Essays on International Trade

By

Oleksandr Lugovskyy

Submitted to the Department of Economics and the
Faculty of the Graduate School of the University of Kansas
in partial fulfillment of the requirements for the degree of
Doctor of Philosophy

Committee members

Ted Juhl, Chairperson

Paul Comolli

Joseph Sicilian

Alexandre Skiba

Bozenna Pasik-Duncan

Date defended: August 16, 2013

The Dissertation Committee for Oleksandr Lugovskyy certifies
that this is the approved version of the following dissertation :

Essays on International Trade

Ted Juhl, Chairperson

Date approved: August 16, 2013

Abstract

As the world progresses and countries continue to compete for dominance, economic development has become the key criterion in assessing of a country's strength. International trade is a catalyst of growth and the study of international economics enjoys immense popularity. Moreover, trade policies are often the only available effective tool for conducting foreign policy. Taking all of this into consideration I set out to make a contribution into the study of international trade, by fusing it with econometrics.

The following essays discuss two important areas within the international trade field: the effect of distance on trade and the comovement of capital and labor. In both of these papers, my goal was to utilize newer econometric approaches in order to obtain better, more robust results. The first chapter analyzes the effect of distance on international trade by applying Pesaran's (2006) cross correlated effects mean group (CCEMG) estimator to the gravity model. The distance effect is then estimated to have remained constant during the 1980-2004 period, even increasing in one scenario, contradicting the popular notion that due to improved transportation, the role of distance as a barrier to trade has diminished. Further, since the CCEMG estimator is robust to slope heterogeneity within the data, the distance effect is estimated to be greater than previously believed. Finally, countries with fewer trading partners experience more volatility in distance effects than their counterparts with many export markets.

In the second chapter, a two-sector, neoclassical model with nontraded goods is employed to show that the co-movement of labor and capital is a general conclusion in the small country case. The co-movement of factors when capital is mobile is analogous to a Rybczynski effect in the Heckscher-Ohlin model. We deduce from the model a co-movement equation that is linear in FDI and migration. We test this equation with a panel of 28 OECD countries using the Arellano-Bond estimation procedure. Our regressions affirm that co-movement is statistically significant, and it remains so even when the largest economies are removed from the panel.

Acknowledgements

I would never be able to complete this dissertation without the help of my chair, committee members, friends, parents, brother and my wife.

I would like to express my deepest gratitude to Dr. Ted Juhl for his patience and hours of one-on-one explanations of econometric concepts and techniques in his office, and especially for encouraging me to learn the skill of teaching myself new things. I would like to thank Dr. Alexandre Skiba and Dr. Paul Comolli for finding the time to work with me, for teaching me the international trade theory, and their patience and encouragement throughout the process. I would also like to thank Dr. Joseph Sicilian for his assistance with this dissertation and throughout the years of the Ph.D. program. A special thanks goes to Dr. Bozenna Pasik-Duncan for her willingness to participate in my defense at the last moment.

I would like to thank Matthew Habiger, who as a true friend was always willing to listen and help. I would also like to thank my parents, Valentyn and Liudmyla, for constant encouragement, and my brother, Volodymyr, who helped me in so many ways on countless occasions. Finally, I would like to thank my wife, Josephine. She is always there cheering me up and standing by me through the good times and bad.

Contents

List of Figures

List of Tables

Chapter 1

The Effect of Distance is Not Disappearing, Just Poorly Estimated

1.1 Introduction

The importance of the trade costs has been discussed extensively in the literature. According to the Anderson and van Wincoop (2004) estimates trade costs are twice as high as production costs, suggesting that trade costs may be even more important than production costs, as they could alter the comparative advantage. Berthelon and Freund (2008) point out that the effect of the distance a product must travel to reach a market is well-known, but little understood. The distance costs can be broken down into transportation costs, costs of accessing information about the foreign markets, costs of translation, costs of finding foreign partners, all contributing to the decreased trade between distant partners (Rauch (1999)). Conventional reasoning suggests that transporting goods over longer distances costs more, and therefore the linearly increasing transportation costs can explain away a substantial portion of the distance effect. Therefore, given the recent advances in technology and international shipping, some may believe that distance affects trade much less than it used to. Nevertheless, a review of international trade literature does not uncover a consensus on the idea that distance is a decaying barrier to trade. On the contrary, many find that the distance effect is unchanged and in some cases even increasing, while others note the decline. Buch et al. (2004) discuss the distance puzzle and the unchanging distance coefficient estimates during the 1960-1990 period. Leamer and Levinsohn (1995) find that the effect of distance is not diminishing over time and the world isn't getting smaller. Frankel (1997) reports the distance coefficient in 1965 to be -.48 and -.77 in 1992, which highlights the fact that the distance effect is not abating. Bhavnani et al. (2002) note that standard estimates of gravity do not show signs of the decline in the importance of distance, although nonlinear estimates allow them to find evidence of globalization. Brun et al. (2002) discusses the stability of the distance coefficient estimates. They also introduce a random effects panel analysis and, by separating countries according to income, they find a decrease in the influence of distance on trade over time. Nevertheless, even in analyses that claim to find evidence of the shrinking globe, standard estimates of the gravity model do not indicate a decline in distance's contribution. An unconventional approach is used by Egger and Pfaffermayr (2004), who use the Haustman-Taylor model to estimate the effect of distance on exports. They report that the impact of distance on trade is small in absolute terms and cannot be estimated precisely, possibly because they used data for developed countries, where distance is known to exert a smaller impact on trade flows. Disdier and Head (2008) perform a comprehensive review of literature concerning distance coefficients and discover that the mean effect is approximately 0.9, which means that a 10% increase in distance reduces trade by 9%.

A common way to track shifts in the distance effect over time is by estimating a gravity model for different years and observing changes in the estimates of the elasticity of trade to distance. The gravity model of trade was introduced into the literature by Tinbergen (1962) and has since been a workhorse utilized by many trade economists. Over the years it was modified and improved, notably in 2003 by Anderson and van Wincoop (2003) who used the advanced model to resolve the border puzzle. The typical specification of the gravity model includes gross domestic product (GDP), distance, and dummy variables for common language, border, common currency and others as the explanatory variables. While estimates are intuitive and appear to explain the data quite well, the dummy variables only partially capture the unobserved heterogeneity of exporters and importers, and the remaining unobserved heterogeneity could potentially bias the results of the coefficient estimates, particularly distance. An example of such heterogeneity would be the difference in the amount of information available to small and medium-sized businesses and the number of contacts they have in a country they could export to. While large companies can afford to collect information about foreign markets on their own, smaller companies are often unable to do so, and they therefore may miss opportunities to trade with a potential partner abroad. According to Kehoe and Ruhl (2004), exports by small and medium-sized businesses can be accountable for a significant portion of trade, and knowledge of the foreign country can be the critical factor in their decision to export. They discuss how setting up trade missions and collecting information for use by small and medium sized businesses can boost exports. Since no variable can be practically constructed to reflect these differences, this can be an issue that goes unnoticed when standard estimates are used. Cheng and Wall (2005) also point out that several recent papers argue that the standard cross-sectional estimates are biased. They note that the effect of policy issues, such as trade agreements, currency blocks and other trade distortions are often captured as dummy variables. They proceed to explain that while many agree to use fixed effects estimates to account for the uncaptured heterogeneity, there is little agreement about how to specify the fixed effects. The CCEMG estimator helps resolve this problem, because it is robust to heterogeneity and does not require the researcher to come up with a particular specification.

The currency union holds its own place in the literature, and since the common currency variable is included in the augmented gravity specification, a discussion is warranted in this paper. For nearly two decades, the prevailing notion was that forming a currency union generates an increase in trade and eliminates the home bias. Although initially the empirical evidence was limited, by early 2000s, the work of Glick and Rose (2002), Frankel and Rose (2000), which produced a number of estimates, helped build the case for currency union formation, citing evidence from the European Union, for example. This paper contributes in two important ways. First, the previous estimates of the currency union effect can be biased due to the same reasons as the elasticity of trade to distance coefficient estimates. This is addressed by applying the new estimation technique (described below). Second, previous work typically uses datasets that end in 1990's. By extending the dataset into the early 2000s new useful information is learned.

On the empirical side, despite the improvements in computing technology and theoretical econometrics, the applied fields are still dominated by estimation techniques such as ordinary least squares and panel fixed effects. These methods are not robust to heterogeneity within data and can produce biased coefficients. Pesaran (2006) proposes cross-correlated effects mean group estimator (CCEMG) for panel data that is designed to account for unobserved heterogeneity by first estimating *N* group-specific OLS regressions and then averaging the estimated coefficients across groups. This has a clear advantage over OLS and Panel FE insofar that CCEMG allows for heterogeneous slope coefficients across group members, while the other techniques may estimate parameters of no interest due to the slope homogeneity assumption.

Applying the CCEMG estimator to a panel dataset that includes over 100 countries, and an annual specification approach of analyzing one year at a time, produces some intriguing results. The CCEMG estimator puts the distance coefficient estimates between the [-1.9; -1.5] interval, which is considerably higher in absolute value than the [-1.4;-0.6] range where most estimates fall (see Brun et al. (2002)). Using the exporter group mean approach, there is no decrease (in absolute value) of the coefficient over time, remaining approximately -1.7[1] for both 1980 and 2004, the end points of the dataset. Moreover, under importer group mean approach, the estimate for 1980 is approximately -1.5 and -1.9 for 2004. Further, the fit and significance improve when the sample is restricted to countries with 50 or more trading partners. Hence, the distance puzzle persists, and the CCEMG estimator suggests that distance is an even larger factor than previously believed.

Several theories have been suggested to address this puzzle. Glaeser and Kohlhase (2003) state that "80% of all shipments (again by value) occur in industries where transport costs are less than 4% of total value," hence it is not prudent to confuse the cost of transportation for the distance effect. Grossman (1998) agrees stating "I suspect that shipping is no more than perhaps 5% of the value of the traded goods" and continues to suggest that other factors such as cultural similarities

[1] See Table 1.4

and familiarity play a larger role. Still, the goal of this paper is not necessarily to explain the distance puzzle, but to use the new estimation technique and the annual specification approach to provide estimates of the distance coefficient that are robust to various kinds of heterogeneity and show that the distance effect is not disappearing, which is accomplished in subsequent sections.

The results are no less interesting when it comes to the common currency effect. It is estimated to be relatively high in the 1980s and early 1990's, dropping off some in the mid 1990's and rapidly decreasing in the late 1990's and early 2000's, becoming rather close to zero (although still statistically different from zero). It appears that the coefficient declines by approximately 80% between 1980 and 2004, with much of the decline happening between 1993-2004. This result is interesting because some notable changes happened in the 1990s, in particular the collapse of the Soviet Union and the subsequent disappearance of the ruble as well as the formation of the European Union and the introduction of its single currency, the union. Therefore, there was variation in during the period, which makes estimation results more reliable. It is also corroborated by the findings of de Sousa (2012), who similarly finds a decrease in the currency union effect and attributes it to the globalization of the financial markets. The result contrasts findings of a stable currency union effect by Rose (2000), and an increase in the effect by Glick and Rose (2002). Note that the OLS or Panel FE estimators do not register this rapid decline in the currency union's coefficient, and it is likely to have gone unnoticed had the CCEMG estimator not been applied.

The rest of this paper is organized as follows: Section 2 discusses the dataset used in this paper, Section 3 concerns the estimation methodology and Section 4 concludes by presenting the findings.

1.2 Data

Data for this analysis is obtained from the French Research Center in International Economics, Centre d'Etudes Prospectives et d'Informations Internationales (CEPII). Two different CEPII databases were merged for the purposes of this paper: the CEPII Trade, Production and Bilateral Protection Database and the CEPII Gravity Dataset. The first one is described in Mayer et al. (2008) and con-

Table 1.1: Sample Descriptive Statistics

Variable	Obs	Mean	Std. Dev	Min	Max
Trade Flow	131250	514211.1	3389118	0.4931	1.58E+08
Common Lang	131250	0.189	0.391	0	1
Distance	131250	7343.486	4344.607	8.450	19650.13
GDP Origin	131250	479752.7	1238607	42.464	1.17E+07
GDP/cap Origin	131250	11561.2	11148.08	62.948	55468.29
GDP Destination	131250	403414.7	1174263	20.573	1.17E+07
GDP/cap Destination	131250	9537.499	10653.92	62.948	55468.29
GATT Origin	131250	0.886	0.317	0	1
GATT Destination	131250	0.817	0.387	0	1
Common Religion	131250	0.187	0.260	0	0.991
Common Currency	131250	0.007	0.082	0	1

tains bilateral trade data (exports) segregated by industry. It spans the 1980-2004 time period and is available on CEPII website.[2] Total exports are calculated as the summation of exports across industries and the sum is used to measure the trade flows between country pairs. The second dataset, described in Head et al. (2010), contains gravity variables for country pairs for the period from 1948 through 2006. Specifically, this dataset contains GDP, GDP per capita, distances, common language indicator, common currency indicator, common border indicator, membership in GATT/WTO indicator and other typical gravity model variables. To create a single database (suitable for gravity model analysis) the two datasets were merged using their ISO3[3] codes, and all missing observations were eliminated to simplify computation. The resulting dataset contains approximately 350,000 observations on trade flows between country pairs. Summary statistics are presented in Table 1.1.

For the gravity analysis, the data is utilized in single-year increments. Exporter countries are treated as the cross sectional units and importer countries as different “years". This approach is described in more detail in Section 1.3.3. Once the time and cross sectional dimensions are specified, each of the 25 datasets contains over 100 "cross-sections" (or exporters) with over 100

[2] www.cepii.fr

[3] International Organization for Standardization three letter country codes

"time-series" (or importers) observations. This data is suitable for the CCEMG estimator, which requires both N and T to be large. OLS and Panel fixed effects requirements are also all satisfied.

1.3 Methodology

This paper aims to introduce a new approach to analyzing international trade data by utilizing a recently developed estimator and the annual specification approach to account for exporter- and importer-specific effects. A search of the literature does not reveal papers that use the CCEMG estimator in context with gravity equation. But while analyzing gravity data in one year increments has been previously performed[4], the novelty of the annual specification approach lies in treating each year as a "panel". Both of these innovations and their advantages are discussed in detail below.

1.3.1 Estimation Methods

Over the past 25 years, technological improvements have allowed for analyses of increasingly larger datasets attracting many theoretical econometricians to the panel data field. Estimation techniques have been developed for datasets with large N_1 and N_2 dimensions, such as World Bank or CEPII. However, on the applied side, the field is still primarily dominated by estimators such as OLS and panel fixed effects. This paper applies a new estimator, CCEMG, to the gravity model of trade. One major advantage of using the CCEMG is that it relaxes the assumption of parameter homogeneity. On the flip side, imposing the slope homogeneity assumption leads to potentially biased coefficients.

To illustrate this in more detail, consider the following linear heterogeneous panel specification:

$$y_{ij} = \alpha_i^\top d_j + \beta_i^\top x_{ij} + e_{ij} \tag{1.1}$$

where y_{ij} is the ijth for $i = 1, ..., N_1$, $j = 1, ..., N_2$, d_j is an $n \times 1$ vector of observed common effects,

[4] See Soloaga and Alan Winters (2001) for example

x_{ij} is a $k \times 1$ vector of regressors at ij. Note the subscript i on β which indicates that CCEMG accounts for variation across group members. In contrast, Panel FE imposes the assumption of slope homogeneity (as does OLS) and, under certain circumstances, produces biased parameter estimates.

Further, the error terms have the multifactor structure:

$$e_{ij} = \gamma_i^\top f_j + \varepsilon_{ij} \tag{1.2}$$

where f_j is the $m \times 1$ vector of unobserved common effects and ε_{ij} are the the individual-specific errors assumed to be independently distributed of (d_j, x_{ij}), according to Pesaran (2006). The author also allows for the possibility of correlation between the unobserved factors, f_j and (d_j, x_{ij}), by adopting the following model for the individual specific regressors:

$$x_{ij} = A_i^\top d_j + \Gamma_i^\top f_j + v_{ij} \tag{1.3}$$

Where A_i is $n \times k$ and Γ_i is $m \times k$ factor loading matrices with fixed components and v_{ij} are the specific components of x_{ij}, distributed independently of the common effects across i. Hence, it is evident that (1) slope heterogeneity is permitted by the model and (2) unobservable factors, or at least some of them are accounted for, unlike for example in the case for panel fixed effects estimator, which assumes the following model[5]:

$$y_{ij} = \alpha + \beta x_{ij} + \mu_i + v_{ij}$$

Where β does not have a subscript i indicating a slope homogeneity assumption, and v_{ij} denotes the remainder disturbance with no special structure imposed.

As noted in Eberhardt (2011), the focus of the estimator is to obtain consistent estimates of the

[5] See Baltagi (2008)

parameters related to observable variables. The CCEMG estimator is robust to a limited number of "strong" factors and an unlimited number of "weak" factors. The amount of knowledge an exporter has about the countries they export to are represented by these factors. Structural changes in the amount of information and trade ties (such as opening a new consulate) would represent the strong factors, while gradual changes, such as accumulation of business connections and the experience of doing repeated business, can be treated as weak factors. Since there exists no variable that accurately measures the knowledge of the foreign markets (and changes in it), application of the CCEMG estimator to the gravity model represents the first attempt to account for them.

1.3.2 Estimation Equation

The standard gravity model of trade was first introduced by Tinbergen (1962)[6]. The model is rooted in Newton's law of universal gravitation and was translated into international trade notation. The model suggests that the trade between two countries depends directly on the size of the countries$'$ gross domestic products and is inversely related to distance. It can be written in its most basic form as follows:

$$Trade_{ij} = G\frac{GDP_i GDP_j}{dist_{ij}}\eta_{ij}. \tag{1.4}$$

Where GDP_i is the gross domestic product of country i, GDP_j is the gross domestic product of country j, $dist_{ij}$ is the distance between countries i and j, G is a constant and η_{ij} is an error term with expectation equal to one. In order to estimate the model econometrically, it is convenient to take the logarithm, which transforms the model:

$$ln(Trade_{ij}) = \beta_0 + \beta_1 ln(GDP_i) + \beta_2 ln(GDP_j) - \beta_3 ln(dist_{ij}) + e_{ij} \tag{1.5}$$

[6]It was also independently developed by Pöyhönen (1963)

where ε is the $ln(\eta)$ (with the expectation equal to zero now) and G is incorporated into β_0. From this point forward, the *ln* notation will be dropped but it is still understood that all observations are in logarithm form.

