United Kingdom	31.837	1.71	-32.937	-1.02
West Germany	31.752	1.71	-32.760	-1.02

Note: All the countries are statistically insignificant for both Aggregate Exports and Imports.

B.2 Country-Specific Intercepts (1987 - 1999)

Country	1987-1999 Aggregate			
	Exports		Imports	
	Estimate	t-value	Estimate	t-value
Australia	11.717	1.05	-38.368	-2.70*
Austria	10.056	0.90	-40.545	-2.85*
Brazil	11.284	1.00	-39.258	-2.75*
Canada	13.845	1.24	-35.195	-2.48*
Colombia	12.192	1.09	-37.832	-2.66*
Denmark	10.414	0.93	-39.816	-2.80*
Finland	10.149	0.91	-40.430	-2.84*
France	11.175	1.00	-37.962	-2.67*
Greece	10.391	0.93	-39.701	-2.79*
Hungary	9.954	0.88	-41.377	-2.90*
India	10.853	0.95	-41.849	-2.90*
Ireland	12.331	1.09	-40.049	-2.80*
Israel	12.519	1.10	-41.173	-2.86*
Italy	10.769	0.96	-37.784	-2.66*
Japan	11.661	1.04	-35.962	-2.53*
Jordan	11.801	1.05	-43.792	-3.07*
Kenya	10.431	0.93	-41.915	-2.94*
Morocco	10.717	0.96	-40.050	-2.82*
Netherlands	12.147	1.08	-38.411	-2.71*
New Zealand	11.326	1.01	-40.39	-2.83*
Norway	10.474	0.93	-41.258	-2.88*
Pakistan	11.284	0.99	-42.233	-2.94*
Philippines	12.491	1.11	-39.146	-2.74*
South Africa	12.605	1.13	-37.450	-2.63*
South Korea	11.154	0.99	-40.604	-2.85*
Singapore	12.568	1.12	-37.756	-2.65*
Spain	10.671	0.96	-36.837	-2.59*
Sri Lanka	10.441	0.93	-38.964	-2.74*
Sweden	10.917	0.97	-38.762	-2.73*
Switzerland	11.390	1.02	-37.380	-2.63*
Syria^	10.319	0.92	-41.667	-2.93*
Thailand	11.921	1.06	-37.388	-2.63*
Turkey	11.228	1.00	-39.779	-2.80*
United Kingdom	12.036	1.07	-38.127	-2.68*
Germany^^	11.273	1.00	-37.396	-2.63*

^Syria is currently known as Syrian Arab Republic

^^Germany is unified in 1990. Hence, 'Germany' will be more appropriate than 'West Germany'.

Note: All the country estimates for exports are statistically insignificant while all the country estimates for imports are statistically significant at 2.5 percent.

B.3 Country-Specific Intercepts with New Variables

(1970 - 1986)

	1970-1986 Aggregate			
	Exports		Imports	
Country	**Estimate**	***t*-value**	**Estimate**	***t*-value**
Australia	-4.793	-2.23**	2.166	0.59
Austria	-3.695	-6.88*	-3.622	-4.49*
Brazil	-0.759	-2.58*	0.377	0.82
Canada	8.354	1.97**	-6.361	-0.87
Colombia	0.323	0.29	-4.130	-2.13**
Denmark	-2.765	-4.45*	-3.270	-3.53*
Finland	-3.646	-5.74*	-3.660	-3.85*
France	-0.379	-2.86*	-0.867	-3.33*
Greece	-3.400	-5.16*	-3.486	-3.23*
Hungary	-4.648	-9.38*	-4.795	-6.22*
India	-3.601	-2.02**	2.875	0.99
Ireland	-2.337	-3.07*	-4.586	-4.09*
Israel	-3.086	-3.16*	-1.646	-1.04
Italy	-1.074	-4.01*	-0.315	-0.69
Japan	-1.285	-1.03	3.544	1.68
Jordan	-4.301	-4.11*	-7.292	-4.41*
Kenya	-6.617	-4.29*	-1.412	-0.56
Morocco	-2.307	-5.98*	-5.364	-6.69*
Netherlands	-0.175	-0.44	-2.289	-3.76*
New Zealand	-6.252	-3.21*	0.262	0.08
Norway	-2.536	-3.65*	-3.532	-3.44*
Pakistan	-3.936	-3.08*	-0.942	-0.45
Philippines	-4.535	-2.43*	1.897	0.59
South Africa	-4.418	-2.61*	1.918	0.68
South Korea	-2.632	-2.15**	1.508	0.73
Singapore	-5.229	-2.46*	1.198	0.34
Spain	-0.823	-3.65*	-2.007	-4.86*
Sri Lanka	-7.093	-4.10*	-0.661	-0.23
Sweden	-2.092	-4.19*	-2.443	-3.32*
Switzerland	-1.611	-2.84*	-2.369	-2.79*
Syria	-5.303	-5.88*	-5.371	-3.69*
Thailand	-4.842	-2.81*	0.663	0.23
Turkey	-2.987	-5.05*	-2.164	-2.25**
United Kingdom[v]	0.000	0.00	0.000	0.00
West Germany[v]	0.000	0.00	0.000	0.00

*Significant at 2.5 percent.
**Significant at 5 percent.