The model has gone through a series of modifications and revisions, both on the empirical and theoretical side. Linnemann (1966) suggested population as an additional measure of a country's size, although it has become more common to instead include a GDP per capita variable, which captures the same effect. It is important to note that the early versions of the model while boasting good econometric fit and being very intuitive lacked solid theoretical underpinnings, which rendered the model unpopular with some trade economists. However, thanks to the work of Anderson (1979), Bergstrand (1985) and others, the model became well-grounded in theory to the point that Deardorff (1995) remarked "it is not all that difficult to justify even simple forms of the gravity equation from standard trade theories." More recently Anderson and van Wincoop (2003) further improved its microfoundations and used the advanced gravity model to resolve the border puzzle. The present day model is typically augmented by adding dummy variables to the equation. They represent common border, common language, former colony, former colonizer, common currency, membership in currency unions, membership in free trade agreements, and others.[7] This analysis utilizes GDP per capita, common currency, border, common religion and GATT/WTO membership dummy variables.

The augmented specification of the model used in this paper is as follows:

$$\begin{aligned} Trade_{ij} &= \beta_0 + \beta_1 GDP_i + \beta_2 GDP_j + \beta_{1c} GDP\_cap_i + \beta_{2c} GDP\_cap_j + \beta_3 dist_{ij} \\ &\quad + \beta_4 comcur_{ij} + \beta_5 border_{ij} + \beta_6 comrelig_{ij} + \beta_7 GATT/WTO + e_{ij}, \end{aligned} \tag{1.6}$$

Where *comcur* is a dummy variable for common currency, *border* is a dummy variable for common border, *comrelig* is a dummy for common religion and $GATT/WTO$ is an indicator for GATT/WTO membership. This specification contains variables that are all very typical for a

[7] For more information on the gravity model of trade see Baldwin and Taglioni (2006).

gravity equation and therefore should return results consistent with those found in the literature. Using the conventional OLS estimator, the model should produce significant coefficient estimates for each independent variable. Signs are expected to be positive, save for the distance coefficient.

Now, lets combine the gravity model equation with the CCEMG estimator. Let x_{it} be a vector of the right hand side variables. Combining the gravity equation in (1.6) with (1.3) and accounting for the fixed effects produces:

$$x_{ij} = A_i^\top d_j + \Gamma_i^\top f_j + v_{ij} \tag{1.7}$$

Note the following details: the subscripts were changed to i for exporter and j for importer, the terms GDP_i and GDP_cap_i drop out of the equation due to a lack of variance when taken one year at a time.

Similarly, combining (1.2) and (1.6) produces:

$$e_{ij} = \gamma_i^\top f_j + \varepsilon_{ij} \tag{1.8}$$

Where $\gamma_e^\top f_i$ contains the unobserved factors (including the amount of information firms have about their trading partners) that affect trade and that are otherwise unaccounted for using the traditional estimation routines. Under these specifications, the CCEMG estimator is robust to unobserved heterogeneity in the data. Estimation is performed by (1) averaging variables across importers, then (2) regressing trade on all right hand side variables, as well as their averages obtained in step (1), and (3) the estimates from step (2) are averaged to obtain the CCEMG estimates.[8] Baseline gravity estimates are obtained by applying OLS and Panel FE estimators, which are well documented in textbooks such as Greene (1997) and Baltagi (2008). This model is applied to the data using the annual specification approach (described in subsection 1.3.3) and results are presented in Section 1.4 and the Appendix.

[8]For more information on the CCEMG estimator see Pesaran (2006).

1.3.3 Annual Specification

Using a panel dataset to obtain estimates of the distance coefficient presents a channel. Using the natural indices of years as time and country-pairs as cross sections and applying a Panel fixed effects estimator does not produce any results. The within transformation used by the Panel fixed effects estimator computes the average of the variable for each cross section and then subtracting this mean from each observation (thus accounting for the fixed effects).[9] Due to the fact that the distance does not change from year to year for any country pairs the average of the distance is the same as the distance itself, and hence the within transformation produces zeroes, rendering computation of the distance coefficient impossible.

One way to solve it is to utilize the dataset in single-year increments which is referred to as the “annual specification" approach throughout the paper. OLS, Panel FE and CCEMG estimates are obtained for each year. The appeal of this approach is that within a year each exporter is treated as a cross-sectional unit and each importer as the “year" (under the importer effects approach). This helps to account for exporter- and importer-specific effects and is possible because the CCEMG and Panel FE estimators do not require observations within each cross-section to be ordered (OLS does not require a time dimension so those estimates are unaffected). As a check, the roles of exporters and importers are later reversed with exporters as the time units and importers for the cross-sectional units (exporter effects approach). The next section details the results obtained using the methodology described above.

1.4 Results and Conclusions

Regression analysis was performed for each year, using the three estimation techniques described in the Methodology section, namely OLS, Panel FE, and CCEMG. All estimators produce estimates for the gravity model that are consistent with expectations. The coefficient estimates are positive for the GDP and GDP per capita, negative for distance, and have appropriate signs for the

[9] Baltagi (2008)

dummy variables.

First, lets discuss the OLS results as they serve two purposes: to provide initial benchmark estimates and to confirm the validity of the data and methodology. If the OLS results are inconsistent with what is found in the literature, it would be an indicator of irregularity in the data. For the dataset used in this paper, OLS returns estimates similar to those in related literature. The distance coefficient estimates fall in the [-1.2; -.9] interval. As mentioned in Section 1.1, Frankel (1997) estimates the distance coefficient to be -.48 (.044) in 1965 and -.77 in 1992 (.038), with standard errors listed in parenthesis. The dataset for this paper does not include data for 1965, however, for 1992 the estimate for the distance coefficient is -.90 with the standard error is .042, hence the 95% confidence intervals of the two estimates for the same year overlap, making them statistically indifferent from each other. Therefore, the estimates are similar when the same estimation techniques are applied to the two datasets. Disdier and Head (2008) constructed a database of 1,467 estimates from 103 papers and found that 90% of all estimates were between .28 and 1.55, with the mean at approximately .9. All OLS estimates in this paper are within the interval specified. Further, findings of this paper corroborate the Leamer and Levinsohn (1995) statement "the effect of distance on trade patterns is not diminishing over time. Contrary to popular impression, the world is not getting dramatically smaller." The OLS estimates for the full sample can be found in the Table 1.2. These results contrast, in general, the findings of Egger and Pfaffermayr (2004), who find the distance to not be significantly affecting exports.

The CCEMG estimator provides additional insights. Due to its robustness to the unobserved heterogeneity in the data, such as information about the foreign country and number of business contacts there, coefficient estimates are in the [-1.9; -1.5] interval during the time period analyzed. The fact that coefficient estimates do not decrease (in absolute value) suggests that the effect of distance is not decreasing, and under the exporter group mean scenario, it is even shown to be increasing, contrary to the popular perception of the "shrinking" globe. The CCEMG estimates for the full sample (importer effects) are presented in Table 1.3. Results differ considerably depending on which countries are included, but in all cases the estimation results produced by the CCEMG

Table 1.2: Full Sample OLS Estimates.

	GDP	GDP/Capita	Distance	Common Currency	Contiguous	Common Religion	Gatt/WTO
1980	0.512***	-0.207***	-0.809***	2.426***	1.277***	-0.669***	-0.415***
1981	0.506***	-0.197***	-0.797***	2.420***	1.374***	-0.757***	-0.467***
1982	0.492***	-0.180***	-0.805***	2.332***	1.418***	-0.771***	-0.490***
1983	0.512***	-0.185***	-0.789***	2.451***	1.495***	-0.934***	-0.525***
1984	0.535***	-0.207***	-0.762***	2.482***	1.559***	-0.861***	-0.587***
1985	0.524***	-0.232***	-0.752***	2.387***	1.556***	-0.835***	-0.528***
1986	0.514***	-0.243***	-0.734***	2.453***	1.699***	-0.842***	-0.489***
1987	0.510***	-0.237***	-0.732***	2.482***	1.667***	-0.912***	-0.485***
1988	0.518***	-0.236***	-0.688***	2.527***	1.816***	-0.874***	-0.439***
1989	0.518***	-0.218***	-0.702***	2.395***	1.895***	-0.893***	-0.445***
1990	0.518***	-0.243***	-0.710***	2.226***	1.868***	-0.919***	-0.489***
1991	0.511***	-0.233***	-0.652***	2.444***	2.043***	-0.862***	-0.507***
1992	0.520***	-0.257***	-0.671***	2.009***	2.070***	-0.841***	-0.519***
1993	0.510***	-0.231***	-0.622***	2.062***	2.241***	-0.887***	-0.529***
1994	0.503***	-0.213***	-0.627***	2.270***	2.210***	-0.774***	-0.390***
1995	0.519***	-0.242***	-0.640***	2.108***	2.120***	-0.742***	-0.357***
1996	0.525***	-0.229***	-0.650***	1.996***	2.085***	-0.752***	-0.326***
1997	0.529***	-0.227***	-0.644***	2.095***	2.123***	-0.719***	-0.246**
1998	0.505***	-0.199***	-0.657***	1.885***	2.097***	-0.635***	-0.289***
1999	0.511***	-0.207***	-0.593***	2.912***	1.863***	-0.847***	-0.277**
2000	0.523***	-0.181***	-0.593***	2.850***	1.901***	-0.839***	-0.189
2001	0.532***	-0.223***	-0.598***	2.520***	1.899***	-0.733***	-0.164
2002	0.519***	-0.235***	-0.619***	2.557***	1.873***	-0.819***	-0.0791
2003	0.514***	-0.228***	-0.629***	2.559***	1.915***	-0.846***	-0.185
2004	0.529***	-0.237***	-0.613***	2.538***	1.986***	-0.880***	-0.316**

Table 1.3: Full Sample CCEMG Estimates.

	GDP	GDP/Capita	Distance	Common Currency	Contiguous	Common Religion	Gatt/WTO
1980	0.378*	-1.77E-05	-0.316	0.509	-0.778	19.99**	1.314
1981	0.882**	4.87E-05	-2.615**	0.513	0.693	7.869	2.243
1982	0.0772	3.80E-05	-2.271**	0.16	0.0755	1.646	1.304
1983	0.394	8.04e-05**	-1.731**	0.395*	0.532	-5.583	0.947
1984	0.341	7.82e-05**	-1.820**	0.395*	0.0021	-1.81	1.498
1985	0.716***	5.87e-05*	-2.052**	0.448**	-0.139	0.856	2.483*
1986	-0.0724	7.72e-05***	-2.050***	0.221	-0.223	5.318	-0.116
1987	-0.334	7.00e-05***	-1.808***	0.226*	0.935	-5.894	-0.198
1988	0.0783	6.10e-05**	-1.626**	0.538**	-0.613	7.048	0.224
1989	0.199	3.41E-05	-1.299**	0.327	-0.374	11.42	0.835
1990	0.13	2.98e-05**	-0.913*	0.515*	0.591	12.54	-0.0318
1991	0.252	4.85e-05***	-1.584***	0.371	-0.285	-2.63	-1.008
1992	0.0681	4.40e-05**	-0.979*	0.251*	1.099	0.825	0.215
1993	0.0507	3.33e-05*	-0.918	0.0557	0.521	2.353	0.438
1994	0.243	1.55E-05	-1.017**	0.295	-0.723	13.76**	0.553
1995	0.121	2.72e-05*	0.458	0.327	-0.164	16.16	0.646
1996	-0.0589	1.96e-05**	-1.020**	0.214	-0.727*	5.142	0.487
1997	0.105	1.63E-05	-0.584	0.204	-0.197	8.367*	0.28
1998	0.19	2.55e-05***	-1.488***	0.237	-0.499	7.181	0.0255
1999	1.633	-0.000201	14.35	-0.0558	-0.592	-8.818	0.469
2000	1.125	-8.15E-06	-1.557	0.0943*	-2.236	4.561	0.468
2001	0.268	2.83E-06	-1.362*	-0.0577	-0.0812	10.90*	0.373**
2002	0.402	3.13E-05	-3.289**	-0.315	0.0125	5.465	0.335**
2003	-0.259	5.48e-05**	-3.880***	-0.346	-0.927	4.209	0.392
2004	-0.0531	4.19e-05***	-3.303***	-0.139	-1.786	1.855	0.126

estimator have notable differences when compared to OLS and Panel FE. In particular, when all countries are included, the GDP coefficient is frequently insignificant, while the GDP per capita coefficient is estimated to be practically zero. Dummies are almost all insignificant at the 5 percent level, and only some are significant at 10 percent. Even the distance coefficient is not significant for some years. On paper, the OLS model might look better, however, for reasons discussed in previous section it has its considerable flaws.

Removing countries with fewer than 50 trading partners from the sample, however, brings about significant changes in the CCEMG estimation results. The significance of coefficients improves

Table 1.4: Restricted Sample CCEMG Estimates (Countries with 50 or More Trading Partners.)

	GDP	GDP/capita	Distance	Common Currency	Contiguous	Common Religion	Gatt/WTO
1980	0.0439	0.144***	-1.718***	1.357***	-0.0867	-1.149	0.0882
1981	0.0756	0.0930***	-1.581***	1.832***	0.123	-2.351	0.250***
1982	0.0861	0.113***	-1.548***	2.061***	0.121	-0.229	0.144
1983	0.0853	0.110***	-1.467***	2.070***	0.28	-1.368	0.234***
1984	0.00534	0.0873**	-1.508***	2.305***	0.419	-4.722	0.212***
1985	0.103**	0.0792**	-1.548***	2.040***	0.324	-0.885	0.194***
1986	0.137**	0.0658*	-1.519***	2.341***	0.312	-0.189	0.164**
1987	0.103**	0.0686*	-1.500***	2.201***	0.405*	0.717	0.109
1988	0.0812	0.0924**	-1.616***	2.017***	0.208	0.176	0.152*
1989	0.159***	0.0751**	-1.619***	2.109***	0.247	-0.314	0.199***
1990	0.148***	0.0441	-1.671***	1.804***	0.397**	-0.239	0.251***
1991	0.208***	0.0496*	-1.602***	1.799***	0.436***	0.438	0.179**
1992	0.168***	0.0392	-1.632***	1.585***	0.360*	0.292	0.206***
1993	0.277***	0.0808***	-1.804***	1.311***	0.301*	0.0217	0.296***
1994	0.340***	0.00376	-1.683***	1.329***	0.458***	-0.0531	0.312***
1995	0.340***	-0.0681***	-1.636***	1.280***	0.667***	-2.372	0.253***
1996	0.339***	-0.015	-1.690***	1.096***	0.543***	-2.822	0.191***
1997	0.300***	-0.0677***	-1.660***	0.942***	0.620***	-1.405	0.192***
1998	0.335***	-0.0175	-1.704***	0.869***	0.548***	-0.147	0.212***
1999	0.295***	-0.00855	-1.718***	0.595***	0.577***	-0.1	0.179***
2000	0.334***	-0.0363*	-1.758***	0.513***	0.593***	-4.685	0.198***
2001	0.321***	-0.0541**	-1.716***	0.475**	0.663***	-1.568	0.285***
2002	0.316***	-0.0686***	-1.699***	0.438**	0.481***	-3.12	0.231***
2003	0.329***	-0.0859***	-1.725***	0.546***	0.449***	-1.905	0.204***
2004	0.323***	-0.0238	-1.682***	0.292**	0.458***	-2.464	0.205***

substantially. GDP and GDP per capita are now frequently significant, as is distance, and the indicator variables are significant more often. See Table 1.4 for CCEMG estimates for the sample that only includes countries with 50 or more trading partners.

To better compare and contrast the distance effect coefficient estimates, they were plotted against each other. First, consider Figure 1.1, which presents full sample importer effects estimates over time. All three estimators (CCEMG, OLS and Panel FE) are plotted in this figure, and there are some important similarities and differences. Notice that in Figure 1.1 none of the coefficients show a rapid decline in the absolute value of the distance coefficient. The OLS coefficient

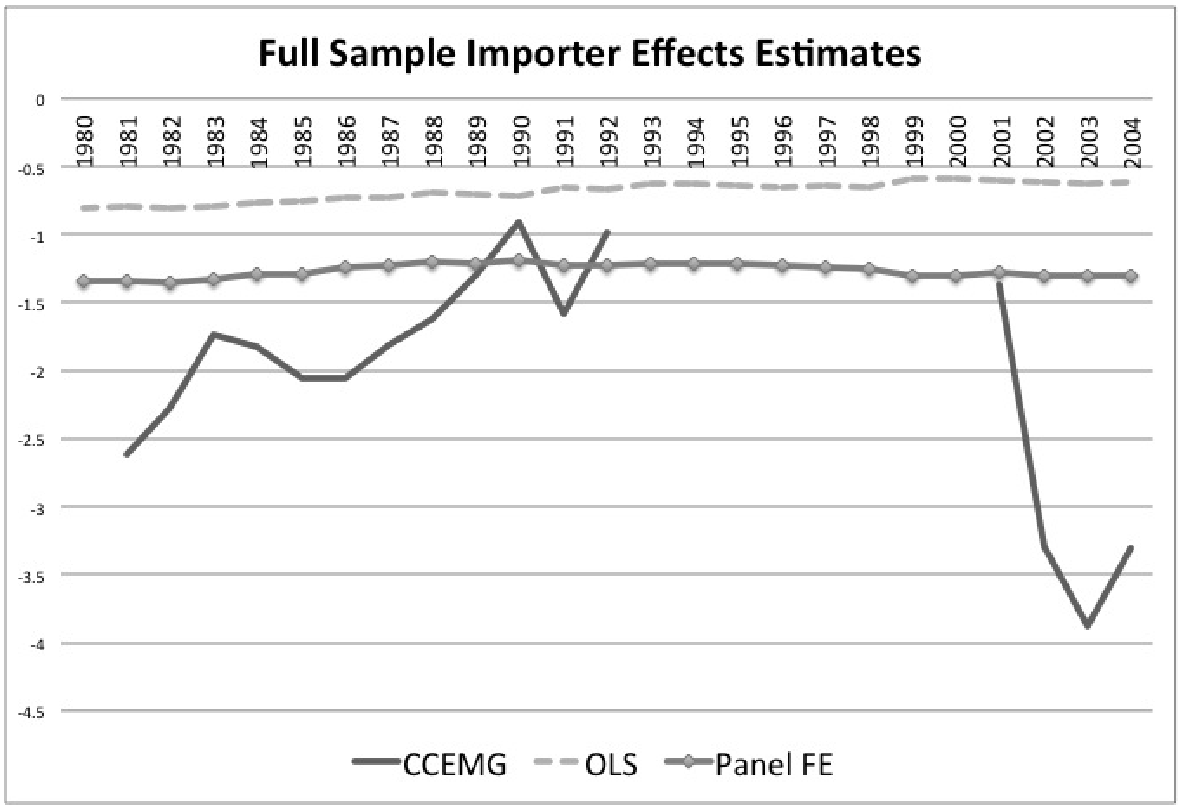

Figure 1.1: Full Sample Importer Effects Estimates

shows a small decline over time, while the panel fixed effects remains about the same (in absolute value). As shown in Table 1.3 , the CCEMG coefficient is not significant for many years, and shows considerable variance for the years in which it is significant. There can be at least two explanations for this. First is that the sample includes countries who have very few trading partners, and it is possible that those countries face a very volatile distance effect. Second, the estimator is designed for large datasets, and including groups that have very few trading partners could be affecting the results.

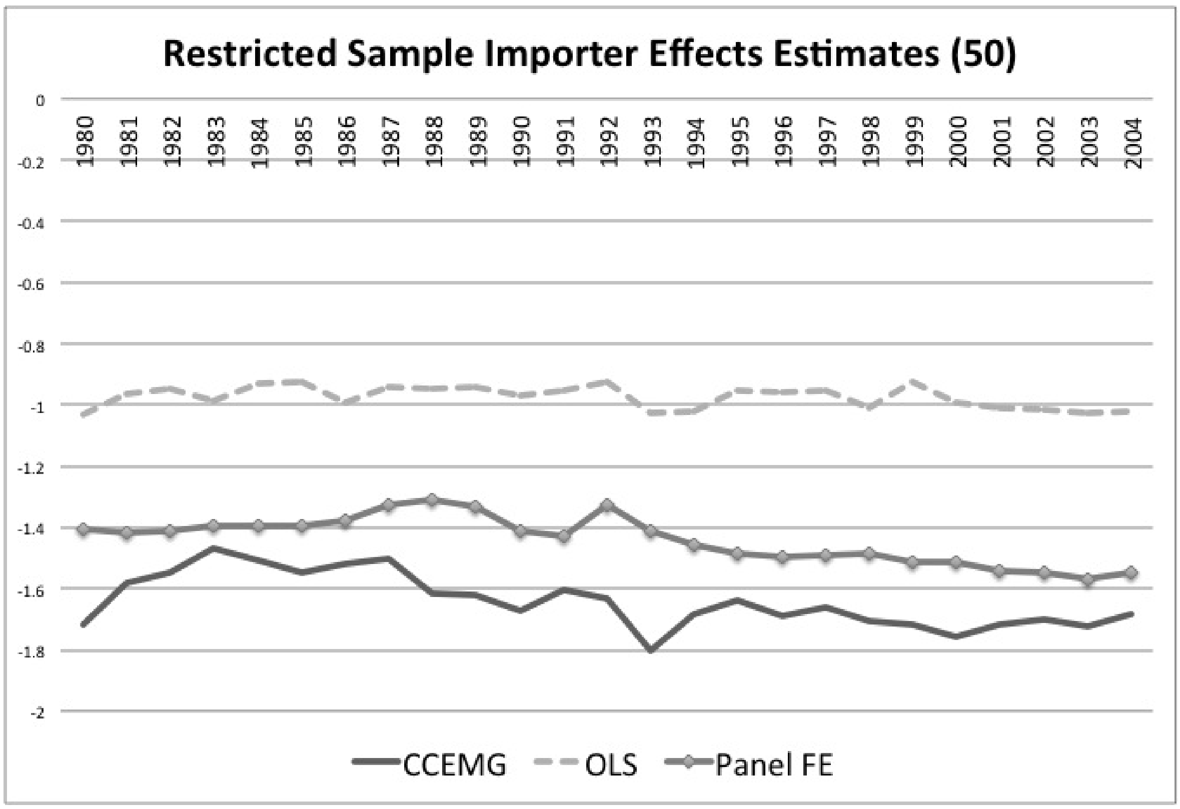

Figure 1.2: Restricted Sample Importer Effects Estimates. Minimum 50 Trading Partners

Next, plotting the results of the restricted samples regression is interesting, because the distance coefficient is now smoother, suggesting that either the estimator is working better, given a greater number of observations. It is consistently greater (in absolute value) than both OLS and Panel FE, pointing to the evidence that the distance effect is greater than than conventional estimators show it to be. The Panel FE estimates are closer to the CCEMG estimates than OLS, but all three behave similarly.

Since the results of the restricted sample with at least 50 trading partners look intriguing, it is interesting to explore further and plot results of a sample which includes at least 30 trading partners, to see how relaxing the restriction changes the results.

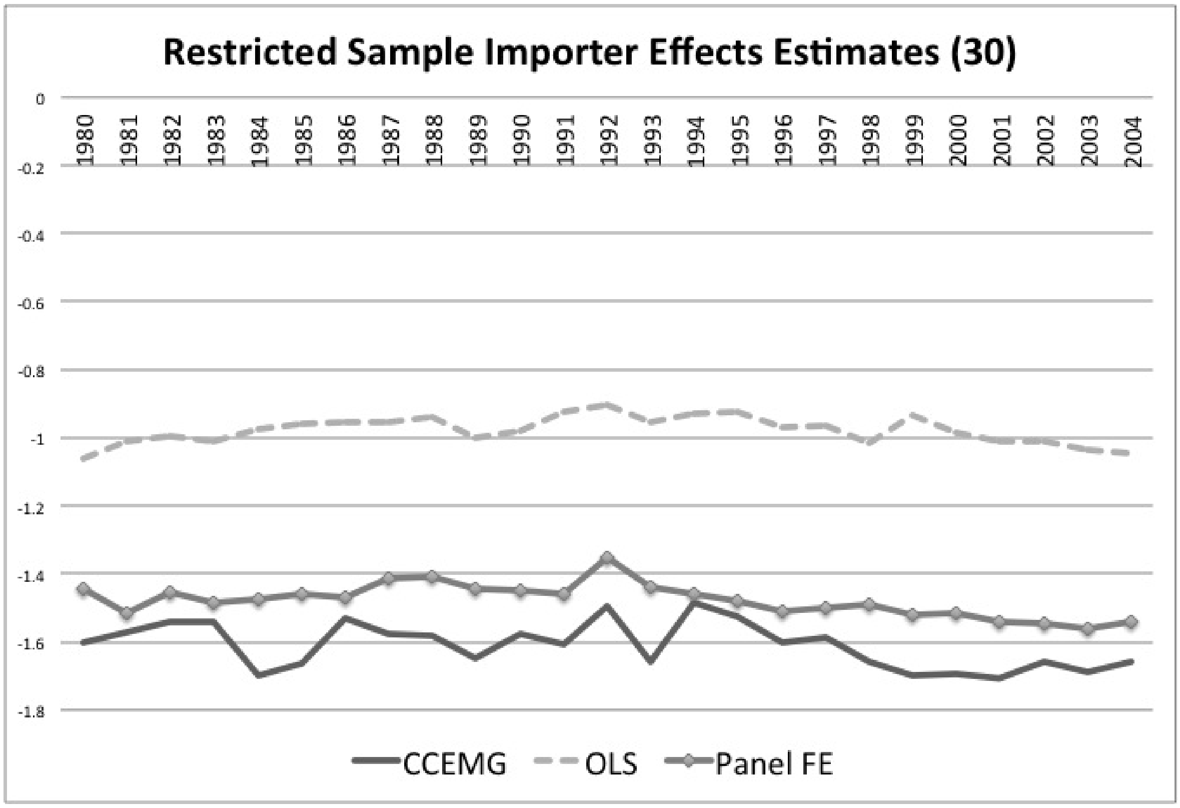

Figure 1.3: Restricted Sample Importer Effects Estimates. Minimum 30 Trading Partners

The results in Figure 1.3, where the sample was restricted to at least 30 trading partners, look similar to those in Figure 1.2, where a minimum of 50 trading partners was required. The CCEMG estimator produces a distance coefficient which is higher in absolute value than its OLS and Panel FE counterparts. Given this result, I further derestricted the sample, requiring it to have only 20 trading partners at the minimum and plotted the results in Figure 1.4.

The results for the sample which was restricted to a minimum of 20 trading partners are similar to the other two restricted samples. The difference between the CCEMG and Panel FE estimates is less than what is observed in Figure 1.2 and Figure 1.3, but still exists.

One can notice some similarities and differences in the three figures above. All estimates point to the distance effect being relatively stable over time. When the sample is restricted to at

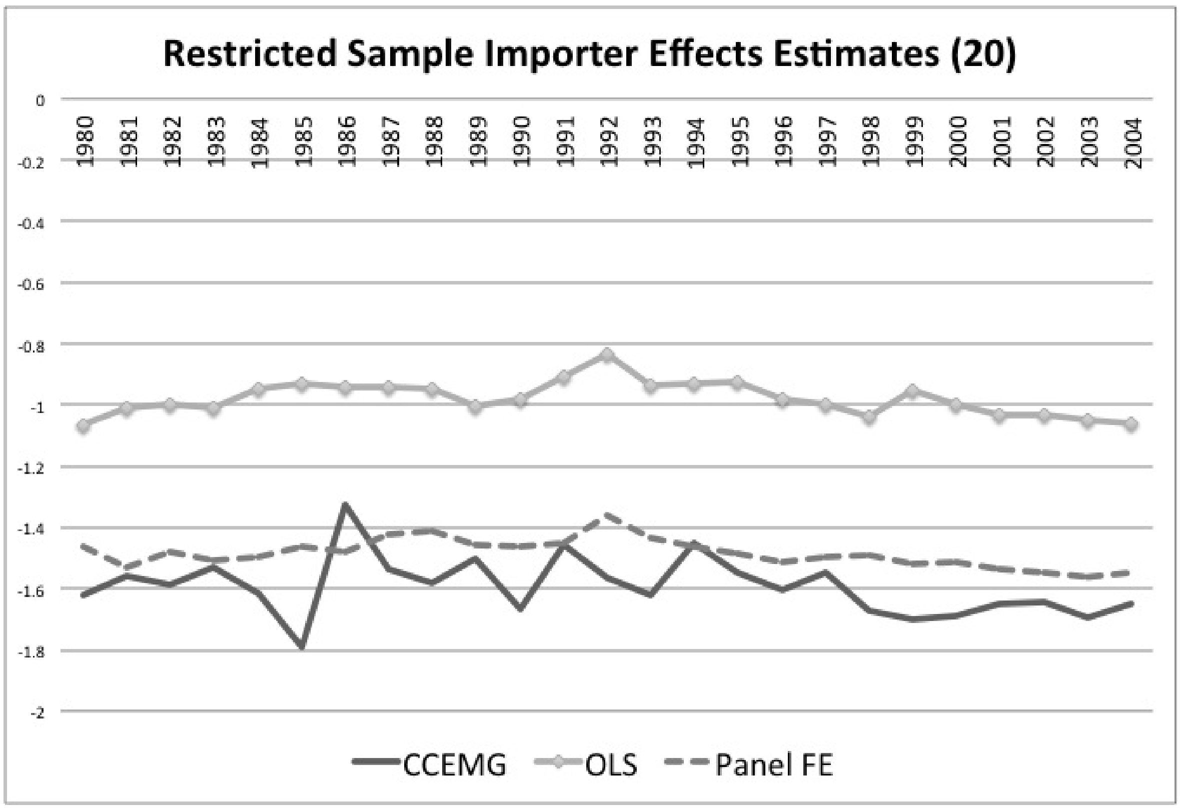

Figure 1.4: Restricted Sample Importer Effects Estimates. Minimum 20 Trading Partners

least a minimum of 20 trading partners, the CCEMG estimator produces results that are easier to interpret. This is likely due to the requirement of both N_1 and N_2 being large. Both OLS and Panel FE estimate the distance effect to be smaller (in absolute value) than the CCEMG estimates, with Panel FE being closer to the CCEMG estimates than OLS. The advantage of using the CCEMG over Panel FE is its robustness to the heterogeneity in the data. If undetected, it can bias the coefficient estimates and render them meaningless.

As a next step, the roles of the importers and the exporters were reversed and exporter effects regressions were run. The expectation here is that after accounting for the importer effects or exporter effects the distance should affect trade similarly. The full sample results are similar to

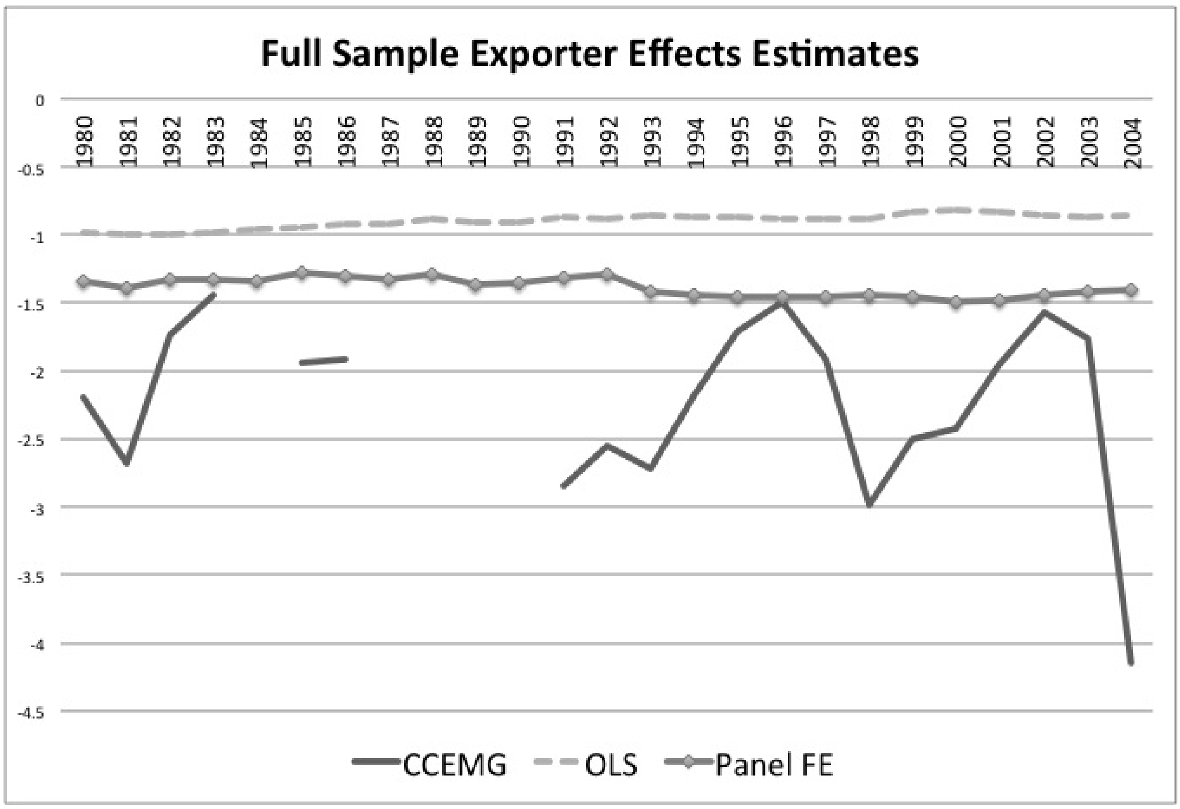

Figure 1.5: Full Sample Exporter Effects Estimates

those for the importer effects. Both OLS and Panel FE estimate the distance effect to be smaller than suggested by CCEMG. The CCEMG, however is insignificant for several years, likely because there are not enough observations for some of the countries.

Restricting the sample to the countries that have at least 50 trading partners brings about a new

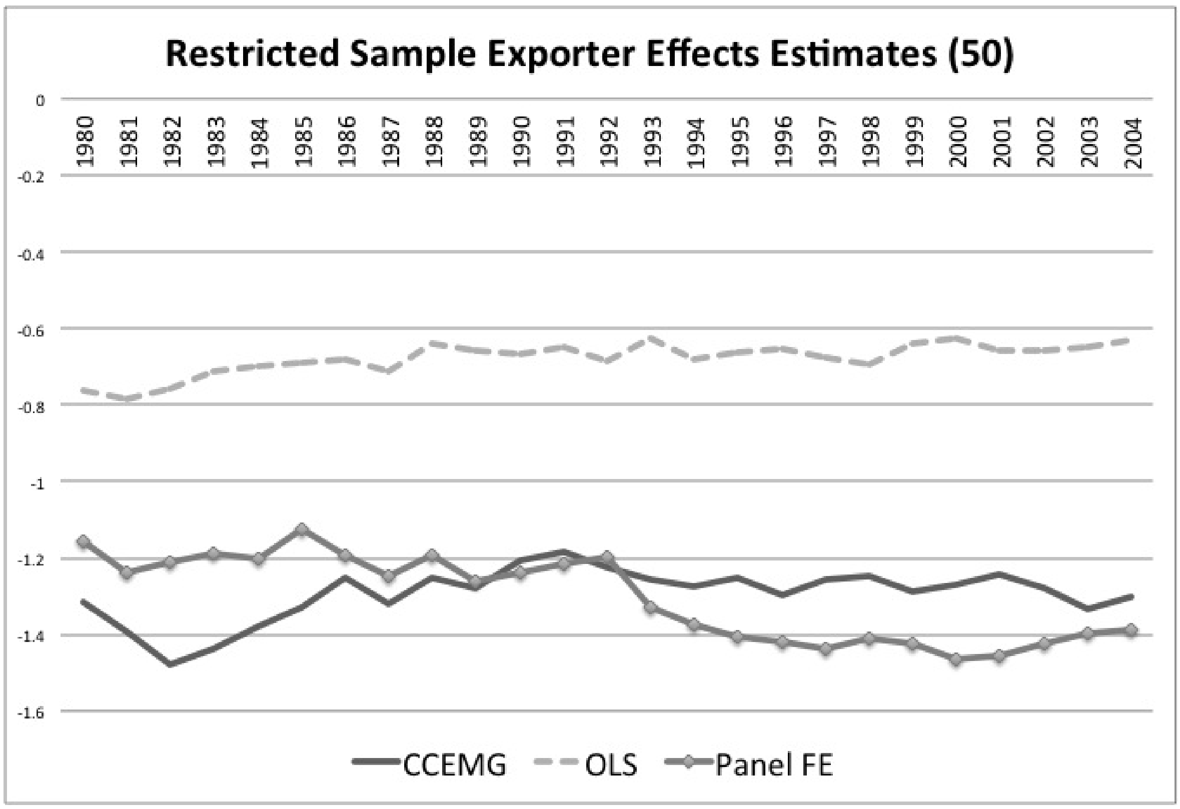

Figure 1.6: Restricted Sample Exporter Effects Estimates. Minimum 50 Trading Partners

result, unlike any of the previous ones. While OLS remains consistently smaller, the Panel FE actually estimates the distance effect to be greater than CCEMG, starting in about 1993. However,