B.4 Country-Specific Intercepts with New Variables

(1986 - 1999)

	1987-1999			
	Aggregate			
	Exports		Imports	
Country	**Estimate**	***t*-value**	**Estimate**	***t*-value**
Australia	0.993	1.52	4.851	5.97*
Austria	0.136	0.61	0.698	2.64*
Brazil	1.397	5.32*	1.825	5.79*
Canada	6.162	1.79	-5.324	-1.22
Colombia	2.867	2.58*	0.804	0.58
Denmark	0.586	1.49	1.029	2.21**
Finland	0.355	1.89	0.708	3.33*
France	1.406	2.17**	2.621	3.31*
Greece	0.318	0.30	2.231	1.83
Hungary[v]	0.000	0.00	0.000	0.00
India	0.418	0.30	0.052	0.03
Ireland	2.731	2.19**	-1.796	-1.20
Israel	2.300	2.66*	1.335	1.31
Italy	0.836	1.17	3.524	4.09*
Japan	1.272	1.17	7.349	5.54*
Jordan	1.578	3.51*	-1.238	-2.29*
Kenya[v]	0.000	0.00	0.000	0.00
Morocco	0.943	0.87	0.529	0.41
Netherlands	2.374	3.64*	2.191	2.80*
New Zealand	0.713	1.58	2.325	4.19*
Norway	0.690	1.31	-0.627	-1.01
Pakistan	0.829	1.04	1.160	1.19
Philippines	1.906	4.07*	3.436	5.87*
South Africa	1.912	4.73*	5.634	11.33*
South Korea	0.635	1.15	1.689	2.63*
Singapore	2.158	3.05*	5.635	6.29*
Spain	0.920	0.56	3.701	1.92
Sri Lanka	-0.211	-0.18	5.497	3.87*
Sweden	1.066	2.36*	2.179	4.03*
Switzerland	1.552	1.53	3.525	2.96*
Syria^	0.104	0.11	0.874	0.82
Thailand	1.276	1.04	7.037	4.74*
Turkey	1.134	1.92	2.226	3.18*
United Kingdom	2.354	2.19**	0.507	0.39
Germany^^	1.384	2.13**	3.710	4.63*

^Syria is currently known as Syrian Arab Republic
^^Germany is unified in 1990. Hence, 'Germany' will be more appropriate than 'West Germany'.
*Significant at 2.5 percent.
**Significant at 5 percent.

END NOTES

[i] Gould uses the Nonlinear Least Squares (NLIN) regression technique in SAS to estimate the parameters of this model. Based on good guesses of the parameters obtained from a double-log approximation, he finds the value that minimizes the error sum of squares of the regression. Since my study is similar to Gould's, I use the same value.

[ii] The equation to derive the average length of stay is:

$$Y_n = \sum_{i=1}^{n} \frac{X_i}{\sum_{i=1}^{n} Xi}(n-j) \qquad \text{when } j = 0,\ i = 1$$

where

Y_n = Average immigrants' length of stay for year n

n = the year of the study in ascending order

i = ascending order number of the year, $(1,..,n)$

j = ascending order number of the year minus 1, $(0,..,n-1)$

[iii] Gould mentioned that as the ratio of skilled immigrants to unskilled immigrants rises, information about the home country will increase (α_{10} and $\beta_{10} > 0$), and as the length of

stay of immigrants increases (α_{11} and β_{11} > 0), information increases but at a decreasing rate (α_{12} and β_{12} < 0).

[iv] The immigrant-link hypothesis suggests that immigration is found to influence only bilateral exports. Immigrant preference for home-country products hypothesis, on the other hand, suggests that immigration is found to influence only bilateral imports. If immigration influences both imports and exports, this may suggest a combination of these two hypotheses (Gould, 1994).

[v] Notice that the estimates for both the United Kingdom and West Germany for the 1970 - 1986 time period have a value of zero. This is similar to Hungary and Kenya for the time period from 1967 to 1999. This could be due to the missing values when the regression is performed.

[vi] I am indebted to Dr. Mukti Upadhyay for suggesting to exclude the lagged value of imports and exports in the trade equation. In the first time period, the exclusion of the lagged values improves the significance of the home country GDP deflator variable for exports. As for imports, it improves the immigrant length of stay, square of immigrant

length of stay, and home-country GDP deflator variables. In the second time period, the exclusion of the lagged values improves the significance of home country GDP deflator variable for imports. In addition to that, the exclusion of the lagged dependent variable also improves the adjusted R^2 for all the equations.

[vii] I am indebted to Dr. Eric Hake for pointing out the trade treaties and regulations between United States and different countries which may have enhanced or hindered trade flows. Hence, the insignificance of the immigrant information variable could be due to the exclusion of these countries.

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