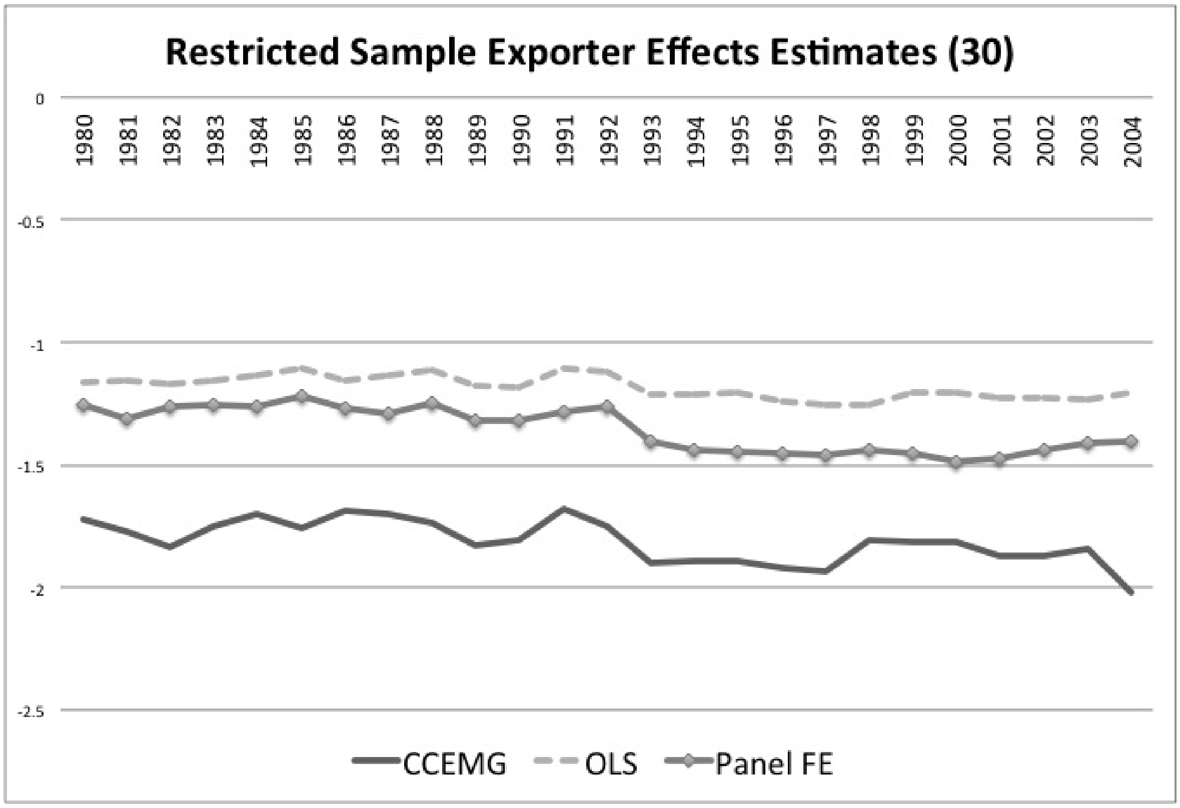

Figure 1.7: Restricted Sample Exporter Effects Estimates. Minimum 30 Trading Partners

once the sample includes countries that include a minimum of 30 partners, this tendency disappears, and the CCEMG distance effect estimates are now considerably greater the Panel FE and OLS estimates, while the latter two are fairly close to each other.

Finally, a 20-trading partner minimum restriction, Figure 1.8, looks a lot like Figure 1.7. Summing it all up it is reasonably to conclude that the distance effect is not diminishing during the 1980-2004 period, but nor is it rapidly increasing. The OLS estimates are smaller than the Panel FE estimates, which in turn are smaller than CCEMG. Considering that Panel FE estimator, while useful, can be misleading, the CCEMG estimates are the ones worth paying attention. They can help account for heterogeneity in the data, and produce reliable results.

Now, turning to the next set of results, related to the currency union effect. It is believed that forming a currency union helps foster trade between the participating countries, and eliminates the

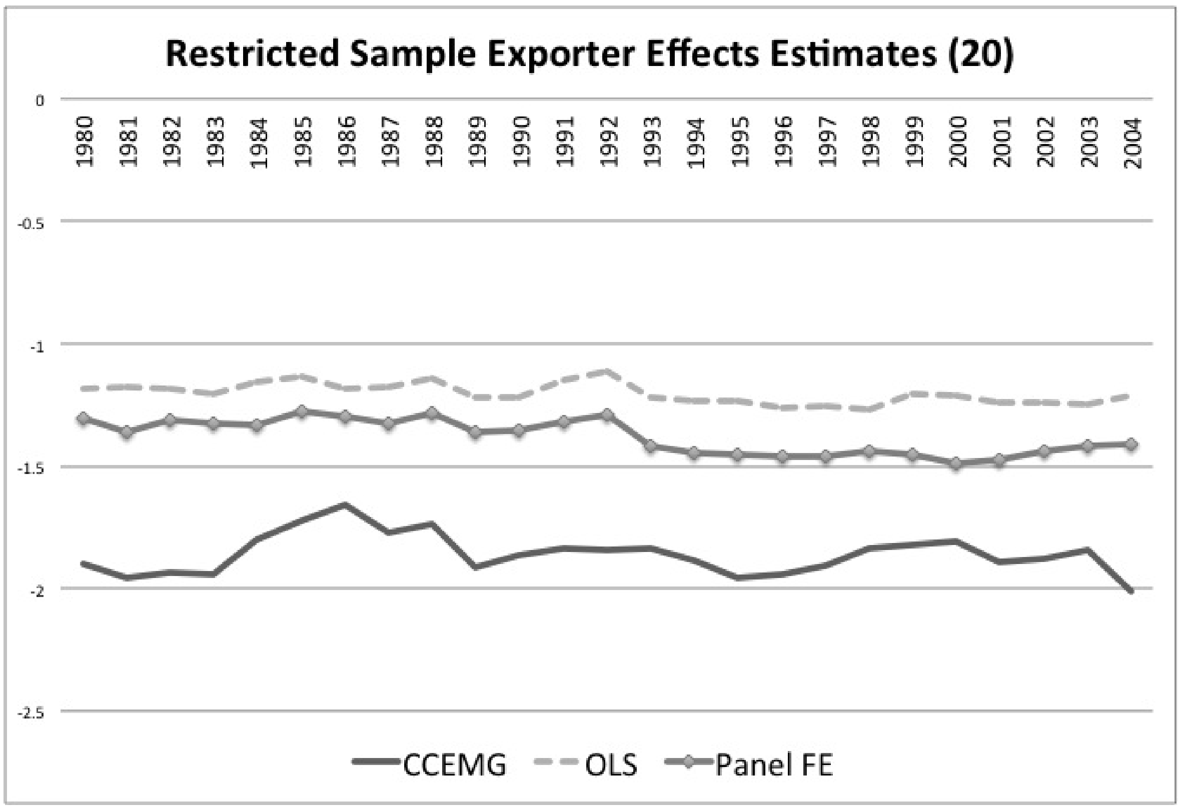

Figure 1.8: Restricted Sample Exporter Effects Estimates. Minimum 20 Trading Partners

home bias. It is further noted by some that currency unions do not result in trade diversion, thus leading to largely positive effects. Additionally a currency union is often regarded as a credible commitment to joint policies, resulting in lower inflation and stability, which are viewed as positives. Partially due to these beliefs European Union was formed with its euro as its single currency. An influential paper by Rose (2000) presents results showing that a common currency increases trade by as much as 300 percent. A subsequent paper by Glick and Rose (2002) uses time-series analysis to estimate the common currency to double the trade between member countries.

The annual specification approach allows to track the changes in the currency union effect, and this paper has two particular advantages: it uses CCEMG, an innovative estimator, and it employs data stretching to 2004, where some of the other datasets, including those used in already published work, end in the 1990s. Similar to the distance effect results, the restricted samples (where the countries are required to have a minimum of 20, 30 or 50 trading partners) produced more useable results. In fact, when the full sample is used, the CCEMG does not produce a significant coefficient for the common currency variable.

When the sample is restricted to a minimum of 50 trading partners, the results are very intriguing. First, note that the Panel FE estimator does not produce significant coefficient estimates, starting in 1999. The OLS shows considerable variation, but there is no evidence of a steady decline. The CCEMG, on the other hand gradually and predictably declines from it's peak value of approximately 2.5 in early 1980s to about .4 in 2004. What is important is that the decline is relatively smooth, and the tendency is easy to pick up, even if the results are not plotted. Panel FE results are fairly level, in all the years for which the estimates are available. In this particular case, the CCEMG highlights its usefulness and ability to pick up a trend, when other estimators fail to do so. What is also important, that had there not been a restriction (which was dictated by the CCEMG's properties), one might not see these results at all. OLS does not provide as clear of a result, and the application of an annual specification approach has not ben previously done in combination with a panel estimator. Therefore, this rather interesting result was obtained thanks to the application of the CCEMG while employing the annual specification, and could otherwise be

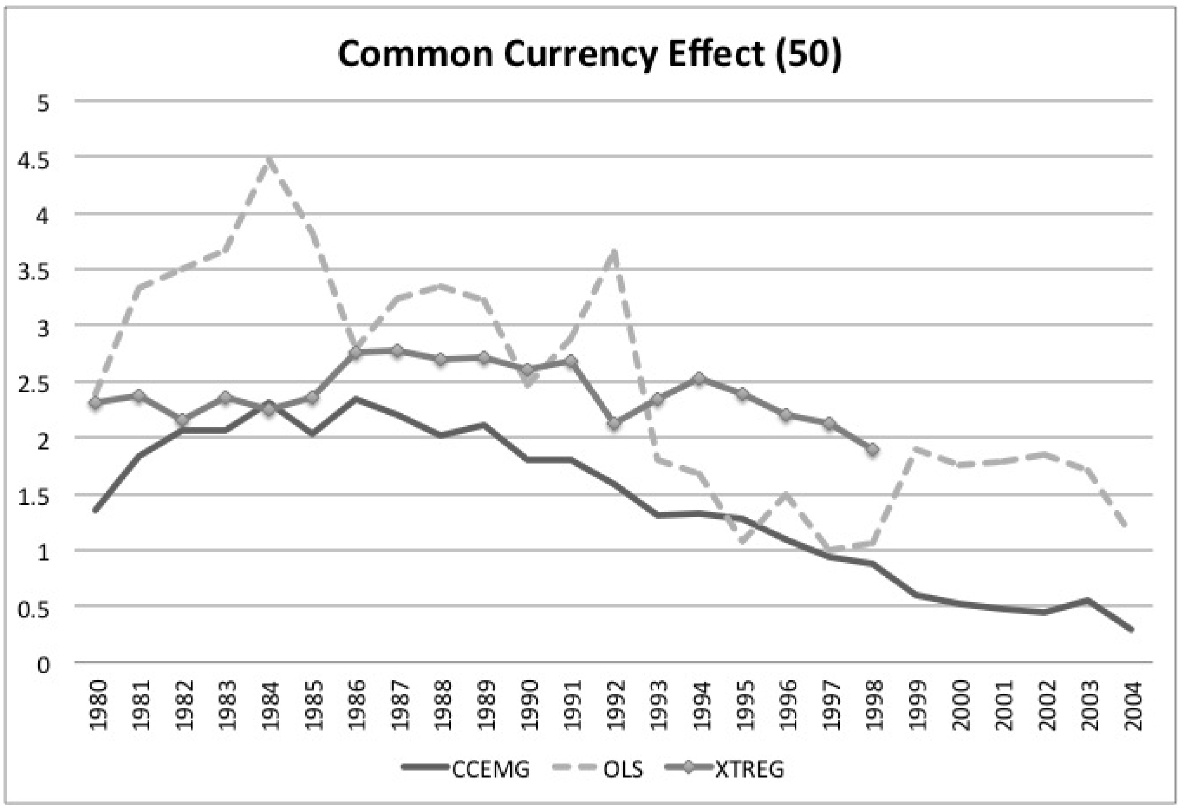

Figure 1.9: Common Currency Effect. Minimum 50 Trading Partners

left unnoticed.

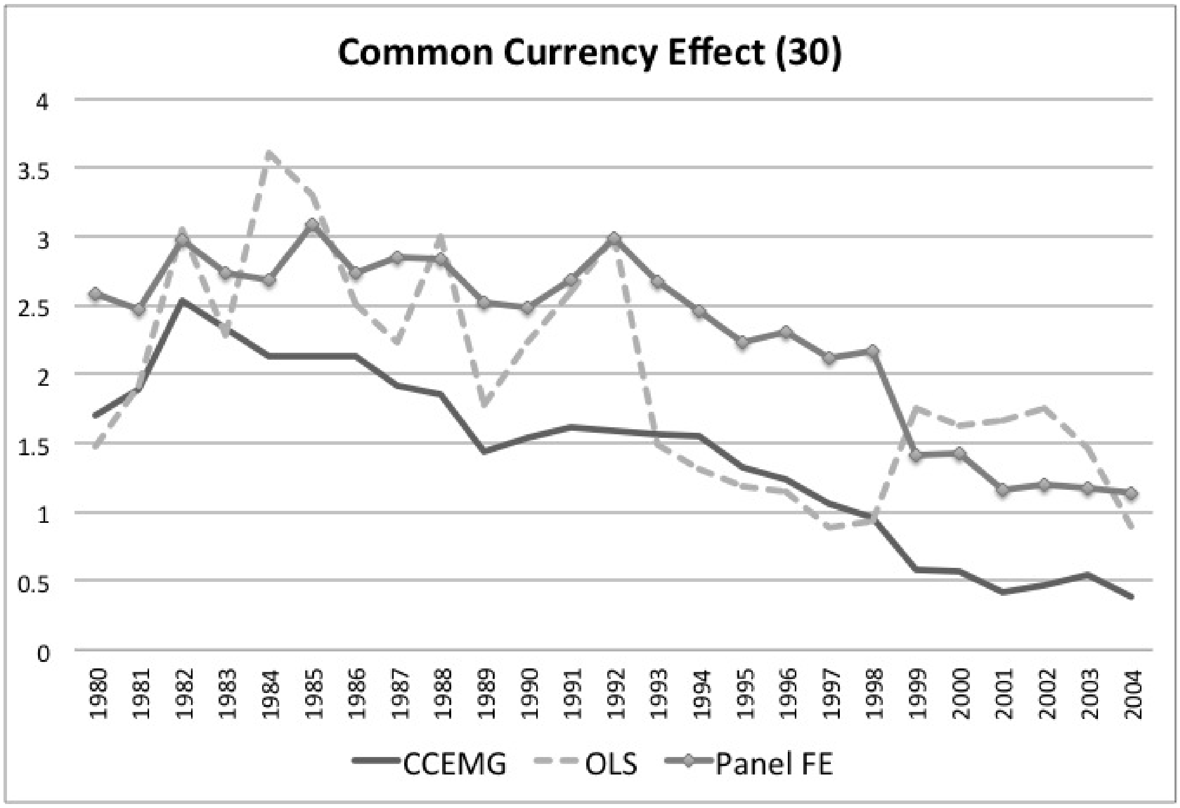

Figure 1.10: Common Currency Effect. Minimum 30 Trading Partners

The results for the sample where the qualifying restriction was a minimum of 30 trading partners are slightly different from the previous estimates. The Panel FE estimator is now producing significant results for the whole period, but it does not show a drop as big as the one shown by the CCEMG. OLS continues to behave erratically and it does not clearly show a gradual decline in the currency effect, leaving CCEMG as the one that most clearly points out to the decline.

Finally, the results produced by the sample which is restricted to have a minimum of 20 trading partners, and therefore the least restricted one almost mimic the results of the previous one. OLS and Panel FE, while pointing to the decline of the importance of the currency effects do so much less convincingly than CCEMG. However, notice that regardless of how the sample is restricted, there is persistent evidence that the currency unions have declined as trade catalysts, especially starting in early 2000's. The data is not available for further years, and once they are published, it would be a useful exercise to estimate the model for the years following 2004.

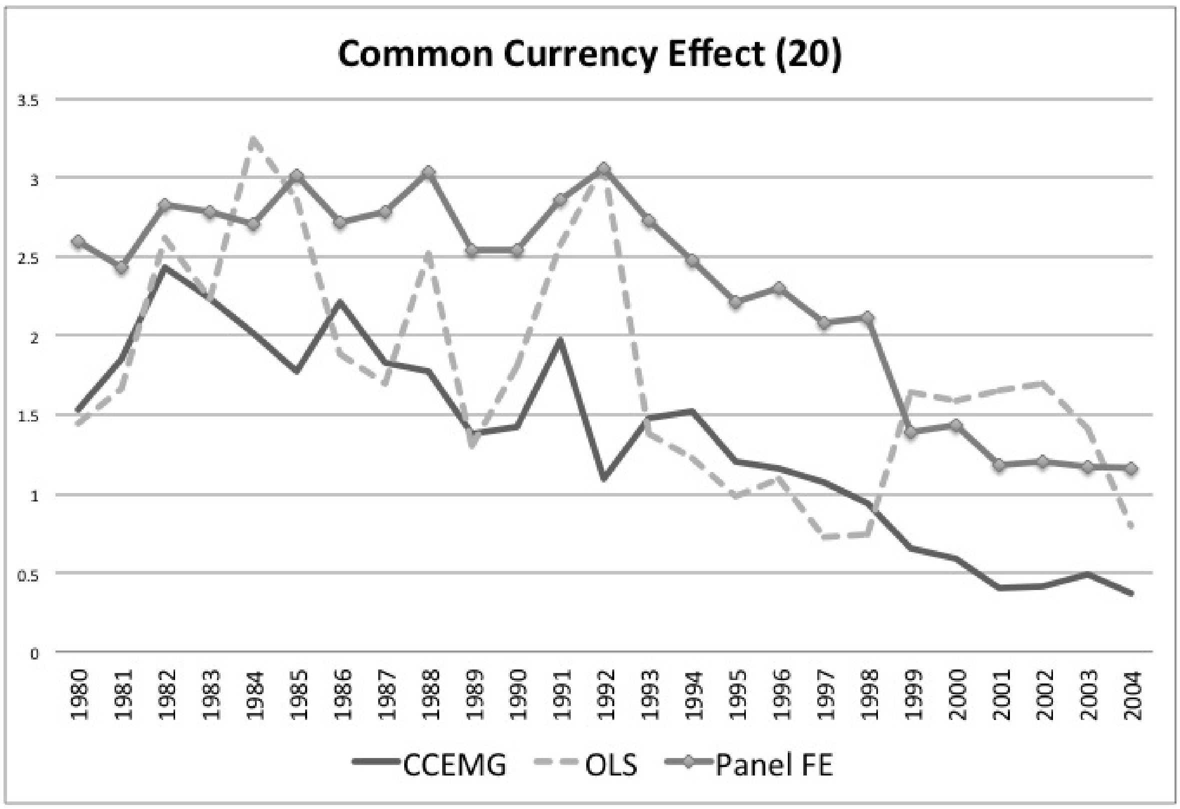

Figure 1.11: Common Currency Effect. Minimum 20 Trading Partners

In conclusion, the distance puzzle continues to persist and is even greater than previously estimated. It is also discovered that common currency is much less of a trade-stimulating factor now than it was in the past. These findings were discovered thanks to an application of a new estimation technique, the CCEMG, and results were contrasted to those obtained by applying older estimation techniques, OLS and Panel FE. CCEMG helped see some trends that could otherwise go unnoticed, thanks to its robustness to the heterogeneity in the data. In the future, it would be interesting to extend this study once the more recent data are available.

Chapter 2

The Co-Movement of FDI and Migration in OECD Countries

2.1 Introduction

In this paper we examine the relationship between migration and FDI in a small open economy. Because migration commonly occurs in countries engaged in global markets, we assume that there is pre-existing trade in goods and capital. It seems plausible that FDI is associated with greater employment opportunities in the receiving country. Given free trade and open borders, our intuition is that labor and capital movements should be positively correlated. Either foreign investment in factories and facilities reduces the outflow of migrants from the source county; or the inflow of migrants increases the amount of available labor and encourages foreign investment in the host country. The former situation, that workers follow jobs is suggested in Aroca and Maloney (2005), who argue that U.S. FDI in Mexico during the post-NAFTA era may explain the reduction in Mexican emigration in the late 1990s. The latter situation, that jobs follow workers, is suggested in Wilson (2003), who concludes that most of the FDI in Canada observed in 1899-1911 can be explained by massive immigration during this period.

Even though these findings are intriguing, they do raise two questions that serve to motivate the present research. First, the methodologies and analyses involved in these studies are quite disparate. Aroca and Maloney (2005) utilize a microeconomic empirical model of workers' decisions to migrate, in order to estimate the significance of variables that influence migration. Wilson (2003) utilizes a macroeconomic theoretical model to numerically simulate observed levels of immigration and FDI inflows. Since neither paper falls within the analytical framework of conventional trade theory, it is unclear whether co-movement can be deduced as a theoretical prediction of a standard trade model. Secondly, it is uncertain whether the co-movement of labor and capital is a general phenomenon in international trade or is idiosyncratic to the specific countries and time frames involved (Canada in the early 20th century; Mexico in the late 20th century). It would be useful to know whether evidence for co-movement can be found in a larger and consistent dataset.

To address the first question, we set out in Section 3 a two good, two factor model of an economy engaged in free trade in capital and a produced good. We suppose that the economy is small in global capital markets and takes the world rental rate as given. Under constant returns to scale it is necessary to assume that the economy produces a second good that is nontraded and consumed domestically. Our analysis yields one normative result and four theoretical results, and these appear to be new to the literature.

First, in contrast to autarky models, migration is welfare neutral in both the host and the source country even with finite movements in labor. This is a normative result that follows directly from the small country assumption under pre-existing trade. Second, labor and capital flows are complementary. We deduce a testable co-movement equation that is linear in FDI and migration. Third, co-movement predicts that migration can reverse a country's pattern of trade. A country that exports capital (imports goods) before immigration may become a capital importer (goods exporter) after immigration. Fourth, we show that if the traded good is relatively more capital intensive than the nontraded good, immigration (emigration) leads to an increase (decrease) in the employment of capital relative to labor in the economy. This suggests that immigration and FDI inflows may in the presence of trade increase productivity and growth. Finally, regardless of the relative factor intensity of the two goods, immigration (emigration) results in a larger (smaller) proportion of the labor stock allocated to the production of the traded good. Thus, immigration tends to be trade expanding.

To address the second question, we examine the panel of 28 OECD countries listed in Table 1 for the period 1995-2010.[1] While we discuss our panel and data set more fully in Section 4, we mention here that this panel has several desirable features for our empirical study. The countries listed in column 1 have relatively unrestricted trade, have comparatively open borders to migration, and actively participate in global capital markets. Although columns 2 and 3 reveal that there is considerable variation in population size and GDP among these countries, the standard neoclassical assumptions would seem to fit them rather well. All are developed economies with relatively insignificant agricultural and informal sectors (column 5). Column 4 measures the importance of traded goods by means of the average of exports plus imports as a percentage of GDP. Evidently, nontraded goods are not unimportant in these countries. Finally, we point out that relevant trade data for these countries come from reliable and consistent sources over an extended period of time (15 observations per country).

In order to avoid endogeneity issues, we estimate a linearized version in differences of the co-movement equation in Section 3. Specifically, we regress the change in net FDI flows on the change in domestic investment, net migration, and the change in the world rental rate. While the theoretical model only predicts correlation (and not causation) between labor and capital movements, our empirical results are improved by assuming that capital moves more quickly than labor (i.e., jobs follow workers). This can perhaps be justified by noting that there are typically construction and documentation lags associated with building new plant and facilities in a foreign country.

We use the Arellano and Bond (1991) technique to estimate coefficients in an effort to minimize potential econometric problems (viz., time-invariant, country-specific fixed effects; autocorrelation; and dimensionality issues related to our observations). Overall, the model is significant and we find strong evidence for co-movement. The first and second lags of migration as well as

[1] Currently, there are 34 members of the OECD. Chile, Estonia, Israel and Slovenia became members in 2010 and are too recent to include in our panel. Slovak Republic became a member in 2000 but it is excluded due to insufficient data. Although Iceland became a charter member in 1961, it is also excluded due to insufficient data.

Table 2.1: Country Profiles, 2010

Country	Pop, mm	$GDP, \$bn$	$\frac{(X_g+M_g)}{2\times GDP}$	Ag % of GDP
Australia	22.3	1132	17.9	2.8
Austria	8.4	377	39.2	1.5
Belgium	10.9	467	85.8	0.8
Canada	34.1	1577	24.7	n/a
Czech Rep	10.5	198	65.2	1.7
Denmark	5.5	312	29.0	1.3
Finland	5.4	237	29.4	2.9
France	65.1	2549	21.8	1.8
Germany	81.8	3259	35.9	0.8
Greece	11.3	299	14.2	3.1
Hungary	10.0	129	70.8	3.8
Ireland	4.5	205	43.6	1.7
Italy	60.5	2044	22.8	1.9
Japan	127.5	5489	13.3	1.2
Korea	49.4	1015	43.9	2.6
Luxembourg	0.5	53	32.4	0.3
Mexico	113.4	1036	29.0	3.5
Netherlands	16.6	774	60.2	1.8
New Zealand	4.4	143	21.4	n/a
Norway	4.9	418	25.0	1.7
Poland	38.2	470	35.2	3.7
Portugal	10.6	227	27.3	2.2
Spain	46.1	1383	20.4	2.6
Sweden	9.4	462	33.3	1.7
Switzerland	7.8	529	35.1	0.8
Turkey	72.8	731	20.5	9.5
United Kingdom	62.2	2252	21.5	0.6
United States	309.3	14447	11.2	1.2

Data Sources: GDP numbers are from the World Bank; population, exports, imports and size of agricultural sector (as % of GDP) are from OECD Stat.

the change in the world rental rate are all significant and have the expected signs. The change in the country's domestic investment is borderline significant and has the expected sign.

The remainder of the paper is organized as follows. In Section 2 we review the theoretical and empirical literature related to our topic. In Section 3 we develop the theoretical model and derive analytical conclusions. In Section 4 we set out the empirical model and estimate the co-movement equation in the model. In Section 5 we conclude the paper with a brief summary of results and suggestions for further research.

2.2 Review of the Literature

Wilson (2003) investigates the causes of the massive immigration and concomitant FDI inflows observed in Canada during the early 20th century. To simulate the Canadian economy during this period, he utilizes a theoretical model of a small open economy that trades in capital and a homogenous good produced via a Cobb-Douglas production function. In order to generate time paths for labor and capital, he assumes exogenous technical progress and overlapping generations of agents. Agents of any cohort (generation) include residents and migrants, and they are assumed to have identical skills and capital endowments. Calibrating his model to match Canadian demographic characteristics in the period 1861-1911, Wilson simulates Canada's transition from a country of net emigration to a country of net immigration during 1899-1911. His numerical simulations reveal that three-fourths of the FDI in Canada during this period can be attributed to immigration.

Aroca and Maloney (2005) consider an empirical model of a small open economy to explain migration within the 32 states of Mexico during the post-NAFTA era (1994-2000). They utilize a multinomial logit procedure to determine the significance of different variables that may influence the probability of a Mexican worker migrating between specific destinations (states). Because of poor data on illegal immigration, they use their estimations to simulate the migration rate to the U.S. as if it were a 33rd state. Based on this novel hypothesis, they infer that U.S. investment in Mexico had a small but significant effect on deterring emigration during this era. Since no direct observations are made on actual emigration to the U.S., their finding of co-movement in labor and capital flows is somewhat speculative.

As remarked in Wong (2006), there appears to be little work in trade theory that might explain this simultaneous movement of factors between countries. He attempts to do so by modifying the standard Heckscher-Ohlin model to allow for the presence of a positive externality (increasing returns) in the production of one of the goods. In order to focus on the role of increasing returns, countries are taken to differ only in the absolute size of their labor and capital endowments. Their relative capital endowments, technologies, and preferences are presumed to be identical. Wong analyzes the model assuming capital mobility and free trade in goods. He demonstrates that when the larger country specializes in the good that exhibits increasing returns, an increase in labor flows between countries reduces the capital flows between countries. Though this result is not inconsistent with co-movement (e.g., an increase in FDI inflows is associated with less emigration), it is somewhat difficult to evaluate because of his special assumptions.

Kugler and Rapoport (2007) observe that the more obvious channel in static trade models is that emigration creates an excess demand for labor causing the real wage to rise and the real rental to fall. This induces source country firms to invest abroad. Hence, labor and capital movements are positively correlated. While this channel may be important in the large country case, e.g., Wong (2006), it would appear to be inapplicable to small open economies. Under pre-existing trade the country's real rental would be unchanged by emigration, which implies under the usual neoclassical assumptions that the real wage is also unchanged. We demonstrate in section 3 that the channel for the small open economy is analogous to a Rybczynski effect and is not readily explained in terms of factor price effects unless factor markets instantaneously adjust. As mentioned in Section 1, our empirical estimations suggest that factor markets do not adjust instantaneously. More precisely, FDI appears to be correlated with lagged migration.

There are two non-trade channels linking FDI and migration that have received attention in the literature. The technology spillover channel proposes that horizontal FDI embodies new technologies, marketing techniques, and management skills that enhance the productivity and competitiveness of firms in local industries (Markusen and Venables (1999)). This has been observed in developed countries, such as the U.K. (Haskel et al. (2007)) and the U.S. (Keller and Yeaple (2009)). Blonigen (2005) has noted that two-thirds of the sales of U.S. MNEs are to local markets through their foreign affiliates. If this is true for OECD countries more generally, then FDI from developed countries is largely horizontal investment that substitutes for exports to the receiving country.[2]

Klenow and Rodriguez-Clare (2005) argue that the mechanism through which this channel operates may be related to the skill composition of the receiving country's labor supply. They propose that the capacity of the receiving country to adopt the new technologies embodied in FDI varies directly with the proportion of skilled labor in its labor supply. Such a skill bias to FDI would have important implications for migration. If emigrants are predominantly skilled, the source country's ability to utilize new technology is reduced and this would tend to discourage FDI inflows[3]. Correspondingly, if immigrants are skilled and raise the host country's proportion of skilled labor, this would tend to discourage FDI outflows. In either case one would observe positive correlation (co-movement) in the country's labor and capital movements.

A second channel that has been suggested is the migrant network effect. This appears to be motivated by the empirical papers of Gould (1994) and Head and Ries (1998), who find that the presence of migrant networks in the host country leads to an expansion in trade with the source country. Buch et al. (2006) and Javorcik et al. (2011) find similar evidence for FDI; namely, foreign direct investment in the receiving country is positively influenced by the presence of migrants from the receiving country. The argument is that because of informational asymmetries and transactions costs, foreign investment in the source country may be costlier and riskier than domestic investment in the host country. Immigrants who network between domestic investors and economic agents in their native country may encourage FDI in the source country, at least to the extent that such

[2]Interestingly, there is little evidence in developing countries to support technology spillovers through horizontal FDI. Javorcik (2004) finds evidence that the linkage in developing countries tends to be through vertical FDI in upstream sectors; e.g., local suppliers of intermediate inputs who sell back to their affiliates in the sending country.

[3]This may not be true for developing countries. Assuming that exports are low-skill intensive, Ivlevs and Melo (2010) find evidence in a sample of 102 developing countries that the emigration of high-skilled labor encourages FDI inflows.

networking reduces transaction costs and facilitates the flow of information. In this case, one would observe negative correlation in a country's labor and capital movements.[4]

Much recent work has been devoted to sorting out the relative importance of these two channels. The paper of Kugler and Rapoport (2007) is representative.[5] They consider the U.S. stock of immigrants by educational attainment (proxy for skill levels) in the years 1990 and 2000. The authors find a small but significant relationship between the stock of immigrants with a primary education in 1990 and total U.S. FDI to their countries of origin in 2000. The relationship is statistically insignificant for immigrants with a secondary or tertiary education. On the other hand, they find a small but significant relationship between immigrants with a secondary or tertiary education in 2000 and total U.S. FDI to their countries of origin in 2000. While interpretations are highly speculative, their results seem to suggest that there may be a migrant network effect in play for unskilled immigrants and a technology spillover effect in play for skilled immigrants.[6]

Based on the empirical evidence to date, it is hard to imagine that these non-trade channels could account for much of the co-movement found in Wilson (2003) and Aroca and Maloney (2005). Still, it is worth mentioning that even though Wilson posits identical skills across cohorts, his assumption of exogenous technical progress with a Cobb-Douglas production function is equivalent to an increase in labor skills over time. Future cohorts are more highly skilled (i.e., productive) than earlier cohorts, and the technology spillover effect may have played a dynamic role in the Canadian co-movement observed in the early 20th century.

Aroca and Maloney (2005) ignore differences in labor skills as an explanatory variable, so the skill bias mechanism is apparently not in play. They do include network effects and find them to be statistically significant in explaining intrastate migration within Mexico. However, in treating the U.S. as a 33rd state, their simulated migration response to U.S. FDI appears to be a residual

[4]Foad (2011) finds that the positive externality of increased information flows also increases portfolio investment in and from developed countries, but not portfolio investment in and from developing countries. He argues that this may be because there are lower barriers to portfolio diversification (e.g., currency risk) in developed countries.

[5]See also Yaman et al. (2007), Dolman (2008), and Federici and Giannetti (2010).

[6]Kugler and Rapoport (2007) also disaggregate their data on immigration and FDI by economic sector (manufacturing and services), but there does not seem to be a consistent story that emerges on the basis of educational attainment (skill level).

effect that does not account for direct network effects between Mexican workers and Mexican emigrants now residing in the U.S. Since the migrant network channel implies negative correlation between labor and capital movements, their finding that FDI inflows are positively correlated with reduced emigration seems to imply that other countervailing channels are also important. The precise nature of these other channels is an open question.

2.3 Theoretical Model and Results

Migration commonly occurs in countries already engaged in international trade. We posit that prior to migration a country freely trades in capital, denoted K, and a numeraire good, denoted X_1. Plausibly, global capital markets are sufficiently broad that the country takes the world rental rate as given. We let X_2 denote the country's production of a nontraded good. We assume that both goods are produced via neoclassical production functions (twice continuously differentiable, concave, and linear homogeneous), which are given as follows.

$$X_i = F_i(L_i, K_i) = L_i f_i(k_i) \qquad k_i = \frac{K_i}{L_i}, \quad i = 1,2 \tag{2.1}$$

where L_i and K_i represent labor and capital, respectively, allocated to the production of good i.

Producers of each good are taken to be perfectly competitive, in which case profit maximization yields the usual marginal productivity conditions:

$$f_1(k_1) - k_1 f_1'(k_1) = w = p[f_2(k_2) - k_2 f_2'(k_2)] \tag{2.2}$$

$$f_1'(k_1) = r = p f_2'(k_2) \tag{2.3}$$

where w and r designate the real wage and rental rate, respectively, and p reflects the relative price of the nontraded good. It is evident that if r is given, then (2) and (3) are four equations in four unknowns; and the country's technologies alone determine w, p, k_1, and k_2.[7] Evidently, fixing r when one good and one factor are mobile is isomorphic to the Heckscher-Ohlin model when the goods price ratio is fixed and both goods are mobile. Instead of having a Rybczynski effect when labor migrates, in the present model we will obtain the co-movement of capital when labor migrates.

2.3.1 Migration and Welfare

Under the small country assumption it is clear that the indirect utility (welfare) of an original resident in the host country is unchanged as a result of exogenous changes in the country's labor endowment (migration). If migrants do not repatriate wages in the form of remittances, the indirect utility (welfare) of a non-migrant in the source country is also unchanged. The welfare neutrality of migration in the model follows from the supposition of pre-existing trade. Differences in technologies between countries would tend to create differences in w and p, and the decision to migrate (at least, in part) would be based on these differences. However, since r is identical in all countries, the welfare of non-migrants does not depend on whether migrants have a claim on capital in the source country.

Welfare neutrality stands in sharp contrast with the standard conclusion when capital is not mobile. Rivera-Batiz (1982) considers a two good model without capital flows. He demonstrates that when one of the goods is not traded, emigration without remittances would generally change the relative price of the nontraded good, causing a deterioration in non-migrants' welfare. The departure of migrants from the source country reduces the consumption possibilities of non-migrants by depriving them of the opportunities to trade with emigrants in the domestic market for the nontraded good. On the other hand, if migrants repatriate their higher wages in terms of the traded good, Djajic (1986) has shown that there exists some level of remittances that allows non-migrants to obtain a consumption bundle that achieves the same utility as they enjoyed prior to emigration.

[7] It is routine to show that w and the k_i vary inversely with r. The relationship between p and r depends on relative factor intensities. When the traded good is more capital intensive than the nontraded good, $k_1 > k_2$, and p varies inversely with r. When the traded good is less capital intensive, $k_1 < k_2$, and p varies directly with r.

Kemp (1993) argues that the welfare of non-migrants may increase if migrants have a share in the capital endowment of the source country. If emigration leads to a higher wage and lower rental in the source country, the loss in rental earnings would be shared by migrants and the net effect of emigration for non-migrants may be an improvement in welfare. This latter observation motivates Djajic (1998), who extends on the Rivera-Batiz model by allowing the source country to import foreign capital. He argues that the lower rental rate induced by emigration would be absorbed by foreign capitalists, and this would buffer the loss in rental earnings to non-migrants. Consequently, even without remittances, non-migrants might be better off after migration in contrast to the Rivera-Batiz conclusion[8].

It is obvious that nothing in a small country model prevents the complete emigration of the source country's labor endowment L. While we implicitly assume that there is a finite emigration less than L, there is no theoretical justification for this. In the real world labor migration is limited by language barriers, legal restrictions, and the social and cultural relationships that tie non-migrants to their native country. It is also possible that a role served by migrants' remittances is to reduce the incentive of non-migrants to emigrate[9].

2.3.2 Equilibrium, Co-movement, and the Pattern of Trade

Let L stand for the country's initial endowment of labor and K stand for its employment of capital. The factor market equilibrium conditions in the 2x2 model can be written as:

$$n_1 = (k - k_2)/(k_1 - k_2); \quad n_2 = (k_1 - k)/(k_1 - k_2) \tag{2.4}$$

where $n_i = L_i/L$ and $k = K/L$. Denote by c_i and x_i the per capita consumption and production, respectively, of good i. Then the goods market equilibrium conditions under balanced trade can be

[8] However, this argument seems less than convincing, since Djajic ignores the response of foreign capitalists to the lower rental rate in the source country. Presumably, foreign capitalists would simultaneously disinvest in the source country, and his model would then collapse to the Rivera-Batiz model (with no foreign capital)

[9] The incentive to emigrate may also depend on non-migrants' job opportunities abroad. Wang and Wong (2011) report evidence that remittances deter emigration of non-migrants with a primary education (unskilled workers) but not those with a secondary or tertiary education (more skilled workers).

written as

$$c_1 = x_1 + r(e-k); \quad c_2 = x_2 \tag{2.5}$$

where $e = E/L$, and E is the country's endowment of capital. We assume that the economy is diversified and produces both goods, hence $n_i > 0$. This implies from (4) that the world rental rate must satisfy $r \in (r_{min}, r_{max})$, where r_{min} and r_{max} correspond to rental rates that result in complete specialization.[10]

We suppose that migrants and non-migrants (residents) have identical and homothetic preferences; thus

$$c_1/c_2 = h(p) \tag{2.6}$$

where $h'(p) > 0$. These are standard assumptions in the literature. The assumption that preferences are identical simplifies our proof of co-movement, but it does not seem to be crucial. On the other hand, the assumption of homothetic preferences appears to be indispensable. This assumption eliminates endowment effects on income, and it is unclear that co-movement necessarily holds under a more general specification.[11]

Substituting from (1), (4) and (5), we rewrite (6) as

$$(k-k_2)f_1(k_1) + r(k_1-k_2)(e-k) = h(p)(k_1-k)f_2(k_2). \tag{2.7}$$

Collecting terms and multiplying through by L, we obtain the country's excess supply of capital,

[10] These bounds are easily derived using (2) and (3). Our assumption that the world rental rate lies between these bounds is analogous to the assumption in the Hechscher-Ohlin model that enables factor price equalization. Namely, the trade equilibrium price lies within the autarky price interval of incomplete specialization for each country.

[11] For simplicity, suppose that residents have identical capital endowments and preferences. If preferences are non-homothetic, (6) becomes $c_1/c_2 = H_1(p,m)/H_2(p,m)$, where $m = w + re$ signifies the representative resident's income. Because $e = E/L$, an exogenous change in L changes e (hence, m) even though w and r remain the same under pre-existing trade. Thus the relative demand for goods changes. The proof of co-movement is now uncertain; and, at the very least, is considerably more complicated.

$E-K$, as a linear function of L. In particular,

$$E - K = aE - bL \tag{2.8}$$

with $a = (f_1 + hf_2)/g$ and $b = (k_2 f_1 + hk_1 f_2)/g$ where, from (2) and (3), $g = f_1 + hf_2 + r(k_2 - k_1) = w + hf_2 + rk_2 > 0$. Therefore, a and b are positive, the latter implying that K and L move in the same direction.

We will take this co-movement as a 'hard' prior in our estimations in Section 4. The excess supply function is graphed in Figure 1. The graph suggests that migration may cause a reversal in the country's pattern of trade. Suppose that prior to migration, the source country imports capital, say at point A. Since emigration corresponds to an exogenous movement up the excess supply curve, it is clear that for sufficient emigration the source country becomes a capital exporter. Similarly, a host country that exports capital at point B prior to migration may become a capital importer for sufficient immigration.

Although a change in the world rental rate would be expected to change the values of a and b in (8), it seems impossible in general to determine the direction of change. When technologies and preferences are Cobb-Douglas, it can be shown that an increase in r lowers b but does not change a.[12] In this case, the excess supply curve rotates up and becomes flatter (the dashed line in Figure 1). This means that for any given L, an increase in r increases the net export of capital. Although this seems intuitive, it is not a general result; accordingly, we will take this as a 'soft' prior in our estimations.

2.3.3 Further Theoretical Results

There are two additional results that one can tease from the model. As noted in Section 2, Wong (2006) finds in his variant of the Heckscher Ohlin model that an increase in labor movement be-

[12] Let $f_1(k_1) = k_1^{\alpha}$ and $f_2(k_2) = k_2^{\beta}$, $0 < \alpha, \beta < 1$. Suppose that $h(p) = (1-\gamma)p/\gamma$, $0 < \gamma < 1$, where γ reflects the budget share of X_2 (nontraded goods). One can then derive the following: $a = [\gamma(1-\beta) + (1-\gamma)(1-\alpha)]/(1-\alpha)$ and $b = (1-\gamma+\beta\gamma/\alpha)(\alpha/r)^{1/(1-\alpha)}$.

tween countries decreases capital movement between countries. This suggests that factor flows may alter a country's aggregate capital/labor ratio. The question we ask is how does co-movement affect k in our model? In view of (8), it is obvious that this depends on

$$b = (k_2 f_1 + hk_1 f_2)/[f_1 + hf_2 + r(k_2 - k_1)] \gtrless k \iff (k_2 - k) f_1 - h(k - k_1) f_2 \gtrless rk(k_2 - k_1)$$

Suppose $k_2 > k > k_1$. Then $b \gtrless k \iff n_1 f_1 - hn_2 f_2 \gtrless rk$ from (4) $\iff x_1 c_1 \gtrless rk$ from (6) $\iff r(k-e) \gtrless rk$ from (5). Hence, $b < k$. A similar derivation yields $b > k$ when $k_2 < k < k_1$.

In words, if the traded good is relatively more capital intensive than the nontraded good $(k_1 > k_2)$, then $b > k$; and simultaneous inflows (outflows) of labor and capital increase (decrease) the country's aggregate capital/labor ratio. Under balanced trade the capital inflow increases the country's export of the traded good. Denoting finite changes by Δ, this means that $\Delta X_1 > \Delta C_1 = h\Delta C_2 = h\Delta X_2$ by (5) and (6). Thus, the economy produces a relatively greater amount of the traded good vis a vis the nontraded good. When the traded good is relatively more capital intensive, this requires a proportionately larger capital inflow vis a vis labor inflow to maintain factor market equilibrium at given factor prices. The reverse would be true in the case of capital and labor outflows.

On the other hand, if the traded good is relatively more labor intensive than the nontraded good $(k_1 < k_2)$, then $b < k$; and simultaneous inflows (outflows) of labor and capital decrease (increase) the country's aggregate capital/labor ratio. With balanced trade the capital inflow increases the country's export of the traded good as argued above. But because the traded good is relatively more labor intensive, this requires a proportionately larger labor inflow vis a vis capital inflow to maintain factor market equilibrium at given factor prices. The reverse would be true in the case of capital and labor outflows.

This result can be compared and contrasted with the Rybczynski effect. In the Hechscher-Ohlin model with incomplete specialization and given commodity prices (hence, factor prices), immigration decreases the economy's aggregate capital/labor ratio. To maintain equilibrium in the goods markets, this leads to an expansion in the output of the relatively labor intensive good and a contraction in the output of the relatively capital intensive good. In the present model, with incomplete specialization and a given rental rate, immigration induces a co-movement in capital to maintain equilibrium in the factor markets. Whereas factor co-movement allows the production of both goods to increase, a production bias a la Rybczynski is still present.

An observation about this conclusion, albeit speculative, may have implications for economic development in small countries. We might suppose that in developed economies nontraded goods, such as services, are less capital intensive than traded goods, such as manufactures. Our model suggests in this case that immigration and FDI inflows would tend to increase the economy's aggregate capital/labor ratio. This tendency is similar to growth in a neoclassical economy, so that greater openness in trade and factors substitutes for greater domestic saving. On the other hand, if traded goods are less capital intensive (e.g., primary goods) than nontraded goods (finished goods), as may be the case in some developing economies, our model suggests that immigration and FDI inflows would tend to reduce the economy's aggregate capital/labor ratio. For these countries greater openness in trade and factor flows may actually reduce their productivity and growth.

We have one final result. The Rybczynski theorem asserts that following immigration since factor intensities are unchanged, more labor and capital are allocated to the production of the labor intensive good and less labor and capital are allocated to the production of the capital intensive good. With co-movement, the economy produces more of both goods. This requires that more of both labor and capital are allocated to each good. However, the present model does predict that regardless of relative factor intensities, the proportion of labor allocated to the traded good increases (decreases) with labor and capital inflows (outflows).

To show this, we utilize (4) to compute $\partial n_1/\partial k < 0$ when $k_2 > k > k_1$, and $\partial n_1/\partial k > 0$ when $k_2 < k < k_1$. From our previous result, when $k_2 > k > k_1$, factor inflows (outflows) lower (raise) k; and when $k_2 < k < k_1$ factor inflows (outflows) raise (lower) k. Since $n_1 + n_2 = 1$, we see that factor inflows (outflows) raise (lower) the proportion of labor allocated to the traded good and lower (raise) the proportion of labor allocated to the nontraded good. Labor and capital inflows not only expand trade in the economy, but they also increase the relative importance of trade in the economy. The reverse is true for labor and capital outflows.

2.4 Empirical model and results

The focus of this paper is on small open economies, and it is natural to consider OECD countries as a point of departure. The model can in principle be applied to any country, including non-OECD (or developing) countries, but enlarging the panel has disadvantages as well as advantages. On the one hand, given a larger sample we could hope to obtain a more general result. On the other hand, we would have to overcome a number of obstacles. For example, some countries do not engage in what would generally be perceived as free trade (viz., they cannot be considered as open economies). For many developing countries, data on FDI are either not available or considered unreliable. The reliability of data was a particularly important criterion in our selection, hence we focus on the OECD members. The time period investigated spans 1995 through 2010 (the latest available year for many series). With trade expanding and transforming due to improvements in technology and communications, we choose to use a relatively recent sample for testing the model. In particular, trade has changed with the introduction of the internet, and our sample should capture this in the data. We exclude the five most recent members of the OECD (viz., Chile, Estonia, Israel, Slovak Republic, and Slovenia) as well as Iceland due to limited data availability. This yields a sample of 28 countries with approximately 15 time-series observations per country. Summary statistics are presented in Table 3 of the Appendix.

2.4.1 Data and Sources

We do not have access to data that would directly measure labor migration. There is some information available on the inflows and outflows of labor, but these statistics are often incomplete and not clearly explained. In order to calculate a net inflow of labor, one would have to subtract the outflows from the inflows. If the data on either of those series are unavailable, the result becomes distorted and likely misleading. At the same time, population data are readily available and appear to be consistently collected by all countries in our sample. Although demographic changes in OECD countries are complex (e.g., d'Addio and d'Ercole (2005)), the current fertility estimates are at approximately 1.75, as reported by OECD Stat (2012). This is just below the 2.1 replacement level (d'Addio and d'Ercole (2005)). Given that all OECD countries experienced population growth during the time period examined[13], this growth can be largely attributed to migration. While this methodology might have its limitations, it is a consistent way to measure the flow of labor. By differencing the population totals, we obtain changes in the total population, and we call this series Change in Total Population (ΔL) in our regression analysis. In addition, we use the first and second lags of the population changes, denoted by $\Delta Pop.Lag1$ and $\Delta Pop.Lag2$ respectively.

A series for capital migration is unavailable. Data are available for FDI inflows and FDI outflows, which is very close to what we need. Intuitively, subtracting the FDI outflows from the FDI inflows will yield a net FDI inflow, which would seem to be a good measure of capital migration. In practice, however, many observations are missing (particularly, for the FDI outflows), and we are faced with a dilemma. If an observation in either series for a particular year and country is missing, we can either delete the whole observation, or blindly tell the software to calculate it anyway (in which case it sometimes considers it a zero and produces a meaningless or worse, a misleading number). The first option leads to a loss of many observations, rendering the dataset to have too few observations and unusable for practical purposes. The second option produces unreliable results. Obviously, neither of these outcomes is desirable so we do not pursue this route. Instead we adopt an approach similar to what we did with labor movements. Because we do have access to the FDI stock in each country for almost every year, we can difference the total FDI stock to arrive at changes in FDI. We call this variable ΔFDI in the empirical analysis in the following section.

We assume a small open economy that takes the world interest rate as given. One measure of the world interest rate is the intermediate bond rate published by the Federal Reserve Economic

[13] OECD Stat (2012)

Data (FRED (2012)) . We use the 3-year bond rate adjusted for inflation as our measure of the real rental rate, and obtain the change in real rental by differencing the rental rates. In our analysis we use the GDP deflator as a measure of inflation as reported by the Bureau of Economic Analysis (2012). This variable is referred to as $\Delta Rent.Rate$ in the empirical analysis.

The last variable that enters the estimation equation is domestic investment. The Penn World Table (Heston et al. (2011)) provides several measures. The series IKON, which is domestic investment at constant prices, seems preferable to use over the domestic investment at current prices series, which would then have to be adjusted for inflation. We construct the first differences of this series and call it $\Delta Dom.Inv$.

2.4.2 Empirical Results

Define $Z \equiv E - K$ and consider (8) in first difference form:

$$DZ \;=\; D(aE) - D(bL) = aDE - D[L\Phi(r)] \tag{2.9}$$

where we take a constant and $b = \Phi(r)$. Approximating the final term by a first-order Taylor expansion and dividing through by L, we obtain:

$$\frac{DZ}{L} = a\frac{DE}{L} - b\frac{DL}{L} - cDr \tag{2.10}$$

with $c = d\Phi/dr$, where DZ is the change in net FDI, DE is the change in domestic investment, DL is the change in labor (population) via migration, and Dr is the change in the real rental rate. More intuitively, the equation can be written as follows:

$$\frac{\Delta FDI}{L} = a\frac{\Delta Dom.Inv.}{L} - b\frac{\Delta Pop}{L} - c\Delta Rent.Rate$$

We suppose that capital moves faster than labor, which may result from construction lags as well as impediments to labor mobility and immigration restrictions. In particular, we regress on the first and second lags of population change. While this suggests that capital follows labor in the model because only the first and second lags are employed, it remains a relatively short-run situation. We found that two lags work best in the sense that individual coefficients are most significant and overall significance of the model is the same. Thus, our regression equation stands as follows:

$$\frac{\Delta FDI}{L} = a\frac{\Delta Dom.Inv.}{L} - b1\frac{\Delta Pop.Lag1}{L} - b2\frac{\Delta Pop.Lag2}{L} - c\Delta Rent.Rate, \tag{2.11}$$

where our priors are that $a, b1, b2 > 0$ while $c < 0$.

Initially we estimate the equation using the full sample of 28 countries (described above). We then rank countries by their GDP and remove the 3 largest economies (U.S., Japan, and Germany) to ensure that the countries in the sample are small. The results in Table 2 appear to be largely the same, with some marginal improvement in significance for some of the variables. This could be interpreted that when it comes to capital and labor co-movement there may not be large and small countries. We also tried removing the 5 and 10 largest economies. This leads to a considerable loss in the degrees of freedom and significance of coefficients. The coefficient of the second lag of population flow (migration) remained highly significant, but the rest of coefficients became insignificant. The sign remained correct on the change in rental rate. Results are presented in Table 2.4 in the Appendix.

We use the Arellano and Bond (1991) technique to estimate the coefficients. The estimator addresses the following four potential problems: (i) correlation of the regressors and error term;[14] (ii) time-invariant, country-specific fixed effects; (iii) the possibility of autocorrelation due to lagged terms; and (iv) the fact that we have a relatively short time dimension compared to a larger cross-

[14]This is done by inserting the first lag of the dependent variable as an explanatory variable in the right hand side of the estimation equation. See Arellano and Bond (1991) for a more detailed explanation. We report estimates of this lag in Table 2.2.

sectional dimension. The results are presented in Table 2.2

Table 2.2: Regression Results

ΔFDI/L	FULL OECD Sample	OECD less 3 Largest Economies
ΔFDI.Lag/L	-.5073***	-.5061***
	(.1382)	(.1388)
ΔDom.Inv./L	$4.23\times10^{-09\star}$	4.18×10^{-09}*
	(.0024)	(2.48×10^{-09})
ΔPop.Lag1/L	.0045*	.0044*
	(2.60×10^{-09})	(.0024)
ΔPop.Lag2/L	.0010***	.0010***
	(.0003)	(.0003)
ΔRent.Rate	-.0010***	-.0011***
	(.0004)	(.0004)
Constant	.0026**	.0029**
	(.0011)	(.0013)
$^{*}p \leq .10$, $^{**}p \leq .05$,	$^{***}p \leq .01$	$^{\star}p = 0.103$

Overall, the model is significant. The results reveal strong evidence for the co-movement of capital and labor. The first and second lags of migration are significant and positive, indicating that in the two years after immigration, new capital in the form of FDI follows. FDI is also sensitive to the world rental rate. The negative sign on its coefficient suggests that if world rental rates rise, FDI inflows reduce. Finally, domestic investment is borderline significant. The sign on the coefficient suggests that capital flows into countries with higher increases in the domestic investment. Thus, our priors are confirmed. In passing, notice that the constant is also significant.

2.5 Conclusion

In this paper we employ a two-sector, neoclassical model with nontraded goods to investigate the relationship between migration and FDI in a small open economy. Given free trade in capital and a produced good, our theoretical model predicts that labor flows will be positively correlated with capital flows. For sufficient migration it is possible that this co-movement of labor and capital can reverse the country's pattern of trade. In contrast to similar models without capital mobility, migration does not alter the welfare of original residents. It was observed that co-movement is analogous to a Rybczynski effect. This observation was shown to have two analytical implications. First, if the traded good is relatively more capital intensive than the nontraded good, immigration leads to an increase in the employment of capital relative to labor in the economy. Second, irrespective of relative factor intensities, immigration leads to a larger proportion of the labor stock allocated to the production of the traded good.

We deduce in our theoretical model a linear co-movement equation, which predicts that changes in net capital outflows (FDI) vary directly with changes in domestic investment, inversely with changes in migration, and inversely with changes in the world rental rate. In order to estimate our co-movement equation, we use a panel of 28 OECD countries for the period 1995-2010. These countries have relatively unrestricted trade, comparatively open borders to migration, and actively participate in global capital markets. In addition, data for these countries are readily available and come from reliable and consistent sources. We employ the Arellano-Bond procedure to estimate coefficients. The significance of our coefficients was improved by assuming that migration leads FDI, i.e. jobs follow workers. We obtain the correct signs on all coefficients and find that they are statistically significant. These results are unchanged when we remove the three largest economies. Thus, we conclude that the co-movement of labor and capital flows is a theoretical conclusion that is supported empirically for small open economies.

In future research we hope to investigate empirically two analytical conclusions which were not addressed in this study. These are that immigration should lead to an increase in the aggregate capital/labor ratio in the economy; and, secondly, that immigration should lead to a greater proportion of the labor stock allocated to the production of the traded good. These issues raise some difficult measurement problems for empirical work. Moreover, it is unclear that our theoretical model is sufficiently rich in its specification that we can explain very much of the variation in the observed levels of a country's aggregate capital/labor ratio or the sectoral allocations of its labor stock.

References

Anderson, J. E. (1979). A theoretical foundation for the gravity equation. *American Economic Review*, 69(1):106–16.

Anderson, J. E. and van Wincoop, E. (2003). Gravity with gravitas: A solution to the border puzzle. *American Economic Review*, 93(1):170–192.

Anderson, J. E. and van Wincoop, E. (2004). Trade costs. *Journal of Economic Literature*, 42(3):691–751.

Arellano, M. and Bond, S. (1991). Some tests of specification for panel data: Monte carlo evidence and an application to employment equations. *Review of Economic Studies*, 58(2):277–97.

Aroca, P. and Maloney, W. F. (2005). Migration, trade, and foreign direct investment in Mexico. *World Bank Economic Review*, 19(3):449–472.

Baldwin, R. and Taglioni, D. (2006). Gravity for dummies and dummies for gravity equations. NBER Working Papers 12516, National Bureau of Economic Research, Inc.

Baltagi, B. H. (2008). *Econometric Analysis of Panel Data*. Wiley.

Bergstrand, J. H. (1985). The gravity equation in international trade: Some microeconomic foundations and empirical evidence. *The Review of Economics and Statistics*, 67(3):474–81.

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

Bhavnani, R., Coe, D. T., Subramanian, A., and Tamirisa, N. T. (2002). The missing globalization puzzle. IMF Working Papers 02/171, International Monetary Fund.

Blonigen, B. (2005). A review of the empirical literature on FDI determinants. *Atlantic Economic Journal*, 33(4):383–403.

Brun, J.-F., Carrere, C., Guillamont, P., and De, J. M. (2002). Has distance died? Evidence from a panel gravity model. Working Papers 200215, CERDI.

Buch, C. M., Kleinert, J., and Toubal, F. (2004). The distance puzzle: on the interpretation of the distance coefficient in gravity equations. *Economics Letters*, 83(3):293–298.

Buch, C. M., Kleinert, J., and Toubal, F. (2006). Where enterprises lead, people follow? Links between migration and FDI in Germany. *European Economic Review*, 50(8):2017–2036.

Cheng, I.-H. and Wall, H. J. (2005). Controlling for heterogeneity in gravity models of trade and integration. *Review*, (Jan):49–63.

d'Addio, A. C. and d'Ercole, M. M. (2005). Trends and determinants of fertility rates in OECD countries: The role of policies. OECD social, employment and migration working papers.

de Sousa, J. (2012). The currency union effect on trade is decreasing over time. *Economics Letters*, 117(3):917–920.

Deardorff, A. V. (1995). Determinants of bilateral trade: Does gravity work in a neoclassical world? NBER Working Papers 5377, National Bureau of Economic Research, Inc.

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

Djajic, S. (1986). International migration, remittances and welfare in a dependent economy. *Journal of Development Economics*, 21(2):229–234.

Djajic, S. (1998). Emigration and welfare in an economy with foreign capital. *Journal of Development Economics*, 56(2):433 – 445.

Dolman, B. (2008). Migration, trade and investment. Productivity Commission Staff Working Paper.

Eberhardt, M. (2011). Xtmg: Stata module to estimate panel time series models with heterogeneous slopes. Statistical Software Components, Boston College Department of Economics.

Egger, P. and Pfaffermayr, M. (2004). Distance, trade and fdi: a hausman-taylor sur approach. *Journal of Applied Econometrics*, 19(2):227–246.

Federici, D. and Giannetti, M. (2010). Temporary migration and foreign direct investment. *Open Economies Review*, 21(2):293–308.

Foad, H. (2011). Immigration and equity home bias. *Journal of International Money and Finance*, 30(6):982–998.

Frankel, J. A. (1997). *Regional Trading Blocs in the World Economic System.* Number 72 in Peterson Institute Press: All Books. Peterson Institute for International Economics.

Frankel, J. A. and Rose, A. K. (2000). An Estimate of the Effects of Currency Unions on Trade and Growth.

FRED (2012). Federal Reserve Economic Data. From the Federal Reserve Bank of St. Louis, accessed.

Glaeser, E. and Kohlhase, J. (2003). Cities, regions and the decline of transport costs. *Papers in Regional Science*, 83(1):197–228.

Glick, R. and Rose, A. K. (2002). Does a currency union affect trade? the time-series evidence. *European Economic Review*, 46(6):1125 – 1151. <ce:title>ISOM</ce:title>.

Gould, D. M. (1994). Immigrant links to the home country: Empirical implications for U.S. bilateral trade flows. *The Review of Economics and Statistics*, 76(2):302–16.

Greene, W. (1997). *Econometric analysis*. Prentice-Hall international editions. Prentice Hall.

Grossman, G. M. (1998). *Comment. In J.A. Frankel (Ed.) The Regionalization of the World Economy.*, pages 29–32. University of Chicago Press.

Haskel, J. E., Pereira, S. C., and Slaughter, M. J. (2007). Does inward foreign direct investment boost the productivity of domestic firms? *The Review of Economics and Statistics*, 89(3):482–496.

Head, K., Mayer, T., and Ries, J. (2010). The erosion of colonial trade linkages after independence. *Journal of International Economics*, 81(1):1–14.

Head, K. and Ries, J. (1998). Immigration and trade creation: Econometric evidence from Canada. *Canadian Journal of Economics*, 31(1):47–62.

Heston, A., Summers, R., and Aten, B. (2011). Penn World Table. Version 7.0.

Ivlevs, A. and Melo, J. D. (2010). FDI, the brain drain and trade: Channels and evidence. *Annales d'Economie et de Statistique*, (97-98):103–121.

Javorcik, B. S. (2004). Does foreign direct investment increase the productivity of domestic firms? In search of spillovers through backward linkages. *American Economic Review*, 94(3):605–627.

Javorcik, B. S., Özden, Ç., Spatareanu, M., and Neagu, C. (2011). Migrant networks and foreign direct investment. *Journal of Development Economics*, 94(2):231–241.

Kehoe, T. J. and Ruhl, K. (2004). The north american free trade agreement after 10 years: It's impact on minnesota and a comparison with wisconsin. *CURA Reporter*.

Keller, W. and Yeaple, S. R. (2009). Multinational enterprises, international trade, and productivity growth: Firm-level evidence from the United States. *The Review of Economics and Statistics*, 91(4):821–831.

Kemp, M. C. (1993). The welfare gains from international migration. *Keio economic studies*, 30(1):1–5.

Klenow, P. J. and Rodriguez-Clare, A. (2005). Externalities and growth. In Aghion, P. and Durlauf, S., editors, *Handbook of Economic Growth*, volume 1, chapter 11, pages 817–861. Elsevier.

Kugler, M. and Rapoport, H. (2007). International labor and capital flows: Complements or substitutes? *Economics Letters*, 94(2):155 – 162.

Leamer, E. E. and Levinsohn, J. (1995). International trade theory: The evidence. In Grossman, G. M. and Rogoff, K., editors, *Handbook of International Economics*, volume 3 of *Handbook of International Economics*, chapter 26, pages 1339–1394. Elsevier.

Linnemann, H. (1966). *An Econometric Study of International Trade Flows*. Amsterdam: North-Holland.

Markusen, J. R. and Venables, A. J. (1999). Foreign direct investment as a catalyst for industrial development. *European Economic Review*, 43(2):335–356.

Mayer, T., Paillacar, R., and Zignago, S. (2008). Tradeprod. the cepii trade, production and bilateral protection database: Explanatory notes. MPRA Paper 26477, University Library of Munich, Germany.

OECD Stat (2012). Organisation for economic development and co-operation iLibrary. Accessed.

of Economic Analysis, B. (2012). Gross domestic product: Implicit price deflator. Bureau of Economic Analysis, accessed.

Pesaran, M. H. (2006). Estimation and inference in large heterogeneous panels with a multifactor error structure. *Econometrica*, 74(4):967–1012.

Pöyhönen, P. (1963). A tentative model for the volume of trade between countries. *Weltwirtschaftliches Archiv*, 90:pp. 93–100.

Rauch, J. E. (1999). Networks versus markets in international trade. *Journal of International Economics*, 48(1):7–35.

Rivera-Batiz, F. L. (1982). International migration, non-traded goods and economic welfare in the source country. *Journal of Development Economics*, 11(1):81–90.

Rose, A. K. (2000). One money, one market: the effect of common currencies on trade. *Economic Policy*, 15(30):7–46.

Soloaga, I. and Alan Winters, L. (2001). Regionalism in the nineties: what effect on trade? *The North American Journal of Economics and Finance*, 12(1):1–29.

Tinbergen, J. (1962). Les données fondamentales d'un plan régional. *Revue Tiers Monde*, 3(11):329–336.

Wang, M. and Wong, M. C. S. (2011). Inward FDI, remittances and out-migration. *Applied Economics Letters*, 18(15):1405–1409.

Wilson, S. J. (2003). A dynamic general equilibrium analysis of migration and capital formation: the case of Canada. *Review of Economic Dynamics*, 6(2):455 – 481.

Wong, K.-Y. (2006). Are international capital movement and international labor migration substitutes under national externality? In: Labor Mobility and World economy. Edited by: Foders, Federico and Langhammer, Rolf.

Yaman, S. E., Kugler, M., and Rapoport, H. (2007). Migrations et investissements directs étrangers dans l'espace européen (ue-15). *Revue économique*, 58(3):725–733.

Appendix A

Appendix 1

Table A.1: Restricted Sample OLS Estimates (Countries with 50 or More Trading Partners.)

	GDP	GDP/capita	Distance	Common Currency	Contiguous	Common Religion	Gatt/WTO
1980	0.708***	0.0554*	-1.031***	2.387***	0.511*	-0.02	-0.179**
1981	0.680***	0.0934***	-0.966***	3.323***	0.845***	-0.173	-0.133
1982	0.674***	0.0781**	-0.949***	3.500***	0.822***	-0.149	-0.0787
1983	0.686***	0.0769***	-0.986***	3.668***	0.920***	-0.241*	-0.0683
1984	0.685***	0.110***	-0.928***	4.470***	0.891***	-0.0661	0.028
1985	0.669***	0.104***	-0.923***	3.828***	1.066***	0.108	0.0406
1986	0.665***	0.0926***	-0.991***	2.792***	0.848***	-0.218*	-0.104
1987	0.662***	0.0858***	-0.939***	3.232***	0.992***	-0.262**	-0.0394
1988	0.694***	0.0581**	-0.945***	3.342***	1.001***	-0.244**	-0.0935
1989	0.674***	0.0901***	-0.941***	3.216***	1.134***	-0.414***	-0.165**
1990	0.652***	0.0676***	-0.970***	2.470***	1.168***	-0.354***	-0.180**
1991	0.652***	0.0602**	-0.951***	2.877***	1.358***	-0.412***	-0.335***
1992	0.625***	0.0596***	-0.923***	3.653***	1.635***	-0.368***	-0.0394
1993	0.648***	0.0459**	-1.024***	1.795***	1.322***	-0.217*	-0.218***
1994	0.642***	0.0312	-1.018***	1.673***	1.475***	-0.247**	-0.136**
1995	0.612***	0.0498**	-0.952***	1.081***	1.297***	-0.0168	-0.225***
1996	0.609***	0.017	-0.961***	1.496***	1.518***	0.0287	-0.261***
1997	0.591***	0.0533***	-0.951***	0.996***	1.561***	0.189*	-0.144**
1998	0.578***	0.0729***	-1.011***	1.061***	1.529***	0.0562	-0.102*
1999	0.570***	0.0750***	-0.925***	1.888***	1.583***	0.0528	-0.113*
2000	0.584***	0.0685***	-0.992***	1.761***	1.538***	-0.06	-0.021
2001	0.606***	0.0594***	-1.010***	1.781***	1.548***	0.0502	-0.181***
2002	0.577***	0.0620***	-1.014***	1.845***	1.513***	0.057	-0.142**
2003	0.594***	0.0350*	-1.027***	1.703***	1.611***	-0.00933	-0.166**
2004	0.593***	0.0282	-1.023***	1.135***	1.893***	-0.0826	-0.179**

Table A.2: Full Sample Panel Fixed Effects Estimates.

	GDP	GDP/capita	Distance	Common Currency	Contiguous	Common Religion	Gatt/WTO
1980	0.808***	0.0787***	-1.336***	2.310***	-0.129	0.323***	0.00322
1981	0.798***	0.0961***	-1.340***	2.377***	-0.115	0.283***	-0.0134
1982	0.774***	0.131***	-1.357***	2.164***	-0.0942	0.16	-0.0094
1983	0.791***	0.127***	-1.326***	2.355***	-0.0489	0.0564	-0.0163
1984	0.811***	0.101***	-1.295***	2.253***	0.0259	0.234**	-0.0825
1985	0.796***	0.0903***	-1.293***	2.359***	-0.026	0.230**	-0.004
1986	0.789***	0.0773***	-1.238***	2.766***	0.187	0.270***	-0.0627
1987	0.792***	0.0697***	-1.232***	2.778***	0.166	0.275***	-0.117**
1988	0.799***	0.0687***	-1.199***	2.692***	0.275*	0.319***	-0.112**
1989	0.796***	0.0793***	-1.217***	2.711***	0.277*	0.374***	-0.119**
1990	0.792***	0.0515***	-1.190***	2.606***	0.312**	0.294***	-0.147***
1991	0.799***	0.0570***	-1.220***	2.684***	0.349**	0.314***	-0.198***
1992	0.804***	0.0138	-1.232***	2.131***	0.363**	0.351***	-0.202***
1993	0.804***	0.0371**	-1.209***	2.349***	0.469***	0.322***	-0.200***
1994	0.799***	0.0387**	-1.218***	2.533***	0.391***	0.411***	-0.0781
1995	0.812***	0.00755	-1.210***	2.394***	0.360***	0.421***	-0.0836
1996	0.816***	0.0301*	-1.232***	2.210***	0.332**	0.383***	-0.0417
1997	0.822***	0.0321**	-1.243***	2.128***	0.335**	0.399***	0.0687
1998	0.800***	0.0489***	-1.250***	1.887***	0.364***	0.492***	0.0442
1999	0.815***	0.0478***	-1.305***	-0.0176	0.235*	0.413***	0.107*
2000	0.823***	0.0618***	-1.299***	-0.0138	0.252*	0.445***	0.222***
2001	0.825***	0.0346**	-1.278***	-0.052	0.247*	0.502***	0.186***
2002	0.817***	0.0300**	-1.301***	-0.0489	0.269**	0.440***	0.163**
2003	0.811***	0.0308**	-1.307***	-0.108	0.306**	0.400***	0.0594
2004	0.824***	0.0181	-1.298***	-0.099	0.308**	0.345***	-0.0518

Table A.3: Restricted Sample Panel Fixed Effects Estimates (Countries with 50 or More Trading Partners.)

	GDP	GDP/capita	Distance	Common Currency	Contiguous	Common Religion	Gatt/WTO
1980	0.817***	0.136***	-1.404***	2.563***	0.0628	0.736***	0.0516
1981	0.803***	0.151***	-1.416***	2.681***	0.151	0.700***	0.0594
1982	0.805***	0.162***	-1.414***	2.771***	0.183	0.646***	0.115**
1983	0.818***	0.168***	-1.393***	2.741***	0.101	0.468***	0.106**
1984	0.816***	0.190***	-1.392***	2.811***	-0.0182	0.781***	0.169***
1985	0.802***	0.185***	-1.396***	2.891***	0.219	0.723***	0.179***
1986	0.811***	0.147***	-1.380***	2.893***	0.322**	0.818***	0.125**
1987	0.802***	0.164***	-1.326***	3.009***	0.403**	0.922***	0.0884*
1988	0.836***	0.156***	-1.309***	2.797***	0.294*	0.850***	0.0311
1989	0.839***	0.159***	-1.331***	2.802***	0.348**	0.933***	0.0198
1990	0.835***	0.0975***	-1.409***	2.530***	0.430***	0.819***	0.0174
1991	0.837***	0.116***	-1.429***	2.411***	0.492***	0.858***	-0.0548
1992	0.809***	0.111***	-1.325***	2.758***	0.757***	0.981***	0.278***
1993	0.848***	0.101***	-1.409***	2.403***	0.648***	0.884***	0.230***
1994	0.850***	0.0649***	-1.459***	2.344***	0.822***	0.816***	0.363***
1995	0.849***	0.0311***	-1.483***	2.163***	0.942***	0.884***	0.243***
1996	0.846***	0.0265**	-1.499***	2.277***	1.050***	0.774***	0.143***
1997	0.836***	0.0387***	-1.493***	2.050***	1.029***	0.785***	0.275***
1998	0.826***	0.0527***	-1.483***	2.072***	1.070***	0.834***	0.264***
1999	0.812***	0.0701***	-1.511***	1.397***	1.076***	0.741***	0.282***
2000	0.826***	0.0627***	-1.511***	1.382***	1.091***	0.639***	0.334***
2001	0.839***	0.0402***	-1.544***	1.196***	0.998***	0.774***	0.313***
2002	0.832***	0.0179	-1.550***	1.218***	0.986***	0.776***	0.347***
2003	0.838***	-0.00372	-1.568***	1.143***	0.969***	0.709***	0.239***
2004	0.838***	0.0158	-1.549***	1.139***	1.040***	0.689***	0.225***

Table A.4: Full Sample Exporter Effects OLS Estimates.

	GDP	GDP/capita	Distance	Common Currency	Contiguous	Common Religion	Gatt/WTO
1980	0.649***	0.0813**	-0.983***	2.187***	1.215***	-0.524***	0.187**
1981	0.662***	0.116***	-0.992***	2.128***	1.235***	-0.611***	0.0892
1982	0.664***	0.132***	-1.002***	2.051***	1.259***	-0.589***	0.121
1983	0.647***	0.110***	-0.980***	2.170***	1.380***	-0.744***	0.174*
1984	0.644***	0.0938***	-0.956***	2.171***	1.456***	-0.649***	0.200**
1985	0.644***	0.120***	-0.941***	2.085***	1.446***	-0.607***	0.185**
1986	0.640***	0.0591**	-0.922***	2.157***	1.596***	-0.620***	0.174*
1987	0.659***	0.0106	-0.922***	2.124***	1.545***	-0.707***	-0.0513
1988	0.655***	-0.00299	-0.882***	2.138***	1.711***	-0.660***	-0.0944
1989	0.650***	0.00168	-0.902***	1.989***	1.782***	-0.679***	-0.137
1990	0.654***	-0.0198	-0.903***	1.890***	1.747***	-0.744***	-0.246**
1991	0.695***	-0.0695**	-0.867***	2.326***	1.876***	-0.708***	-0.235**
1992	0.700***	-0.0890***	-0.884***	1.903***	1.907***	-0.702***	-0.257**
1993	0.701***	-0.0692**	-0.854***	1.960***	2.044***	-0.734***	-0.168
1994	0.690***	-0.0913***	-0.864***	2.104***	2.007***	-0.636***	-0.2
1995	0.695***	-0.110***	-0.868***	1.941***	1.934***	-0.605***	-0.231*
1996	0.699***	-0.118***	-0.883***	1.794***	1.903***	-0.629***	-0.136
1997	0.710***	-0.116***	-0.879***	1.839***	1.920***	-0.581***	-0.301**
1998	0.708***	-0.136***	-0.884***	1.653***	1.908***	-0.524***	-0.176
1999	0.698***	-0.140***	-0.825***	2.565***	1.701***	-0.704***	-0.287**
2000	0.693***	-0.135***	-0.824***	2.581***	1.734***	-0.678***	-0.539***
2001	0.701***	-0.165***	-0.825***	2.269***	1.745***	-0.606***	-0.195
2002	0.709***	-0.183***	-0.858***	2.232***	1.709***	-0.679***	0.492***
2003	0.724***	-0.219***	-0.875***	2.227***	1.735***	-0.713***	0.592***
2004	0.738***	-0.222***	-0.862***	2.199***	1.804***	-0.745***	0.537***

Table A.5: Restricted Sample Exporter Effects OLS Estimates (Countries with 50 or More Trading Partners.)

	GDP	GDP/capita	Distance	Common Currency	Contiguous	Common Religion	Gatt/WTO
1980	0.888***	0.325***	-1.090***	1.262***	0.235	0.094	1.261***
1981	0.934***	0.298***	-1.125***	1.880***	0.648**	-0.598***	1.540***
1982	0.941***	0.325***	-1.135***	2.481***	0.511**	-0.179	1.583***
1983	0.930***	0.356***	-1.121***	2.296***	0.500**	-0.507***	1.410***
1984	0.928***	0.357***	-1.096***	2.986***	0.508**	0.0806	1.676***
1985	0.953***	0.423***	-1.018***	2.845***	0.844***	-0.103	1.635***
1986	0.964***	0.376***	-1.132***	2.134***	0.556**	-0.0131	1.720***
1987	0.994***	0.345***	-1.125***	1.981***	0.568***	0.11	2.018***
1988	0.972***	0.353***	-1.102***	2.843***	1.002***	-0.0754	2.009***
1989	0.985***	0.330***	-1.137***	1.707***	0.945***	-0.000494	1.857***
1990	0.996***	0.289***	-1.130***	2.316***	0.945***	-0.072	1.782***
1991	1.004***	0.273***	-1.073***	2.906***	1.159***	-0.103	1.396***
1992	0.985***	0.258***	-1.097***	2.738***	1.231***	-0.00238	1.275***
1993	0.974***	0.228***	-1.197***	1.441***	1.201***	-0.257***	0.924***
1994	0.959***	0.199***	-1.153***	1.492***	1.339***	-0.167*	0.789***
1995	0.943***	0.213***	-1.175***	1.162***	1.326***	-0.0665	0.905***
1996	0.962***	0.199***	-1.203***	1.367***	1.571***	-0.183**	0.962***
1997	0.954***	0.233***	-1.190***	1.077***	1.532***	-0.111	0.980***
1998	0.984***	0.201***	-1.205***	1.136***	1.537***	-0.193**	0.957***
1999	0.968***	0.196***	-1.146***	1.516***	1.557***	-0.125	0.912***
2000	0.979***	0.202***	-1.164***	1.594***	1.611***	-0.265***	0.966***
2001	0.977***	0.222***	-1.193***	1.471***	1.577***	-0.183**	1.024***
2002	0.987***	0.225***	-1.193***	1.444***	1.577***	-0.0853	1.120***
2003	0.992***	0.187***	-1.202***	1.232***	1.630***	-0.155*	1.022***
2004	1.006***	0.184***	-1.156***	0.901***	1.844***	-0.0773	0.895***

Table A.6: Full Sample Exporter Effects CCEMG Estimates.

	GDP	GDP/capita	Distance	Common Currency	Contiguous	Common Religion	Gatt/WTO
1980	0.556	0.291*	-2.194***	0.291	0.0204	-7.048	0.276
1981	-0.0736	0.677	-2.677***	0.438	0.21	-3.244	-0.355
1982	-0.0674	0.211	-1.734***	0.0722	0.393**	-0.907	0.748
1983	0.0736	0.0499	-1.444*	0.132	0.247	-2.164	1.14
1984	3.623	0.661	15.18	0.102	0.239	-20.59	0.717
1985	0.102	0.1	-1.942***	0.0696	0.208	-0.565	-0.252*
1986	0.0943	0.134	-1.913***	0.0113	0.175*	-2.585	1.206
1987	2.439	0.873	11.1	-0.0364	0.0378	-32.68	0.0253
1988	0.258***	0.13	-1.170**	-0.0362	0.171	-0.765	0.208*
1989	0.293***	0.138	-0.757	0.131	0.203*	-2.978*	0.216*
1990	0.441	0.352	0.494	0.267***	0.273**	-1.937	0.167*
1991	0.00405	-0.0771	-2.839**	0.107	0.192	5.185*	0.15
1992	-0.0504	-0.0415	-2.548**	0.0663	0.214**	5.074*	0.0955
1993	-0.129	-0.0449	-2.720**	0.0176	0.214**	2.806	0.0963
1994	-0.0163	0.0884	-2.179**	0.0213	0.0571	2.053	0.118
1995	0.216	0.189	-1.716**	0.0101	0.159	1.043	0.151**
1996	0.293	0.219*	-1.493*	0.0138	0.115	0.285	0.143**
1997	0.2	0.279***	-1.915***	0.0324	0.194*	-1.728	0.165***
1998	0.0911	-0.0322	-2.987**	-0.193	0.205**	1.499	0.200***
1999	0.199	0.108	-2.501***	0.033	0.186**	-0.838	0.220***
2000	0.133	-0.00432	-2.422***	0.0296	0.226**	-3.378	0.196***
2001	-0.226	-0.188	-1.956***	0.0632	0.163	-3.277	0.137**
2002	-0.337	-0.425	-1.571*	-0.0226	0.133	-4.742	0.0908
2003	-0.283	-0.154	-1.756**	-0.0254	0.149*	-4.679	0.111**
2004	2.18	2.091	-4.151**	-0.112	0.165*	6.115	0.142***

Table A.7: Restricted Sample Exporter Effects CCEMG Estimates (Countries with 50 or More Trading Partners.)

	GDP	GDP/capita	Distance	Common Currency	Contiguous	Common Religion	Gatt/WTO
1980	0.102*	0.0339	-1.313***	0.158	-0.0608	-5.466	0.113
1981	0.0756	0.0211	-1.393***	0.261	-0.161	-10.45	0.0834
1982	0.0994*	0.025	-1.480***	0.254	-0.152	-6.691	0.0415
1983	0.106*	0.0428	-1.438***	0.0131	-0.0673	-7.595	0.0697
1984	0.0969*	0.0293	-1.380***	0.122	-0.0235	-6.007	0.00753
1985	0.0977*	0.0208	-1.331***	0.0234	-0.0582	-11.22	0.0558
1986	0.136**	0.051	-1.251***	-0.0852	0.148	-7.725	-0.0193
1987	0.0923*	0.0258	-1.321***	-0.0988	0.0218	-7.809	-0.0212
1988	0.0781	0.0421	-1.250***	-0.109	0.291	-8.168	-0.0239
1989	0.0676	0.0393	-1.280***	-0.0585	0.168	-9.596	-0.0242
1990	0.0697	0.0331	-1.208***	0.0257	0.243	-6.539	-0.0493
1991	0.0738*	-0.00204	-1.184***	0.0137	0.0473	-2.25	0.00448
1992	0.0739	-0.00527	-1.226***	-0.0275	0.169	2.167	-0.0199
1993	0.0913**	0.0149	-1.257***	-0.026	0.0852	-5.614	-0.105
1994	0.106**	0.031	-1.276***	-0.103**	0.141	-3.634	-0.144
1995	0.0961**	0.0328	-1.253***	-0.0226	0.0686	-4.848	-0.121
1996	0.106**	0.0259	-1.296***	-0.104	0.0672	-6.517	-0.142
1997	0.119***	0.0363	-1.256***	-0.0639	0.08	-4.923	-0.0958
1998	0.117***	0.0403	-1.249***	-0.158	0.079	-4.794	-0.0737
1999	0.0943**	0.0435	-1.289***	-0.506	0.0211	-1.523	-0.0741
2000	0.105***	0.038	-1.269***	-0.0639	-0.0196	-0.381	-0.0593
2001	0.119***	0.0497	-1.241***	-0.518	-0.00318	-4.061	-0.0982
2002	0.0822*	0.0321	-1.278***	-0.84	-0.0194	3.311	-0.0772
2003	0.0711*	0.0398	-1.335***	-0.527	0.0301	0.855	-0.0889
2004	0.0705*	0.0361	-1.302***	-0.324	0.0363	1.982	-0.0969

Table A.8: Full Sample Exporter Effects Panel Fixed Effects Estimates.

	GDP	GDP/capita	Distance	Common Currency	Contiguous	Common Religion	Gatt/WTO
1980	0.931***	0.297***	-1.159***	2.179***	0.174	-0.103	0.509***
1981	0.933***	0.327***	-1.209***	1.926***	0.121	-0.128	0.463***
1982	0.932***	0.369***	-1.179***	1.842***	0.249	0.0382	0.538***
1983	0.920***	0.350***	-1.180***	1.856***	0.267	0.0223	0.584***
1984	0.918***	0.338***	-1.177***	1.750***	0.307	0.154	0.612***
1985	0.909***	0.369***	-1.133***	1.946***	0.383**	0.204*	0.599***
1986	0.904***	0.303***	-1.125***	2.436***	0.497***	0.094	0.723***
1987	0.925***	0.252***	-1.136***	2.413***	0.438**	0.0148	0.587***
1988	0.924***	0.244***	-1.113***	2.380***	0.620***	0.169*	0.523***
1989	0.916***	0.256***	-1.120***	2.309***	0.696***	0.169*	0.464***
1990	0.918***	0.230***	-1.104***	2.394***	0.675***	0.0247	0.426***
1991	0.960***	0.174***	-1.112***	2.489***	0.664***	-0.101	0.413***
1992	0.959***	0.141***	-1.135***	1.886***	0.671***	-0.144	0.367***
1993	0.971***	0.163***	-1.133***	2.009***	0.692***	-0.151	0.437***
1994	0.975***	0.149***	-1.163***	2.130***	0.603***	-0.0976	0.328***
1995	0.980***	0.132***	-1.148***	2.130***	0.552***	-0.0597	0.281***
1996	0.989***	0.135***	-1.169***	1.982***	0.484***	-0.0605	0.447***
1997	1.001***	0.135***	-1.182***	1.873***	0.496***	-0.0641	0.325***
1998	0.993***	0.103***	-1.119***	1.766***	0.669***	-0.175*	0.457***
1999	0.998***	0.110***	-1.157***	0.449***	0.574***	-0.0864	0.391***
2000	0.997***	0.113***	-1.161***	0.504***	0.545***	-0.0633	0.221**
2001	0.989***	0.0955***	-1.148***	0.338**	0.599***	-0.0463	0.526***
2002	0.995***	0.0707***	-1.132***	0.370**	0.678***	0.0146	1.092***
2003	1.008***	0.0341**	-1.126***	0.302*	0.744***	0.0183	1.185***
2004	1.020***	0.0306*	-1.125***	0.268*	0.763***	-0.00284	1.207***

Table A.9: Restricted Sample Exporter Effects Panel Fixed Effects Estimates (Countries with 50 or More Trading Partners.)

	GDP	GDP/capita	Distance	Common Currency	Contiguous	Common Religion	Gatt/WTO
1980	0.102*	0.0339	-1.313***	0.158	-0.0608	-5.466	0.113
1981	0.0756	0.0211	-1.393***	0.261	-0.161	-10.45	0.0834
1982	0.0994*	0.025	-1.480***	0.254	-0.152	-6.691	0.0415
1983	0.106*	0.0428	-1.438***	0.0131	-0.0673	-7.595	0.0697
1984	0.0969*	0.0293	-1.380***	0.122	-0.0235	-6.007	0.00753
1985	0.0977*	0.0208	-1.331***	0.0234	-0.0582	-11.22	0.0558
1986	0.136**	0.051	-1.251***	-0.0852	0.148	-7.725	-0.0193
1987	0.0923*	0.0258	-1.321***	-0.0988	0.0218	-7.809	-0.0212
1988	0.0781	0.0421	-1.250***	-0.109	0.291	-8.168	-0.0239
1989	0.0676	0.0393	-1.280***	-0.0585	0.168	-9.596	-0.0242
1990	0.0697	0.0331	-1.208***	0.0257	0.243	-6.539	-0.0493
1991	0.0738*	-0.00204	-1.184***	0.0137	0.0473	-2.25	0.00448
1992	0.0739	-0.00527	-1.226***	-0.0275	0.169	2.167	-0.0199
1993	0.0913**	0.0149	-1.257***	-0.026	0.0852	-5.614	-0.105
1994	0.106**	0.031	-1.276***	-0.103**	0.141	-3.634	-0.144
1995	0.0961**	0.0328	-1.253***	-0.0226	0.0686	-4.848	-0.121
1996	0.106**	0.0259	-1.296***	-0.104	0.0672	-6.517	-0.142
1997	0.119***	0.0363	-1.256***	-0.0639	0.08	-4.923	-0.0958
1998	0.117***	0.0403	-1.249***	-0.158	0.079	-4.794	-0.0737
1999	0.0943**	0.0435	-1.289***	-0.506	0.0211	-1.523	-0.0741
2000	0.105***	0.038	-1.269***	-0.0639	-0.0196	-0.381	-0.0593
2001	0.119***	0.0497	-1.241***	-0.518	-0.00318	-4.061	-0.0982
2002	0.0822*	0.0321	-1.278***	-0.84	-0.0194	3.311	-0.0772
2003	0.0711*	0.0398	-1.335***	-0.527	0.0301	0.855	-0.0889
2004	0.0705*	0.0361	-1.302***	-0.324	0.0363	1.982	-0.0969

Appendix B

Appendix 2

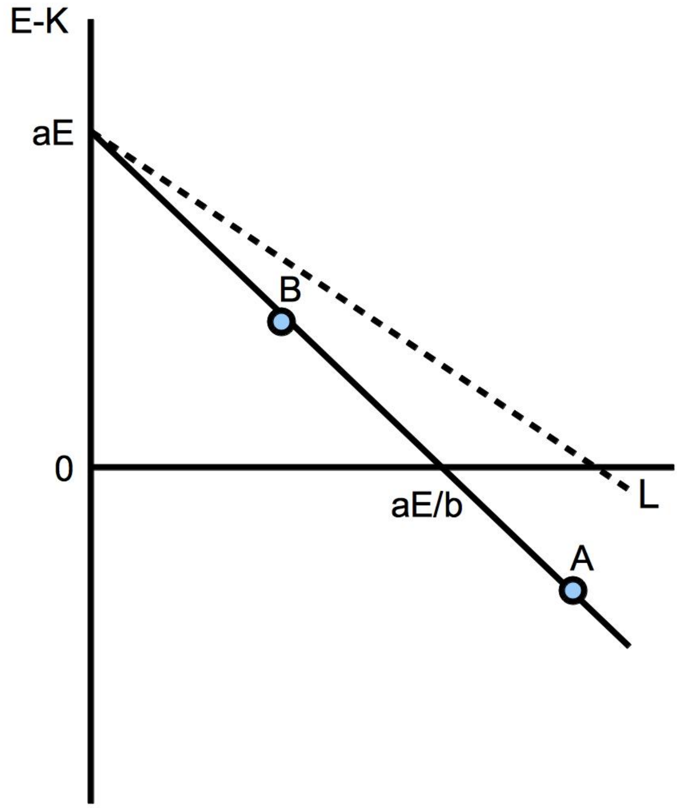

Figure B.1: Excess Supply

Table B.1: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min.	Max.
Pop.Tot (L) (persons)	438	4.06×10^{07}	5.81×10^{07}	408625	3.09×10^{08}
Rent.Rate (%)	448	4.068125	1.706613	1.11	6.26
Inflation (%)	448	2.068165	.725525	.5842304	3.319632
Dom.Inv (US$)	420	1.30×10^{13}	4.81×10^{13}	3.39×10^{09}	2.78×10^{14}
FDI.Tot (US$)	423	255035.7	376691.7	0	2658932
GDP (US$)	448	1157101	2185965	19785.26	$\times10^{07}$

Table B.2: Regression Results for OECD-5 and OECD-10

ΔFDI/L	OECD-5	OECD-10
ΔFDI.Lag/L	-.6327***	-.6317***
	(.0491)	(.0487)
ΔDom.Inv./L	-8.07×10^{-10}	-1.01×10^{-08}
	(8.77×10^{-10})	(1.86×10^{-08})
ΔPop.Lag/L	.0174	-.0092
	(.2379)	(.2644)
ΔPop.Lag2/L	.0007***	.0007***
	(.0002)	(.0002)
ΔRent.Rate	-.0002	-.0003
	(.0003)	(.0004)
Constant	.0036	.0046
	(.0025)	(.0029)

$*p \leq .10$, $**p \leq .05$, $***p \leq .01$